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Tech-Savvy Educators' Perceptions of Using Smartphones for Self-Directed Professional Development

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Abstract

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MA, Marygrove College, 2015

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Dissertation Submitted in Partial Fulfillment

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Abstract

The proliferation of the smartphone has encouraged educators, particularly the tech savvy, to seek personalized learning options in lieu of the absence of individualized professional development (PD) offerings provided by their academic institutions that are not based on short-term whole group instruction. Although smartphone use has attracted the attention of researchers, not much has been examined about how educators use the device to enhance their learning. The purpose of this generic qualitative study was to investigate the perceptions of tech-savvy educators regarding smartphone use for informal self-directed PD. The conceptual framework of the study was the 3 x 3 model of 21st century learning. Semistructured interviews were conducted with 13 self-described tech-savvy K–16 educators. Data were analyzed using a priori and inductive codes. Findings indicated that tech-savvy educators' smartphone use for informal PD was driven by a curiosity to pursue desired interests and the autonomy to access information in real time. Participants perceived the smartphone as indispensable because it allows instant collaboration and access to other professional perspectives. Findings may be used to promote alternative methods of delivering PD opportunities and may provide evidence that the smartphone can be a conduit for inexpensive opportunities for underprivileged educators to pursue informal PD.

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Dedication

This work is dedicated to family and friends I neglected in pursuing this degree. Most importantly, my three outstanding sons, Trey, Nile, and Rio, who had to, on many school nights and weekends, manage without their mom. This dissertation is also dedicated to my husband, Dr. Daniel M. Ragatz, who not only held the fort so that I could focus but offered a patient and supportive ear during dissertation drama episodes. I also want to thank all of the friends, family, and colleagues who offered encouragement along the way.

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Chapter 1: Introduction to the Study

Educators often report unresolved pressures about maintaining professional skills in the face of multiple competing demands and prioritizing their time (Chai et al., 2019; Koh et al., 2017). Traditional whole group professional development (PD) offerings have been considered a viable way for educators to stay informed about developing innovations relating to practice (Cavendish et al., 2020). However, the whole group PD model is not effective for all educators (Rouleau et al., 2019). According to Sawaya (2015) and Mishra and Mehta (2017), ongoing PD methods do not consistently change or advance the teaching practice of the participants. The trend in PD offerings for educators is often limited to short-term, whole group, one-size-fits-all workshops. Because of this practice, some educators have turned to mobile technology, like the smartphone, to fill in the PD gaps and differentiate their learning (Jones & Dexter, 2018).

The proliferation of mobile devices and referencing-technology tools like the smartphone has attracted the attention of researchers as well as educators because of their potential to enhance learning (Anshari & Alas, 2015; M. Richardson et al., 2018). However, not much has been examined about how professional educators, especially tech-savvy teachers, use the smartphone for professional learning and development (Quansah, 2018; Sawaya, 2015). Specifically, researchers have not explored the perspective of tech-savvy educators who use available technology to overcome challenges they recognize in their professional practice and utilize technology tools extensively in their personal lives as well (De Clercq, 2019; Schrum et al., 2008). In the

current study, I investigated the perceptions of tech-savvy educators and their use of the smartphone for self-directed PD.

The practice of relying on the referencing mobile devices to inform professional practice is on the rise (Bernstein et al., 2017; M. I. Brown et al., 2017; Cho & Lee, 2016; Geres-Smith, 2020). However, the use of the smartphone in academic settings has been viewed as unprofessional and unsafe due to features such as high-resolution cameras and audio-video recording capabilities (Dávideková, 2016; McNally et al., 2017). Furthermore, the smartphone's instant connectedness to remote online storage and internet platforms is often considered a threat to sensitive populations and the security of confidential personal data (Mackay et al., 2017; McNally et al., 2017). Although there exists a preponderance of studies regarding the use of smartphones for learning by students, Quansah (2018) and Sawaya (2015) asserted the lack of research about the use of smartphones for the purpose of learning for professional practice. Specifically, the literature indicated a lack of investigations into the extent and perceptions of experienced technology users using the smartphone for informal personalized learning or self-directed PD.

Instructional innovators and instructional technology coaches find it difficult to gauge where experienced technology-using educators go to find digital content for learning (Maseleno et al., 2018). Also, digital content creators lack understanding on how tech-savvy educators access new information and how the new knowledge changes their practice (Gamrat et al., 2014; Maseleno et al., 2018). Creating digital content is labor

intensive, and newly crafted content often falls unused by the intended audience (Maseleno et al., 2018).

In this chapter, underlying information is given to describe the problem, the purpose of this study, and the research questions. A conceptual framework is explained, which is followed by an explanation of the nature of the study, definitions, assumptions, and scope of the study. In the last two sections, the limitations of the study are addressed, including the study's significance. The chapter concludes with a summary and introduction to Chapter 2.

Background

Because this study focused on tech-savvy educators as participants, it was important to understand common characteristics, motivations, and challenges this specific group of technology users might have. Schrum et al. (2008) conducted one of the first studies involving tech-savvy educators and provided important traits relevant to this group of educators as individuals who (a) are lifelong learners, (b) are comfortable with technology, (c) use it extensively in their personal lives, and (d) implement it with ease in professional teaching and learning. Schrum et al. (2008), along with several newer studies, provided the historical definition and background on tech-savvy educators' self-efficacy, or the beliefs in their learning capabilities (Bandura, 2018; Giles & Kent, 2016).

Educators, like other professionals, often carry their smartphones on their person, so it is important to analyze how they chose to use this tool for personalized learning. Personalized learning refers to learning strategies that give agency to the individual

learner and address their needs, experiences, and interests (Bouffard, 2019). Huda, Maseleno, Atmotiyoso et al. (2018) and Anshari et al. (2017) indicated a gap in the literature and encouraged the study of the smartphone as a tool for acquiring content knowledge online. The current study may provide greater understanding to service providers, school district decision makers, school administrators, and policy makers on how to adapt teacher PD that aligns with the rapid adoption of smartphones in education.

Since the introduction of the touch screen smartphone by Steve Jobs in 2007 (Castelluccio, 2017), researchers conducted studies to debate whether mobile devices like smartphones are tools or toys (Jukes et al., 2010; Kolb, 2008; Pegrum et al., 2013). Many of these studies focused on the value of mobile learning and its potential in the context of teacher education. For example, Baran (2014) conducted a cross-study of 137 articles and concluded that (a) of late, there is a growing number of articles published on the subject from researchers from all over the world; (b) there is an insufficient report of theoretical and conceptual points of view; and most significantly that (c) the understanding of the potential of mobile learning of educators and its role becomes more essential in addressing the learning needs of students across several disciplines. In recent studies, researchers recommended the examination of the different aspects of the relationship between educators and mobile learning devices for PD (Mesutoglu & Baran, 2020; Tondeur et al., 2019). The current study may provide additional strategies for mobile learning integration in the PD of educators.

Recently, a number of studies focused on everyday use of smartphones and the phenomenon of learning using the smartphones (Alhasanat, 2020; Gasaymeh & Waswas,

2019; Ignatov et al., 2019). Alhasanat (2020) found that the smartphone as a learning device offers benefits of rich content delivery, knowledge sharing, and dynamic learning activities for learners, and encouraged educators to embrace the smartphone to take advantage of its usability. A related gap in the literature was highlighted by Mishra and Mehta (2017) who studied the perceptions of K–12 educators and the challenges they face in teaching what participants believed is important for 21st century learning. Findings showed participants ranked content knowledge much lower than skills such as problem solving, critical thinking, innovation, communication, and collaboration as the most important knowledge in the 21st century. The focus on how tech-savvy teachers use smartphones for learning was guided by two main ideas: (a) learning will happen when learners are provided direct access to information via information and communication technologies and (b) it is more important that learners be able to have the necessary skills to access knowledge that challenge their values and impact their practice when needed.

Finally, according to Tour (2017) and Ding et al., (2019), it is critical to explore educators' technology use in personal and professional domains because PD must consider an individual's personal experiences to provide opportunities for them to reflect on their practice and digital mindset. A digital mindset is defined as a set of attitudes and behaviors that enable people to foresee possibilities to incorporate and extract value from technology to enhance their work (Hagen & Wibe, 2019). Both Tour's (2017) and Ding et al.'s (2019) findings provided foundational information for the current study because they indicated the baseline of the digital mindset of educators regarding the adoption and practical use of mobile technology in informal PD.

Problem Statement

The problem investigated in this study was the lack of understanding of tech-savvy educators' perceptions of the use of the smartphone for self-directed PD. Professional development offerings for educators are often based on short-term whole group instruction that does not often change or advance their teaching practice (Darling-Hammond et al., 2009; Mishra & Mehta, 2017; Sawaya, 2015). However, the advent of smaller and more affordable mobile devices has encouraged educators to seek personalized learning options online (Tour, 2017). Most of the research on the perception of educators regarding technology-related PD focused on the following: (a) Most mobile learning PD efforts are focused on the use of laptops or app-based tablets (Baran, 2018; Chung et al., 2019), (b) most studies focused on mobile learning as a general phenomenon and not on the efficacy of the learning (Chung et al., 2019), (c) most of the existing research focused on mobile learning for students (Anshari et al., 2017; Crompton et al., 2019).

The customizable nature of mobile devices, especially smartphones, makes it likely that individuals will use them in unique ways (Alhasanat, 2020; Sawaya, 2015). The portability and prevalence of smartphone technology has encouraged educators and policymakers around the world to incorporate it into teaching and learning (Alfelaij, 2016; Anshari et al., 2017) because it also supports differentiated learning opportunities for self-directed learners (Arif et al., 2017). As a result, there is a need to study how learners in different disciplines use their smartphones for learning (Al-Daihani, 2018; Sawaya, 2015).

Researchers identified tech-savvy educators as those who are different from typical educators (Becker, 2000; Schrum et al., 2008). According to Becker (2000), tech-savvy educators have more developed experiences than other educators and a more self-directed commitment to lifelong learning. This unique group of educators shares a level of confidence that makes them willing to try new technology tools and teaching approaches (Schrum et al., 2008). Since these early studies, there has been a rapid transformation of teaching requirements as well as learning tools. Earlier studies provided not only a rich foundation for current research, but also required important reexamination to better frame changes in how tech-savvy educators perceive the use of certain technologies to advance their personal and professional practice.

Migdalski (2017) concluded that technology-using educators can opt to enhance their practice using smartphones. The current study was conducted to better understand how tech-savvy educators use smartphones and might provide insight into the viability of smartphones as a tool for self-directed PD. In addition, this study also has the potential for social change by promoting innovative PD options and furnishing a needed analysis of the use of smartphones for learning by tech-savvy educators.

Purpose of the Study

The purpose of this qualitative study was to examine the perceptions of tech-savvy educators in their use of the smartphone for self-directed PD. Aspects of their learning approaches and activities were explored through interviews (see Lune & Berg, 2016), and the findings of this study may furnish information to fill a gap in the literature by providing awareness of the use of smartphones by self-directed tech-savvy educators.

Tech-savvy educators are seldom offered personalized advanced level PD and often must seek their own nontraditional path to becoming more qualified (Hunt et al., 2019). Understanding the use of the smartphone by tech-savvy educators may afford insights into what they learn to advance their professional practice and how they foster innovative PD using this mobile device. In addition, the findings could be used to foster social change in PD options for first adopters.

Tech-savvy educators furthest from PD opportunities and access to cost-prohibitive face-to-face programs could benefit from the findings of this study. In many cultures, teachers are perceived as natural leaders and providers of positive social change in their communities and in the lives of their students (Bourn, 2016). According to Bourn (2021), teachers who promote transformative change should be willing to embrace new ways of accessing information and update themselves regarding emerging processes that foster impactful change. K. J. Brown (2015) reported that is especially relevant for learning through the lens of global poverty and development opportunities. The findings of the current study may reveal ways tech-savvy educators acquire knowledge that leads to changes in learning in their classrooms and may bring about change to their school and society as a whole.

Research Questions

There was one main research question and two subquestions guiding this study:

Research Question: What are the perceptions of tech-savvy educators using smartphones for self-directed professional development?

Subquestion 1: How does the knowledge gained by using the smartphone influence educator beliefs about the use of the smartphone as a learning device?

Subquestion 2: How do tech-savvy educators perceive using the smartphone for self-directed professional development influences their professional practice?

Conceptual Framework

The conceptual framework for this study was constructivism through the lens of Vygotsky (1978) and the 3 x 3 model of 21st century learning (Kereluik et al., 2013; Mishra & Mehta, 2017). Vygotsky (1978, as cited in J. S. Brown et al., 1989) suggested that learning not only occurs in a social context but is also an active process in which learners must learn to discover principles, concepts, and facts for themselves. The ability of smartphone users to access the internet to retrieve massive amounts of data may influence learners' views of self-directed content acquisition (Anshari & Alas, 2015; Anshari et al., 2017; Sawaya, 2015). Kereluik et al. (2013) developed a set of overarching categories derived from an analysis of multiple researchers' 21st century learning frameworks. The analyses of the researchers yielded a summary of nine forms of knowledge under three categories: foundational knowledge, meta knowledge, and humanistic knowledge. These three categories offered a coherent integrative structure regarding what knowledge is important to educators in the 21st century in the context of digital/information and communication technology. A more detailed analysis is provided in Chapter 2.

Nature of the Study

I used a generic qualitative approach to understand tech-savvy educators'

perceptions of the use of smartphones in how they gain knowledge and craft innovative

learning ideas for their practice. According to Merriam and Tisdell (2016), a generic

qualitative approach is used to provide an in-depth study of how the participants (in this

case tech-savvy educators) interpret, establish, and connect their experiences. Data were

collected by inviting 13 participants to this study by selecting them using the results of a

demographic survey (see Appendix A). I developed semistructured, open-ended

interview questions (see Appendix B) to collect data to answer the research questions.

After the interview, I emailed each participant a copy of their interview transcript for

them to review. Each interview transcript was hand-coded using the three main categories

of the conceptual framework as a priori codes.

Definitions

21st century learning: A collection of competencies needed to navigate the

intricate and interconnected global environment (Bernhardt, 2015). Bernhardt (2015)

referred to skills such as digital literacy, inventiveness, entrepreneurship, and critical

thinking.

Digital literacy: The ability to navigate, evaluate, and create information

effectively and thoughtfully using a range of technology tools and online platforms

(Kereluik et al., 2013).

Personal learning: Instruction that is self-directed and is optimized for the needs

of each learner (Maseleno et al., 2018)

Self-directed or informal professional development: A set of processes, such as a constant evaluation of the effectiveness of learning activities, self-motivation, relevant goals, and well-defined outcomes, and the ability to monitor progress of improvement (Hamilton, 2018).

Smartphone: A handheld phone with advanced hardware and software capable of performing complicated functions much like a personal computer (Arthur, 2012; BinDhim & Trevena, 2015)

Tech-savvy educators: Educators who are experienced and comfortable with technology and are considered to be digitally literate (Dudeney & Hockly, 2016; Liao et al., 2016; Schrum et al., 2008).

Assumptions

This study was based on three assumptions. First, the design of the smartphone prompts users to use the device in different ways (Sawaya, 2015), so I assumed participants in this study would honestly indicate the way they use their smartphones. A second assumption was that the inclusion criteria would enable me to recruit participants who would be honest about their use of their smartphones to inform their professional practice. Lastly, I assumed self-described tech-savvy educators would be honest about having a proficiency level on the use of the smartphone to be able to understand the features and advantages of the device.

Scope and Delimitations

The purpose of this study was to understand the perceptions of tech-savvy educators regarding their use of smartphones for informal PD. Traditional whole group

PD is not always effective for populations of educators who are self-directed learners (Kereluik et al., 2013; Mishra, 2019). According to multiple studies, educators reported that whole group PD is rarely transformative to their practice (Kereluik et al., 2013; Mishra & Mehta, 2017). Educators also suggested that they require more autonomy and independence to choose their PD opportunities and craft their personalized learning experiences (Anshari & Alas, 2015; Sawaya, 2015; Yasué et al., 2019). In the current study, the choice of tech-savvy educators was aligned with the gap in the literature that suggested the need for additional research on populations using the smartphone for informal learning (see Bello-Bravo & Lutomia, 2019; Sawaya, 2015). Although many studies about the use of the smartphone for learning had been conducted, not many focused on aspects of self-directed teacher PD.

Delimitations are limits consciously applied by the researcher to establish boundaries in a study that identify and explain what the study will and will not include (Theofanidis & Fountouki, 2018). The participants in the current study self-identified as tech-savvy educators and had an advanced understanding of emerging education technology. This purposeful sample was chosen because participants could contribute experiential and in-depth explanations for the study. A delimitation was applied to exclude educators who were unfamiliar with emerging education technology and would not be able to contribute knowledge of the smartphone for learning. An additional delimitation was to exclude tech-savvy students or other populations within educational institutions. Even though there have been numerous studies targeting the use of the smartphone by students for learning, the use of the smartphone by tech-savvy educators

was not extensively covered in the literature. Tech-savvy educators living outside of the United States were also excluded. Future researchers transferring the findings of this study should recognize that the data focused on tech-savvy educators living in the United States. Researchers interested in this area could focus additional research targeting groups of participants living outside of the United States.

Limitations

One of the limitations of the generic qualitative study is that it is less bounded and defined (Kahlke, 2014). Merriam (2009) noted that the generic qualitative study is a design that can stand alone as the researcher's declared approach. In a generic qualitative study, the researcher can deviate from established methodology. This research design was chosen because generic studies focus on the understanding of interpretations or meaning making based on the participants' experiences and views of the world (see Merriam, 2009). To avoid pitfalls in the generic qualitative design, I employed a systematic approach by aligning the research questions and the literature review.

An additional limitation was that the participants were self-described tech-savvy educators who shared unique experiences using their smartphones for informal learning. The study was conducted to explore the perceptions of a small sample of participants. The purposive sample ensured depth rather than breadth of the data. Purposeful sampling was used to narrow the data to a limited set of experiences based on the demographic information of the participants. According to Merriam (2009), internal validity relates to how findings of a study correlate to the internal reality or how well the study is done. To ensure reliability and dependability, I used recognized tools like the audit trail, which

ensures other researchers can authenticate the findings in my study (see Lincoln & Guba, 1986).

Significance of the Study

Designing transformational 21st century PD experiences that are a fit for all educators is a challenge. The use of smartphones may support differentiated learning opportunities for self-directed educators (Arif et al., 2017). The current study added to the existing research by providing an understanding of how learners from different disciplines use their smartphones for learning (see Al-Daihani, 2018; Sawaya, 2015). In addition, the study filled a gap in the literature by focusing on the perceptions of tech-savvy educators regarding their use of smartphones as a mobile means of self-directed PD. This study provided insights into an underresearched area of teacher PD that integrates smartphones as a mobile tool for educators (see Bald et al., 2016; Baran, 2018). By focusing on tech-savvy educators, I not only examined how participants innovate their practice (see Mishra & Mehta, 2017; Sawaya, 2015) but also considered the potential for social change in providing new PD options for self-directed educators (see Arif et al., 2017). The study could influence educators in geographical locations where there are few opportunities for traditional face-to-face PD, but there are Wi-Fi towers that support internet access through the smartphone (see Kaliisa & Picard, 2017). Also, the study could reveal a new value to effective self-directed PD practices by tech-savvy educators (see De Clercq, 2019) and empower these educators and school administrators with new evidence-based information to reassess the smartphone as a tool for PD (see Wilkinson, 2020).

Summary

Chapter 1 provided an introduction to the underlying information in the background section followed by a description of the problem and purpose of this study. The research questions were provided as well as the conceptual framework. There was also an explanation of the nature of the study, definitions, assumptions, and scope of the study. The last two sections addressed the limitations and significance of this study. Chapter 2 provides a literature review exploring related studies and theories relevant to self-efficacy, the 3 x 3 model of 21st century learning, and the efficiency of current PD practices for educators. The literature review also includes a review of studies focused on the use of smartphones in the classroom and pertinent device features related to traditional beliefs about learning practices.

Chapter 2: Literature Review

The research problem investigated in this study was the lack of understanding of tech-savvy educators' perceptions of the use of the smartphone for self-directed PD. The social problem stemmed from the absence of individualized or customized PD offerings for educators that are not based on short-term whole group instruction. In whole group instruction, all participants learn the same content at the same time through a single source such as an instructor or facilitator providing direct instruction (Wyatt & Chapman-DeSousa, 2017). Researchers found that short-term PD fared poorly in participants' perceptions and beliefs on the sustainability and impact of the training (Gningue, 2003) while newer studies indicated that educators reported similar limitations to whole group, short-term PD. According to Sawaya (2015) and Mishra and Mehta (2017), current PD methods do not always change or advance the teaching practice of the participants. The research problem was the lack of information about the perceptions of tech-savvy educators regarding the use of smartphones for self-directed PD and the use of this tool as a personalized learning vehicle. The purpose of the study was to examine how tech-savvy educators use the smartphone for self-directed PD and as a tool for personalized learning. The framework of the study was the 3 x 3 model of 21st century learning to examine the use of the smartphone by tech-savvy educators for PD and how they perceive knowledge. There are multiple definitions of 21st century learning, but it can be described as a collection of competencies that are needed to navigate the intricate and interconnected global environment (Bernhardt, 2015; Boholano, 2017). Bernhardt (2015) referred to skills such as digital literacy, inventiveness, entrepreneurship, and critical thinking.

The emergence and proliferation of wireless and mobile computing devices has encouraged a transformation in the delivery of information through digital means and linked distance learning to electronic learning and finally to the current mobile learning models (Chee et al., 2017; Moreira et al., 2018). Computing devices and information technology have scaled educational opportunities and revolutionized learning approaches (Moreira et al., 2018). In addition, more customizable and portable mobile devices like smartphones have established a space in which individuals can learn in unique ways (Alhasanat, 2020; Anshari, et al., 2017; Sawaya, 2015), raising the question of the use of these technologies for personalized learning.

Early concerns by educators about mobile learning devices focused on elements of their physical characteristics such as battery life, size of screens, reliability, personal security, and possible radiation exposure (El-Hussein et al., 2010; Kukulska-Hulme, 2007). A central limitation to the early progress of mobile learning was the debate about whether mobile devices like mobile phones and smartphones were tools or toys (Kolb, 2008). In contrast, newer studies on mobile learning focused on systems and methodology used to integrate mobile technology in the classroom (Anshari et al., 2017; Baran, 2014; Ciampa, 2016).

To leverage mobile learning technology, educators have led initiatives and participated in PD opportunities to encourage the integration of these tools in the classroom (Bald et al., 2016). Much attention has been focused on PD related to technology adoption and integration and how to encourage educators to adopt changes. However, a vital aspect of technology integration is the creation of school cultures that

support and motivate educators who independently use emerging technology to find and

transfer new knowledge into their practice (Levin & Schrum, 2013; Mishra & Mehta,

2017). These educators are often known as tech savvy because they are comfortable with

technology and considered to be digitally literate (Dudeney & Hockly, 2016; Liao et al.,

2016). Digital literacy is defined as the ability to navigate, evaluate, and create

information effectively and thoughtfully using a range of technology tools and platforms

(Kereluik et al., 2013; Mishra & Mehta, 2017). Although educators emphasize the

concept of 21st century learning in technology-related PD, most of the focus has been

placed on the phenomenon of mobile learning as it relates to students (Anshari et al.,

2017; Baran, 2018) but not on the perceptions of tech-savvy educators using mobile

devices for their personal learning (Delello et al., 2020; Sawaya, 2015).

This literature review is organized into three sections. The first section is the

literature search approach used to locate current research, including key search terms and

databases. The second section identifies the conceptual framework. The framework

featured in this study was the 3 x 3 model of 21st century learning (see Kereluik et al.,

2013), . The third section includes key themes forming the basis of the literature review.

Literature Search Strategy

The literature was identified by searching current studies published in peer-

reviewed journals between 2015 and 2020. The search began with individual terms

related to mobile learning and was broadened to include combinations of relevant terms

that focused on handheld mobile learning devices such as the smartphone. The databases

used were Education Resource Information Center (ERIC), EBSCO Database, and

ProQuest. Terms such as *21st century learning*, *tech-savvy teacher*, *tech-savvy educator*, and *self-directed learning* were the focus of the initial searches. However, when Google Scholar was used, other terms began to emerge such as *TPACK*, *self-determination theory*, *work motivation*, *adult learning*, *andragogy*, *seamless learning*, *cyberloafing*, and *smartphone in learning*. Among the many professional journals searched were the *Journal of Education Technology Research*, *Journal of Educational Computing Research,* and *Journal of Affective Disorders*. I also consulted several dissertations found through ProQuest ranging in dates from 2008 to 2020. The literature review includes more than 100 sources containing peer-reviewed studies published after 2015.

Conceptual Framework

A review of the literature about the description of 21st century learning revealed that researchers created frameworks to mitigate the gap between the current 21st century learning goals and the current teaching practice (Ambrose, 2018; Care et al., 2018; Guha et al., 2018). In earlier and current 21st century knowledge frameworks, authors asserted that education fails to prepare students for the requirements of the 21st century workplace (Tondeur et al., 2017; Zhao, 2009, 2015). The literature also suggested that the concept of 21st century learning is unclear. Some researchers described 21st century learning as a set of survival skills to thrive in the world, such as critical thinking and problem solving, collaboration and leadership, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analyzing information, and curiosity and imagination (Bedir, 2019; Sloan, 2019; Wagner, 2008; Wagner & Dintersmith, 2015). Others described 21st century learning as a set of cognitive and

social behaviors such as ways of thinking, ways of working, tools for working, and living in the world (Anshari et al., 2017; DiCerbo, 2014). Others focus on a collection of the original steps on how to teach the aforementioned skills (Drake & Reid, 2018; Kay & Greenhill, 2013; Saavedra & Opfer, 2012) and/or on the use of technology standards to outline 21st century learning indicators like the ISTE (International Standards for Technology Education) guidelines for instructional technology (Fuller, 2020). I framed this study through the lens of the 3 x 3 model of 21st century learning because it was a viable framework from the top 15 most relevant publications in the 21st century knowledge and learning domains.

3 x 3 Model of 21st-Century Learning

The conceptual framework for this study was the 3 x 3 model of 21st century learning. Currently, 21st century knowledge narrative asserts that current education models fail to prepare students for their future (Kereluik et al., 2013; Mishra & Mehta, 2017). Kereluik et al. (2013) synthesized 15 leading frameworks and perspectives on 21st century learning to provide a critical review of what knowledge and learning means to educators. According to Kereluik et al. (2013), despite the great innovation in mobile learning technology and the many frameworks that have been developed to promote new types of knowledge, little has changed in regard to the objectives of the education system.

The 3 x 3 model for 21st century learning framework combines common elements of the 15 frameworks and/or prevalent definitions of 21st century learning to provide three encompassing categories that anchor a common understanding of the type of knowledge that has the most worth in the 21st century: foundational knowledge, meta

knowledge, and humanistic knowledge. Each of the major categories can be described as (a) what knowledge people need to know (foundational knowledge), (b) how people act on that knowledge (meta knowledge), and (c) the values people bring to their knowledge and actions (humanistic knowledge). Under each of the three categories exist three additional subcategories creating nine distinct domains that address the current beliefs about 21st century learning and current teaching and learning practices (Kereluik et al., 2013).

Kereluik et al. (2013) summarized the foundational knowledge category in terms of three categories: (a) cross content knowledge or the mental processes specific to traditional academic disciplines such as mathematical thinking for real-life problem solving; (b) digital and informational literacy, which is defined as the ability to find, evaluate, organize, and process information from multiple media platforms in ethical ways; and (c) cross-discipline knowledge that describes the ability to integrate knowledge from multiple information sources from a variety of fields. The meta knowledge category describes the ability to process and act on the foundational knowledge through problem solving and critical thinking, communication and collaboration, and creativity and innovation. Finally, the category of humanistic knowledge places the learner in a broader social and global context by focusing on life skills, job skills, leadership, cultural competence, and ethical and emotional awareness (Kereluik et al., 2013).

The 3 x 3 model of 21st century learning is closely related to the technology pedagogical content knowledge (TPACK) framework that guides educators to teach more effectively with technology (Mishra & Koehler, 2006). Applying the 3 x 3 model of 21st

century learning would allow the gap between accepted beliefs about 21st century learning and the common methods used in teacher PD to be analyzed. The 3 x 3 model of 21st century learning would also provide a framework to address the perceptions of tech-savvy educators using 21st century skills and devices for self-directed PD.

Kereluik et al. (2013) and Barbosa and Aguiar (2018) asserted that there is a gap between the beliefs about 21st century learning and the current teaching practices. These researchers' synthesis of multiple frameworks revealed a paradox in the perception of 21st century learning. On the one hand, Kereluik et al. (2013) argued that "everything [in education] has changed" due to the proliferation of mobile technology, but on the other hand the 3 x 3 model analysis revealed that "nothing has changed" in schooling practices (p. 131).

New teaching and learning methodologies must often compete with traditional educational expectations such as mandated curricula and standardized tests (Ramsay-Jordan, 2020; Shelton & Brooks, 2019; Wagner & Dintersmith, 2015; Zhao, 2015). The 21st century skills mentioned in the 3 x 3 model have become accepted descriptors in educational narrative and, together with the proliferation of mobile learning technology in schools, have created the illusion of a sudden change in learning (Kereluik et al., 2013). At the same time, chronicles of the stagnant and less relevant nature of teaching practices have also emerged (Mishra & Mehta, 2017). By using three foundational knowledge categories as a framework, I targeted a narrow population of educators who were exemplars of 21st century skills as applied to teaching and learning. The most salient characteristic of tech-savvy educators is their high level of digital literacy. Their ability to

seek out, process, and apply information through multiple media platforms often propels

them to learn new content knowledge in a self-directed way rather than through

traditional whole group PD. Tech-savvy educators' experiences evaluating and

synthesizing a wide variety of online content without being constrained by the mobile

learning devices showcased the reflexive practice described in the meta knowledge

category. Their innovative teaching practices displayed the characteristics of lifelong

learning perceptions that exist beyond current traditional district PD objectives. In the

synthesis of the nine categories describing the 21st century learning, I relegated

knowledge of technology to a single subcategory. Fundamental content knowledge exists

in only one category, which highlights the paradox of 21st century knowledge presented

to educators in PD and the collective skills illustrated by the 15 frameworks.

Mishra and Mehta (2017) used the 3 x 3 model of 21st century learning to

compare and synthesize the learning perceptions of practicing educators with that of the

theorists in their study of 21st century learning frameworks. Mishra and Mehta used the

nine categories of the 3 x 3 model and surveyed educators to analyze their ranking of the

categories in order of value and importance to them. Mishra and Mehta expanded on the

synthesized framework of Kereluik et al. (2013) by focusing on the differences between

the conception of learning of both the framework theorists and researchers and those of

the practicing educators. This mixed-methods study revealed a wide difference in opinion

in the ranking of the nine categories. For example, the practicing educators ranked

digital/information and communication, along with meta knowledge (problem solving,

critical thinking, creativity, innovation, communication, and collaboration) as being the

most important in 21st century learning over foundational knowledge (content and cross-disciplinary knowledge). Mishra and Mehta suggested these findings resulted from the misinterpretation of the goals and purpose of education and played into the narrative about the role of mobile technology in accessing information.

Relationship Between Learning Practices and the 3 x 3 Model Framework

Mishra and Mehta's (2017) conclusions revealed a wide difference between what researchers and theorists and the practicing educators in the field value as important in 21st century learning. This conflict of opinions led to a further review of the relationship between learning practices and the Kereluik et al. (2013) 3 x 3 categories of knowledge. The practitioners' point of view was also supported by Mitra and Dangwal (2017) who asserted that in an age of immediate access to information, skills like critical thinking, problem solving, innovation, communication, and collaboration foster the development of self-directed learning, which in turn renders the traditional content knowledge delivery practice obsolete. This controversial view was scrutinized by researchers who criticized technology-aided self-directed learning trends and suggested that learning requires the guidance of a knowledgeable expert to mitigate difficulties (Mishra et al., 2016; Mishra & Mehta, 2017; Rutherford, 2017; Tarek, 2017).

According to Howard et al. (2016), the quality and quantity of autonomous learning achieved outside of the traditional learning context via mobile technology increases with the support and encouragement of a teacher or instructor. It is also enhanced by higher expectations and practices of a teacher or instructor. However, some studies suggest that technology-using instructors do not understand their role in

promoting self-directed learning outside of the traditional whole group instruction (Lai, 2015; Strobl et al., 2019). For example, studies of the perceptions of students learning using social media platforms like Facebook, asserts that the informal learning setting of Facebook extended learning more efficiently than the classroom setting (Alm, 2015; Giannikas, 2020; Miller et al., 2019; Toffoli & Sockett, 2015). According to Giannikas, (2020), while instructors focus on the technical aspects of mobile technology, learners prefer the ease of access to information and the practicality of the content accessed through mobile devices. However, despite today's acceptance of mobile devices as information platforms, there exists a low acceptance of professional level learning using mobile devices in autonomous or self-directed learning (Mei et al., 2018; Şad & Göktaş, 2014).

Literature Review

The unique nature of the smartphone's multi-functional design and use has prompted academic debates about its characterization as a mobile learning tool, its effectiveness as a learning device, its limitations, and its uses as an instructional technology device (Anshari et al., 2017; Ariel & Elishar-Malka, 2019; Pila et al., 2019). This review of the literature presents a background to bring clarity to the established historical understanding of mobile learning and the principles that have driven the mobile learning phenomenon. In order to broaden deliberations of the smartphone as a practical professional development device, the review also summarizes trending instructional technology acceptance models and perceptions of self-directed professional development. The multifaceted design and reported use of the smartphone also prompted a more

extensive exploration of past studies covering numerous but applicable topics, including

the multiple ways the use of the smartphone has been studied. In addition, the review

encompasses the multiple aspects of integration, existing technology integration

guidelines that have been studied, perceptions of the practicality of the device, and

factors impeding the use of the device in professional development.

Brief Historical Overview of Mobile Learning

The idea of a world where communication becomes the center of learning and

where educators become participants in the learning rather than the source of learning

first appeared in John Dewey's *Democracy in Education* (Rashevska & Tkachuk, 2018).

In the 1970s, Alan Kay established the notion of a book sized computer (the Dynabook)

and the prerequisites of Computerized Learning (Kay, 1972) or human and machine

interaction for learning (Trouche, 2004). By the 1980s, researchers began to form

theoretical understanding of mobile learning. By 2004, the first theoretical and

methodological principles of electronic learning (eLearning) encouraging the study of

learning with the aid of computers in universities were developed (Littlejohn & Shum,

2003). Sharples et al. (2005) studied the impact of mobile learning and created a

framework for theorizing about mobile learning in a variety of learning contexts. Shortly

after, Ragus (2006) began to study the creation of mobile learning standards, which

encouraged researchers to examine the radically transformative nature and possibilities of

mobile, personal and wireless devices and began to allude to the logistical and cultural

instructional changes universities and colleges would need to make to accommodate

mobile learning (Traxler, 2007). In the 1990s, the development of global networks

changed the definition and description of mobile learning (Rashevska & Tkachuk, 2018).

Definition and Description of Mobile Learning

There have been many attempts by scholars and practitioners to define mobile

learning since historically, there is an ongoing debate about the attributes that should be

included in the definition (Hamidi & Chavoshi, 2018; Manuti et al., 2015; Traxler &

Crompton, 2015). Early definitions of mobile learning were technocentric like Traxler

and Crompton's (2015) notion that mobile learning requires provisions where focus is

placed on handheld or palmtop devices. But with the development of global networks,

definitions began to include the concept of learning without being tied to a physical

location like a classroom (Kukulska-Hulme, 2007; Traxler & Crompton, 2015).

Modern attempts at defining mobile learning have focused on the effectiveness of

mobile learning and the systems-design around mobile learning (Kearney et al., 2019;

Sawaya, 2015). In terms of effectiveness, most researchers find that students and

educators have a positive effectiveness perception of mobile learning. For example, early

on, Al-Fahad (2009) surveyed higher education students and concluded that mobile

learning enhances students' experiences and improves their retention rates by allowing

them to learn anywhere and anytime. Al-Fahad's study is also supported by current

seminal studies focusing on the effectiveness of anywhere-anytime instruction (Fattah,

2015; Green & Donovan, 2018). Systems design, on the other hand, focuses on the

advancement of the learning behavior which often creates multiple categories of how

mobile learning is used. For example, Hou et al., (2014) compared three different blended

learning approaches in museum learning modules to understand the learning process of college students and found that through their blended systems design, mobile learning successfully extends the implementation of the museum's learning activities. In addition, researchers like Jeno et al., (2017) compared the effect of their mobile learning application and the use of traditional textbook to understand biology students' intrinsic motivation, their perceived competence and achievement to find that the mobile applications promoted elements such as interest, choice, and in-time feedback.

By 2015, two specific trends appear in the literature: (a) studies begin to focus more on the examination of learning with mobile devices rather than solely in the learning outcomes and, (b) they also begin to analyze studies that feature researcher and/or teacher-led learning (Lykourentzou et al., 2013; Sawaya, 2015; Tesoriero et al., 2014).

Synthesis of Learning Using Mobile Devices

The evolution of mobile devices in accessibility, usability and affordability has progressively encouraged their use in and transformation of the learning context (Anshari, et al., 2017; Baran, 2018; Romrell et al., 2014). A broad look at the literature about current uses of mobile devices for the explicit purpose of learning is necessary in establishing the relationship between mobile devices and learning.

In recent years, researchers have undertaken studies to understand how participants learn using mobile devices. A broad analysis of the literature shows a new interest in the relationship between learning and mobile technology. Baran (2014) was the first to conduct a review of 37 quantitative and qualitative studies to observe the

direction of mobile learning in teacher PD. What Baran (2014) set out to do was to find learning trends among university students using mobile learning devices. Guedalia, and Guedalia (2016) analyzed the usage and habits of university students to reveal their enthusiasm and readiness to learn through mobile devices in formal academic settings. Although both studies found a positive perception of mobile learning by the students, they both coincided in identifying limitations of mLearning such as the challenges and problems surrounding the effective implementation of the technology by the instructors. Baran (2018) re-examined instructional technology PD models and found a need for considerable change in pedagogical experiences for educators as well as a transformative shift in the mindset of modern educators to use mobile devices more productively.

Concurrently, some authors have also suggested that education institutions have provided educators with PD to learn to use mobile devices. However, many educators still struggle to integrate mobile devices in their instruction in relevant ways (Bald, et al., 2016; Burch & Mohammed, 2019; Francom, 2020) and often make little effort to use mobile devices to connect learning experiences to real-world activities (Delen & Krajcik, 2017; Sung et al., 2016). There has been a noticeable shift in focus from the technocentric view of mobile learning to today's focus on types of learning and knowledge generated by the hyper access to information through mobile technology and these devices value (Kereluik, et al., 2013).

Newer mobile devices like the smartphone have scaled the impact of mobile learning since many people now own and carry smartphones technology and have access to information without restrains from location and/or time (Ally & Prieto-Blázquez,

2014; Bald, et al., 2016; Donovan, 2017). According to Donovan (2017), devices like smartphones have created an environment where individuals are able to access information through this device rather than rely on prior knowledge (Chou et al., 2015). For example, Chen et al., (2015), conducted a study in which they combined wearable technology like Google Glass to analyze how individuals completed complex tasks like assembling 2D Lego models while being guided though step-by step, remote instructions in the form of YouTube video tutorials. In their research, they discovered the intricate and multifaceted nature of creating a cognitive assistance system or applications to aid in self-directed learning. Despite the multitude of smartphone applications for learning and the faster digital performance as well as, the versatility and usability of the device (Chen, et al., 2015), some educators still have difficulty applying mobile learning tools like the smartphone in accordance to their design to differentiate learning and enrich their instruction (Farley et al., 2015; Sung, et al., 2016). In contrast, some educators do know how to implement mobile technology effectively and use it in their personal lives and in self-directed learning (Jeno et al., 2017; Visser et al., 2014).

Self-Directed Learning Principles Supporting Mobile Technology

As academic institutions navigate through the 21st century skills narrative, educators are beginning to understand their role in bridging the use of mobile technology with 21st century skills to enhance their teaching practice (Alm, 2015; Lai, 2015). This study focuses on the notion of self-directed learning and on the perceptions of tech-savvy educators about using smartphones as learning devices. The practical experiences of tech-savvy educators in the use of smartphones for learning, are directly associated with their

self-determination (Ryan & Deci, 2017). According to Visser, et al. (2014), connected-educators, like tech-savvy educators, find smartphone app-based platforms, like Twitter, a microblogging smartphone app and desktop website, more effective as tools for self-directed PD than for personal use because of the ability to find customized resources. School administrators planning PD tend to dismiss the relevance of the principles of self-determination that spurs the motivation of tech-savvy educators seeking personalized learning online (Curran et al., 2017). When educators are self-directed, they are more likely to benefit from PD content and apply their new knowledge to their practice (Trust et al., 2017; Visser, et al., 2014).

Hamilton (2018) defined Self-Directed Learning as a set of processes, such as a constant evaluation of the effectiveness of learning activities, self-motivation, the relevant goals and well-defined outcomes, and the ability to monitor progress of improvement, that require a proactive learner. These processes can be explained through the lens of Self-Determination Theory (SDT). SDT is a theoretical construct that explain people's basic needs for learning: (a) *autonomy*, which is a state where one feels self-endorsed and has multiple choices, (b) *competence*, which creates a sense of wellness related to how effective and to what level of mastery one feels, and (c) *relatedness*, which is a reciprocal feeling of being cared for and having a sense of belonging to a group (Deci & Ryan, 2016; Gagné & Deci, 2014; Ryan, & Deci, 2017). Autonomy is the most controversial and underestimated element even though it influences the sense of buy-in in people and it increases performance (Hamilton, 2018; Ryan, & Deci, 2017). When the learner is given repeated experiences of autonomy, a pattern of well-being

emerges which in turn, motivates the learner to intrinsically search new information as new questions arise (Jeno, et al., 2017). Mobile learning increases a learner's choices. However, as stated by Jeno, et al., (2017) traditional instruction discourages autonomy, which decreases the learner's well-being.

Traditional Beliefs About Learning and Self-Determination Theory

Many educators feel overwhelmed by new teaching strategies, tools, and methodologies introduced by the steep number of education initiatives implemented by school district officials (Louws et al., 2017a). The lack of inclusive policies and personalized PD support has contributed to the apathy and complacency. The policies are also negatively impacting the effective integration and use of mobile learning devices (Baran, 2018; Price et al., 2014).

A large number of existing studies broadly aligned with literature focused the Self-Determination Theory argue that with the autonomy to choose learning paths, the learner has a higher tendency to select a more relevant learning approach to delve deeper into content knowledge they find applicable. For example, Kiemer et al., (2015) focused on the outcomes of a video-based self-directed program to promote a more reflective learning dialogue to find a positive increase of the learners' experience, competence, and intrinsic motivation based on the autonomous nature of the learning activities. A number of authors recognize that providing opportunities of self-directed learning results in the adoption of a positive motivational mindset and the achievement of mastery of goals (Ruzek et al., 2016), and a more positive learning experience (Benita et al., 2014; Tour, 2017).

A majority of existing research about mobile learning and PD for educators,
centers on the low-level skills of novice participants showing a gap in research involving
the high-level digital literacy skills of participants who are experienced in the use of
technology or tech-savvy educators (Sung et al., 2016). According to Sung, et al. (2016)
experienced technology users choose handheld devices like the smartphone for informal
inquiry-oriented learning because of its functionality and capabilities of encouraging
seamless learning environment. Seamless learning happens when a person can learn
without noticeable interruptions across multiple locations, times, technologies, and/or
social settings (Mouri et al., 2018). In an analysis of how professionals in the field
practice problem solving techniques, Schön (1992) found that experienced participants
depend less on PD formulas and more on knowledge that arises with job experience and
professional networks.

Self-determination theory calls for the rethinking of how educators can obtain and
process foundational content knowledge. Like Knowles (1973), recent studies in adult
learning rebuff the notion that adults can learn effectively in environments and
methodologies designed for children (Malby et al., 2018; Robinson et al., 2017) and
recommend a redesign of the formal education setting to provide more experiential and
self-directed learning opportunities (Robinson, et al., 2017). A study conducted by Allen
and Penuel (2015) suggests that experienced educators engage in productive management
of the uncertainty of unclear learning standards while other educators focus on the
ambiguity of the unclear standards making it apparent that the implementation of
innovative practices depends on sustained sense making activities. Newer PD designs

such as free, voluntary, and participant-driven workshops like Edcamp unconferences indicate a high level of participant motivation to attend and positive perception of the learning process and networking experiences (Carpenter & Linton, 2016; Krutka & Carpenter, 2017).

Tech-savvy educators use their ease with technology and digital literacy abilities to search, find, and process relevant teaching strategies and their capacity to act on new content knowledge engages them in meta knowledge activities such as proposed by Kereluik et al. (2013) and Mishra and Mehta, (2017). They then use their meta knowledge abilities to define their humanistic knowledge approach that affects their professional practice which also, aligns with the 3 x 3 model of 21st century learning (Kereluik et al., 2013).

Relationship Between the 3 x 3 Model Framework and This Study

The 3 x 3 model framework can act as a passage to help organize how tech-savvy educators use smartphones for informal, self-directed learning. The combination of self-determination theory and the 3 x 3 model of 21st century learning as the conceptual framework will be used to assist in explaining how this specific population of educators use their smartphones to generate new content knowledge to complement their unique practice and inform their meta and humanistic knowledge categories.

Although mobile technology, by definition liberates the learner from traditional physical learning setting, instructional PD designs, for educators, is limited in taking advantage of the full adaptability of mobile devices (Baran, 2018). As reported by Baran (2018), even technology related PD often confines educators to one static location.

Digitally literate educators exemplify 21st century skills in the way they navigate, evaluate, and create information effectively using a range of technology tools and platforms (Kereluik et al., 2013; Liao, et al., 2016). The 3 x 3 model of 21st century learning is a framework that can advance the notion of self-directed informal learning through the lens of informal foundational, meta, and humanistic knowledge. According to the theory of self-determination, autonomy encourages motivation, which in turn propels informal, self-directed exploration of new information (Knowles, 1973; Mouri, et al., 2018).

The level of digital literacy of tech-savvy educators includes the ability to evaluate and reflect on how new online content knowledge aligns with their current instructional practice by considering the learning process and outcomes that promote continuous contemplation of learning (Bald, et al., 2016; Schön, 1992) or meta knowledge. Several studies indicate that reflection of one's professional practice leads to an immediate change in mindset and in methodological approaches which turns new content knowledge into action (Bald, et al., 2016; Schön, 1992). For example, a study of the relationship between service-learning and civic engagement in college alumni suggests that college students are more likely to take part in civic action when they are given the opportunity to engage in reflexive dialogue in the preservice higher education experiences (Richard et al., 2017). Although the focus for this proposed study centers on the perceptions of tech-savvy educators in relation to the use of smartphones for informal learning, the literature review provides an overview of mobile learning and the ability for individuals to use it to pave the way for independent and self-directed PD. After

reviewing the literature, one can conclude the importance to also address the need for using self-determination principles that are supported by the physical characteristics of mobile technology devices. In addition, the communal nature of the internet forces a feedback mechanism that enhances instructional discourse. Self-determination principles like autonomy encourage tech-savvy educators to reflect on their practices and their mindset which in turn, leads to instructional innovation (Schön, 1992).

Instructional Use of Smartphones

The early benefits of mobile learning are well documented (Farley, et al., 2015). A subset of earlier studies analyzed how participants use mobile devices for learning. For instance, Clough et al., (2008) examined the early adaptation of the PDA and smartphone for self-directed, informal learning. Clough et al. coded participants' online survey results into learning activities categories that included functions like, (a) collaboration (b) location awareness which included features like museum guides and exploration guidebooks, (c) data collection like notetaking and data logging, (d) administration while using tools like the calendar, and the address book, (e) referential like using the dictionary and e-book features, (f) interactivity using graphing and animation tools as well as drill and testing tools, (g) microworlds such as models of real world domains like *uDrumSteps*. In more current studies like Farley et al. (2015) researchers begin to find a disconnect between the optimizations of course learning materials for their use on a smartphone and the reluctance by educators to lead mobile learning activities.

Independent smartphone use in the classroom is still frowned upon and many educators describe smartphones as being distracting and contributing to an unhealthy

dependency on the device (Anshari et al., 2017; Richardson, et al., 2018). A series of seminal studies focus on the use of the smartphone in whole group instruction or in teacher-led controlled activities. These studies propose that using the smartphone for learning produces less student distraction when the teacher uses the device more effectively by preparing responsive academic content in ways that capabilities of the device (Coca & Sliško, 2017; Kaya & Balta, 2016). Educators, however, do not integrate this device in instruction for fear of distractions (Anshari et al., 2017).

Since the emergence of the smartphone in 2007, research on the device has gradually changed from a focus on the objective use of the device, its characteristics, its cultural impact, and its application systems to the subjective use of the smartphone for learning and its impact to the health of the user. Earlier studies like Falaki et al., (2010) detailed the use of the smartphone to examine the different ways participants use the device to understand user interactions with the smartphone's many features. Balasubramanian et al., (2009) measured the energy consumption in download rates of mobile phones on internet networks like 3G, GSM, and WiFi. A number of diary studies like Sarwar and Soomro (2013) examined the paradoxical impact of the smartphone on user productivity and phycological well-being. However, existing research suggest that the advantageous flexibility of anytime, anywhere access to information provided by an internet-connected smartphone, in some cases, interferes with the user's mental health, social behavior and work habits (Elhai et al., 2017; Gombert et al., 2018).

Over time, an extensive review of the literature also highlights the smartphone as a device that is changing how people retrieve and process information in their personal

and professional lives. For example, in medical settings, smartphones are being used to collect patient data about patient behavior such as physical activity and diet through social media, smartphone apps and connected wearable activity trackers (Müller et al., 2018). Anshari et al., (2017) explain that college students use the convenience of smartphones to enhance their learning experience by accessing course material and assignments.

The benefits of learning with the smartphone compete with the studies that bring to light some of the limitations of using this device in the academic context. One of the limitations is the distracting nature of the device. In a survey of 675 students throughout the United States, McCoy (2016) found that students reported that they used their smartphone for non-academic purposes during class and that the device encouraged them to engage in distracting behavior. Tossell et al., provided their participants with iPhone that reported device usage for a year (2015). Tossell, et al. (2015), found that students changed their perceptions of the benefits of the smartphones after the study since even though they used the device for informal learning and for educational purposes, students deemed the smartphone as detrimental to their academic goals because it caused distractions. This study is supported by a number of seminal studies that consider the smartphone to be a supportive tool for learning (Chuang, 2015; Laing et al., 2014; Soukup, 2015) as well as a distraction to the academic process.

Even though the smartphone provides numerous documented learning benefits, educators are still not noticeably incorporating the flexibility of this device in their instruction. A number of authors suggest that in order to overcome some of the

challenges created by the ever-present smartphones, educators can use relevant ground rules to apply mobile technology in their practice (Bald, et al., 2016) and blend tools like the smartphone in their course expectations in order to sustain interaction with students and mitigate distractions (Anshari et al., 2017). To study the effectiveness of mobile device integration in teacher education, many researchers rely on technology acceptance models to understand the reluctance to allow students to use the smartphone independently in an academic context.

Limitation of the Smartphone as a Tool for Learning

It is clear in the literature that the smartphone is not always a force for good since even Narli (2018) indicated that among Syrian refugees, some used the device for illegal or criminal activity. This view is supported by authors studying participants in a variety of contexts. For example, in an ethnographic study about the daily routing of immigrant anglophone immigrant mothers using the smartphone, a use-track app installed in participants' smartphones, Jezer-Morton (2016) finds that the ubiquitous use of the device creates a conflict between the way parents expect children to use the smartphone and their mothers' perceptions toward the practicality of the smartphone. The smartphone provided a community connection, but extended periods spent on the device provided fewer opportunities for verbal communication between parent and child as well as a sense of isolation as well as low self-worth among adolescents and adults (Enez Darcin et al., 2016; Jezer-Morton, 2016; Reddy, 2015). Enez Darcin, et al. (2016), further indicate adolescents that use the smartphone specially to access social media sites are in danger of developing unhealthy addictions to the device as well as social phobias.

Although the smartphone's multiple capabilities make it a comprehensive learning tool, the debate in the literature is still whether it is a learning aid or a distraction within the academic context. As previously highlighted, an internet-connected smartphone is an advantageous device because of its portability and its ability to allow the user to multi-task. In an academic context, the learner can use the smartphone to connect with instructors and classmates, access class materials and assignments as well as access a plethora of instantly available information. Because of its characteristics, many modern learners, notably youth, rely on this device daily (Vanden Abeele, 2016). Using the smartphone in learning would encompass using it to support or augment communication in knowledge-building communities in and outside the classroom (Anshari et al., 2017). However, a new crop of studies highlights the limitations to the practicality of the smartphone. Researchers argue smartphones in the classroom not only affect students' performance but also their behavior and sleep quality (Anshari & Alas, 2015; Anshari et al., 2015; Anshari, et al., 2017; Cooper, 2015). One such study surveyed tech-savvy university students between the ages of 20 and 40 years and asked them to partake in focus group discussions to learn about Internet and smartphone activities including habits, and application usage (Anshari, et al., 2017). Researchers asserted that although students found the smartphones to be effective learning tools, used inappropriately, smartphones become a serious distraction with incoming messages, notifications from social media, videos and entertainment apps, which negatively affected their learning (Anshari, et al., 2017). Students also reported an unhealthy dependency and, in some cases, reported dysfunctional obsessions and addiction with their

smartphone use (Anshari, et al., 2017; Marchiori, 2018; Wang, 2016). Furthermore, in a review of several studies, Samaha and Hawi (2016) found that smartphone addiction has a profound effect on the users' mental health and that the addiction correlates with perceived stress as well as poor academic performance. Smartphone addiction can be described as utilizing the device persistently with a desire to continue to use it which may cause the user to neglect important tasks and responsibilities (Al Abbasi, 2018).

Review of Technology Acceptance Models

The adoption of new technology has been discussed by a great number of authors in the literature. Taherdoost (2018) defines *acceptance* in the technology context simply as the positive decision to use an innovation. This author also asserts that using a Technology Acceptance Model (TAM) helps predict users' behavior and their adoption of technology devices. TAM is the most widely cited model in the technology acceptance field, and it explains that individuals adopt new technology when they find it useful and easy to operate (Granić & Marangunić, 2019; Marangunić & Granić, 2015). In other words, it is not a matter of the technology but a matter of perceptions of relevance, usability, and usefulness. There are, however, a few limitations to the TAM since it does not address the role of habit and intentions and it assumes that the user's intentions are planned and logical. For instance, often people line up to purchase trending technology even though they have not assessed the benefits or practicality of the new device. According to Granić and Marangunić (2019) and others, the TAM is limited because it does not explain to the user how to use the technology nor how to design technology that improves ease of use (Taherdoost, 2018).

Another relevant tool used to characterize the acceptance of technology in a global level is the Diffusion of Innovation Theory (DOI) which analyzes different levels of innovation by classifying the rate of adoption of users into five categories: innovators, early adopters, early majority, late majority, and laggards (Rogers, & Shoemaker, 1971; Taherdoost, 2018). Tech-savvy educators populate the innovators, early majority and early adopters' groups and are most likely to imagine, plan and initiate the use of new technology (Richardson et al., 2015; Sterrett & Richardson, 2017).

These studies support the idea that the use of new technology should be intentional and relevant to motivate users. Mobile devices, like the smartphone, have changed the way learners interact with information and with each other (Anshari et al., 2017; Rajurkar & Shirsagar, 2017). In a seminal review of four studies on the impact of the smartphone on society, Sparrow et al. (2011) found that easy access to internet information demonstrates that people are relying less on recall than in their mobile devices when faced with challenging tasks. Newer studies examining the relationship between smartphone use and cognitive functions assert that memory, attention span, and delayed gratification are reduced by the mere presence of a smartphone (Fjortoft et al., 2018; Xiang et al., 2015). With the aid of smartphones, people can broadcast information, for example, videos that can be consumed in real time by millions of viewers (Rajurkar & Shirsagar, 2017). The ability to find, create and broadcast information has created unprecedented learning opportunities for individuals able to navigate multiple digital platforms for didactic purposes (Anshari et al., 2017; Godwin-Jones, 2017). However, the

lack of longitudinal data of the long-term effects of using the smartphone in this fashion makes understanding this phenomenon inconclusive (Wilmer et al., 2017).

Although the smartphone is used in personal daily tasks by many, educators often do not integrate this tool in their daily instruction, which in turn, exclude it from being used as an appropriate PD tool. Bald et al. (2016) suggests that the lack of guidelines to help use handheld mobile devices in the classroom and in a professional setting might explain educators' reluctance to see the smartphone as a learning tool in the classroom. Bald et al. (2016) as well as Tondeur et al., (2017) suggest that mobile devices require assessment frameworks and guidelines for successful integration.

Guidelines to Technology and Mobile Device Integration

Technology integration in instruction is a term used by educators to describe the effective use of technology by educators and students in the learning setting (Sterling, 2009). Davies and West (2014) define technology integration as the effective implementation of educational technology to reach specific learning goals while newer authors recognize the complexity of this definition and describe technology integration as the idea of utilizing technology devices and platforms to meet 21st century learning (Tondeur et al.., 2017). Tondeur et al. asserted there is a wide description of what it means to learn with technology. Classroom educators who are fluid in content knowledge and multiple instructional methodologies are not always able to apply the same expertise using mobile devices for a variety of reasons (Bald et al., 2016; Francom, 2016; Ruggiero & Mong, 2015). For example, Francom (2016), surveyed K-12 educators to identify obstacles to successful technology integration experiences and found that smaller school

districts received better training, more access to mobile devices and consistent administrative support while larger districts received more planning time and longer periods to develop a technology rollout plan. Francom (2020) asserts that though access to technology tools and resources have increased, educators' perceptions of technology integration in the classroom have declined overtime. Previous research like Borko et al. (2009) called for a coherent vision on how to support the teacher who use digital technologies to aid and expand their own learning and understand how to apply new tools to advance their students' learning. Their assertion is still supported by new researchers whose study of tech-savvy pre-service educators revealed that although these digital natives were proficient with mobile technology in their personal lives, they do not integrate the mobile devices competently and use it to deliver a high level of content (Visser et al., 2014; Wang et al., 2014; Yerrick et al., 2018). According to Yerrick et al. (2018), when the technology aligns with the goals of tech-savvy pre-service teachers, they employ the technology to expand their foundational knowledge and to reflect on their lessons. This study will be focused on a better understanding of participants who are able to maintain a high level of content knowledge and new pedagogies while navigating the digital world fluidly. It is vital that participants also have an understanding of the effective integration of mobile technology and devices in learning.

As demonstrated, the phenomenon of the disconnect between teacher PD approaches and the effective integration of mobile devices is well documented however, there are a number of frameworks that are often used in teacher technology PD to create a consensus in the meaning of effective technology integration. Because smartphone use is

the focus grounding this study, the following frameworks can also be used to describe and categorize their use in the learning context.

Technology, Pedagogy, and Content Knowledge

The TPACK is a framework introduced by Mishra and Koehler (2006) to establish the relationship between the different aspects of knowledge educators need for effective technology integration in learning. The TPACK also provides information about the degree to which technology is applied to different learning situations (Mishra, 2019; Mishra & Koehler, 2006). In describing the effectiveness of technology professional development (ETPD), Pierson and Borthwick (2010) insist on the use of a consistent structure in which to measure the gaps between what educators know about teaching and learning, and measurable effectiveness of the learning process. In other words, it is important to discern what type of technology PD works where. Newer studies concede that the TPACK can be used as an evaluation tool to provide a broader understanding of how well the educators (a) understand the foundational content, (b) the appropriateness of their mobile learning device or digital platform, and (c) how well their choice of technology advances learning in their classroom (Baran, et al., 2019; Harris, 2016; Mishra, 2019).

Although the TPACK is widely recognized in the instructional technology field, there are not many studies focused on applying the TPACK to understand the interaction contexts, knowledge development, and instruction of in-service teachers considered to be tech savvy. A great majority of studies using the TPACK examine the effectiveness of technology integration of pre-service teachers (Baran, et al., 2019; Dare et al., 2018;

Tondeur et al., 2020), the growth of in-service teachers with a basic-level use of technology (Harris, 2016; Redmond & Lock, 2019; Redmond & Peled, 2019), or the findings of theoretical journal reviews (Saubern, 2020).

This limitation creates a gap in which to examine a population of educators, tech-savvy educators, that may have unique perceptions and practices based on their advanced knowledge of mobile technology and their experiences. In a qualitative multiple-case study, Swallow and Olofson (2017) interviewed and observed educators in their classrooms to find that there are a variety of factors, like attitude, and individual beliefs about 21st century learning that affect the way a teacher might select and use a technology tool. Hechter and Vermette (2014) and Zhai et al. (2019) concluded that even tech-savvy educators with strong beliefs about the importance of technology integration in 21st century learning do not always create innovative learning environments in their classrooms. Their findings indicate that teacher-led technology, like the smartboard, is more widely adopted than handheld technology like the smartphone (Hechter & Vermette, 2014; Zhai et al., 2019).

Factors Propelling the Use of Smartphones for Learning

Tech-savvy educators use their digital literacy abilities to search, find, and process relevant teaching strategies and practical experiences in the use of smartphones for learning, are directly associated with their self-determination. Although schools have historically spent enormous amounts of resources to support technology integration, educators' personal motivation is still the best indication of a successful technology implementation (Giles & Kent, 2016; Schrum et al., 2008). Using a qualitative two-year

case study approach, Heath (2017) analyzed teacher beliefs on self-initiated technology integration of a one-to-one program in their classrooms in an effort to understand intricacies and discrepancies of the way educators use technology. The author found that even when the technology initiative is not led by administrators but by teachers with a positive perception of the use of technology, there is a gap in the way the technology was used in the classroom (Heath, 2017).

This contradiction, however, plays out differently in the experiences of tech-savvy educators. In a similar case study of a tech-savvy learners, Ciampa (2016) used Malone and Lepper's (1987) taxonomy of intrinsic motivation for learning as a framework to analyze how motivation applies to tech supported learning. Malone and Lepper (1987) believed that motivation is an essential characteristic in any type of learning experience and the efficacy of the learning depends on the level of motivation. Ciampa (2017), however, determined that the lack of attention paid to the concept of motivation also factors into the gap between the perception of technology use in learning and the actual practice.

Ciampa (2017) used a longitudinal research study approach in a school where the teacher and her students had a high level of experience and expertise with technology. The data collection method included teacher and student interviews, a blog kept by the teacher, observation fieldwork, and an ecological survey of the community. According to Ciampa's (2017) findings, motivation can be strengthened through elements like (a) *Challenge*, when the learning is implemented in a way that the process is neither too easy or too difficult, (b) *Curiosity*, both sensory curiosity or videos, audio, music, animation,

etc., and cognitive curiosity or the learners desire to explore and find new information with the technology, (c) *Cooperation*, (d) *Competition*, (e) *Recognition*, and (f) *Control* or, *self-determination*. The implication of the Ciampa (2017) study explains that the gap between the perception of technology and instructional practice using technology can be closed using activities that enhance student motivation.

The practical experiences of tech-savvy educators in the use of mobile technology designed to access information for learning, like the smartphones, are directly associated with their motivation and self-determination. According to Johnson et al. (2019), connected-educators including tech-savvy educators find smartphone app-based platforms, like Twitter more effective as tools for self-directed PD than for personal use because of the ability to find customized resources. Motivated educators, like tech-savvy educators, actively seek PD to improve their skill and overcome barriers to technology use (Bandura, 2018; Giles, & Kent, 2016; Johnson et al., 2019).

Furthermore, Heath (2017) and Giles and Kent (2016) explain that educators' beliefs and perceptions about their ability to use technology effectively are laudable indicators of their likelihood to use technology for learning throughout their career. While Visser et al. (2014) focused on the perceptions of tech-savvy educators, Giles and Kent (2016) sought to analyze the beliefs of novice educators regarding their use and implementation of technology for learning. Participants in the study were part of a teacher education program at a southern university level program and were engaged in undergraduate coursework as well as fieldwork specifically designed to teach the novice educators how to integrate technology successfully and purposefully in their classrooms.

In addition, each participant was assigned a classroom with moderate levels of technology tools including mobile devices. Although their level of technology use varied from minimal to transformational, survey results indicated a high level of confidence using the tools since many grew up using technology for social media and personal learning even though none of the participants had used technology for teaching.

Other authors support the findings that a major factor that propels educators to use technology for learning is their level of self-efficacy (Barton & Dexter, 2020; Booker, 2017; Tondeur et al., 2019). When educators value the technology and feel confident using it, they find it easier to adopt new devices and to innovate instruction using them (Barton & Dexter, 2020; Kent & Giles, 2017).

Additional factors such as gender, economic, and education level also affect a learners' motivation and self-efficacy using mobile devices like the smartphone (Espinosa et al., 2017). In that recent study, Espinosa et al. found that among students in a South American university that owned smartphones, male participants of a higher economic level, attending private colleges were more likely to have a data plan and use their smartphones more extensively for professional use. Female students, on the other hand, reported having less self-efficacy in the use of the device than their male counterparts, even when they owned smartphones for longer periods (Espinosa, et al., 2017). Similarly, Ma et al. (2018), supported these findings by adding geographical location and profession as major factors that determine self-efficacy and motivation using and learning with a smartphone. Additionally, cultural norms, like female independence, and the preference for more socially present interactions, also play part in the effective

use of smartphones for learning (Ameen & Willis, 2016; Khan et al., 2015; Sanakulov & Karjaluoto, 2017). These studies shed light on the limitations of the factors that propel learners to use the smartphone for academic purposes as well as self-directed learning activities. Espinosa et al. (2017), point at the need for further studies to identify the specific skills that learners need to effectively use the smartphone as well as classify obstacles preventing the use of this device in PD or work context. The studies also prompt further understanding of the current perceptions about the use and practicality of the smartphone.

Perceptions About the Practicality of the Smartphone

There exists a great variety of views about the practicality of smartphones. New findings range from perceiving the smartphone as a tool for survival and integration (Li et al., 2017; Narli, 2018; Rahman et al., 2015), to the smartphone as a culprit of a growing number of mental health conditions and behavioral addictions (Chen, 2020; Jameel et al., 2019; Samaha & Hawi, 2016; Yu & Sussman, 2020). The debate about the conflicting views and the practicality of the smartphones also extends to the education environment. For example, in an attempt to understand the plight and adaptability of Syrian refugees fleeing from the war that began in 2011, Narli (2018) conducted a study to analyze how the use of the smartphone affects their daily lives. Narli used the often-disputed Foucauldian ideology to frame forced human migration with the use of communication technology, in particular, the smartphone. Describing the smartphone in Foucauldian terms as an apparatus or a *dispositif* (in French), Narli (2018) views the smartphone as a device with the strong implication of and abilities to control because of its ability to

capture, orient, secure behaviors, opinions, and conversations of people. Narli's (2018) findings indicate that refugees, especially women, use the smartphone in connection with Telecom Wi-Fi connection as a tool for safe travel (Li et al., 2016; Rahman et al., 2015). Narli (2018) created three conceptual categories that describe the varied uses of the smartphones in the refugee experience: (a) *war, displacement and survival* which describes the use of the device in navigating their journey and having a virtual address even during traumatic displacement, (b) *resettling and rebuilding life and communication scenery* which describes their access to essential information for shelter and assistance as well as communicating with other refugees and loved ones left behind, (c) *virtual connectivity to the war and the building of news, images and memory archives* since the refugees used their smartphones to keep records of their displacement. Narli (2018) also finds that the smartphone was used for language acquisition and learning, accessing critical/procedural information like translation and emergency guidance, and connections to work, social circles as well as education opportunities. The study concludes that smartphone use is highly dependent on context because smartphone users adjust the way they use this device depending on their motivation, their needs, geolocation, and social behaviors (Do et al., 2015; Labhart et al., 2019; Wang et al., 2018).

Self-Directed Professional Development

Many authors agree that school administrators have difficulties providing effective PD for educators (Baldwin, 2016; Darling-Hammond et al., 2017; Kalinowski et al., 2019) and often educators return from PD experiences to the isolation of their classrooms and do not apply their learning to their practice (Mishra & Mehta, 2017;

Stewart & Sigrist, 2017). After an extensive review of 35 studies analyzing the optimal

conditions for PD, Darling-Hammond et al. (2017) defined effective PD as an experience

that changes the knowledge and the practice as well as improves students' learning. Self-

directed PD is defined as the educators' own initiative and willingness to learn (Kyndt et

al., 2016; Soebari & Aldridge, 2015; Zepeda, 2018) and has been identified as a

successful approach to PD in teaching practices (Sebotsa et al., 2019; Valeyeva et al.,

2019).

Early sections of this literature review focused on instructional use of the

smartphone, assessment and acceptance levels, extrinsic factor and intrinsic perceptions

that propel educators to use the smartphone for learning, and negative perceptions of the

practicality of the smartphone. According to Anshari et al. (2017), educators can mitigate

the distracting nature of the smartphone by establishing a new set of operating rules

regarding using the device in the learning process. Current school culture and technology

integration PD models for educators require job-embedded and collaborative

opportunities (Mishra, 2019; Mishra et al., 2016; Mishra & Mehta, 2017). Other studies

suggest that some educators do use internet platforms like Twitter to post information or

reminders for their students, share educational resources, follow relevant hashtags, and

for PD purposes (Buzzelli et al., 2019; Miller et al., 2019; Tang & Hew, 2017).

Much of the literature on PD using mobile technology or handheld devices is

aimed at educators learning to use the technology effectively (Beauchamp et al., 2015;

Oigara & Ferguson, 2020). According to Beauchamp et al. (2015) and Mishra (2019),

educators prefer technology related PD models that are more adaptable, allow for a

personal pace, and encourage independent learning. Researchers who conducted a study to examine the use of app-based devices in educators' personalized learning networks indicated educators favored real-world, relevant context that not only had personal meaning to them but also allowed them to choose their own learning apps, activities, and agency (Kearney & Maher, 2019). Even though the use of social media or social networking sites by educators have on occasion been a source of social controversy (Kearney & Maher, 2019), many educators use these platforms for personal reasons yet admit they do not use them for professional reasons because of institutional impediments (Avidov-Ungar, 2016; Xerri, 2017).

The bulk of literature regarding smartphone and PD activity is centered around health care and medical professionals. There are few studies that address the use of the smartphone technology in relation to educators and independent PD (Pila et al., 2019; Sawaya, 2015). This gap allows an opportunity to conduct further studies that focus on self-directed PD, and the use of the smartphone in PD of professionals in other fields.

Institutional Factors Impeding Self-Directed Professional Development

As schools progressively promote 21st century learning skills, there is a growing need for educators to model and integrate 21st century teaching practices in their classroom as well as in their personalized learning (Bernhardt, 2015; Koh et al., 2017; Mishra, 2019). One of the characteristics of being a 21st century learner is having the ability to be an independent, life-long learner. Kazu and Demiralp (2016) described life-long learning as the ability of the learner to remove obstacles like location, age, time, and educational level in order to learn needed skills that arise from the teacher's own

initiative (Weir, 2017). When educators are given the opportunity to be self-directed

learners, they are more likely to develop the traits of independent, life-long learners

(Bernhardt, 2015; Szabo, 2019). Bernhardt (2015) and Szabo (2019) explain that PD for

educators should emphasize teacher-centered model and activities that based on real-life

contexts. In a close examination of K-12 schoolteacher PD programs, Bernhardt (2015)

interviewed administrators and experienced educators to understand the development and

implementation of a new teacher-centered PD approach. The educators in the study

agreed that they preferred PD that occurred outside of the school context and in an

environment where they had a wide choice of experts and teaching strategies. However,

although the aim of the administrators was to involve their educators in the PD

development process, when asked, the educators reported that the planning of their

learning activities were neither open nor transparent with little mention to 21st century

competencies. The administrators reported they had little understanding of how 21st

century learning skills fit in school staff PD. In contrast, Kazu and Demiralp (2016)

analyzed other population of educators, like pre-service educators to find that few of

them had interest in self-directed lifelong learning and the authors found this group

lacked the curiosity and intrinsic motivation to become lifelong learners. With these

findings in mind, it is reasonable to posit that a possible factor affecting a teacher's self-

directed PD activity is their level of experience.

Summary and Conclusion

The smartphone has scaled the content and information pipelines for millions of

western professionals (Anshari et al., 2017). Although education institutions spend

millions of dollars for technology training for the educators, many still do not integrate mobile learning tools effectively in their instruction (Hartman et al., 2019; Kurniati, 2017). Despite the overwhelming findings in the literature that indicate that educators prefer self-directed, self-paced, independent PD, academic institutions provide group learning activities that offer little autonomy. Tech-savvy educators, on the other hand, have the ability to integrate smartphone use with learning objectives and strategies as well as they do in their personal lives (De Clercq, 2019; Dudeney & Hockly, 2016; Liao et al., 2016). As smartphone technology becomes cheaper and more accessible, educators have discovered the ease in which they can find resources and professional support online (Curran, et al., 2017). To mitigate PD costs and travel expenses, educators can use the smartphone for on-demand PD (Tang & Hew, 2017). Schools need to allow the use of multiple pedagogical approaches for teacher PD including independent learning opportunities using devices that are ubiquitous, easy to carry and can deliver anywhere, anytime learning experience, like the smartphone.

The multifaceted nature of smartphone technology has opened a debate about the practicality of this mobile device in formal learning environments. The notion of independent PD for educators is still not fully accepted in the field (Ariel & Elishar-Malka, 2019; Sawaya, 2015). In addition, the option of using a device considered a distraction to some and an addiction to others is highly polarizing. Many educators resist using smartphones in the classroom because they believe it takes students' attention away from classroom activities (Ariel & Elishar-Malka, 2019; Coca & Sliško, 2017; Kaya & Balta, 2016). Studies related to mental health and the smartphone explain the mental and

behavioral outcomes of overexposure to the smartphone (Samaha & Hawi, 2016;

Yuchang et al., 2017).

On the one hand, the smartphone offers a multitude of usable tools in one, like

phone, messaging tools, camera, microphone, games, and a mobile portal social

environment on the internet. These features are seen as a windfall to people like displaced

refugees since it offers access to a semblance of a permanent address, vital life-saving

information, and safety networks, as well as language learning options with its app-based

features (Narli, 2018). Students, also have a positive perception of using the smartphone

for learning since it allows them to access course materials, stay connected with their

network and opportunities for them to create and turn in content on the move (Ariel &

Elishar-Malka, 2019; Green, 2019). In addition, studies show that when educators use the

smartphone features to create dynamic and interactive lessons, the device is not a

distraction but instead expand the learning (Anshari et al., 2017).

Tech-savvy educators often find whole group PD to be insufficient for their

learning. Administrators are often reluctant to allow educators to learn at their own pace

and away from the whole group traditional development model (Ariel & Elishar-Malka,

2019). The principles of self-determination and self-directed learning allow some

educators to be more independent in their quest for new foundational knowledge.

Educators that are given the autonomy to learn independently, not only retain PD content

better but are more reflective in their practice and tend to seek more content to improve

their craft (Deci & Ryan, 2016; Jeno et al., 2017). Using evaluative frameworks like the

TPACK, to begin to dilute some of the institutional factors that impede tech-savvy educators from learning independently (Mishra & Mehta, 2017).

This study will address how tech-savvy educators perceive the use of the smartphone for self-directed PD. This literature review on key concepts of teacher PD, and the smartphone focuses on the principles of self-directed learning to demonstrate the need for independence for a certain population of educators, tech-savvy educators, and their quest and dissemination of content knowledge. It also focuses on the acceptance of the smartphone as a viable device for authentic learning. Factors like the practicality and limitations of the smartphone, have cause a debate that often bars and muddles the integration of the smartphone as a feasible learning tool for this population of educators. The literature review also explored assessment frameworks and theories that administrators can use to evaluate the effectiveness of self-directed technology PD for educators.

Researchers asking questions about the relationship between the smartphone and learning, focus on student populations. The literature review leads to an opportunity to study self-directed PD, and the perceptions of tech-savvy educators using the smartphone to gain new content knowledge personally and professionally.

Chapter 3: Research Method

The purpose of this study was to examine the perceptions of tech-savvy educators regarding the use of smartphones for self-directed PD. In this chapter, I describe the research design and the rationale for selecting a qualitative method to answer the research question and subquestions. I also outline the population sample, recruitment criteria, and data analysis approach. I also discuss the role of the researcher, trustworthiness, and ethical procedures I employed in the study.

Research Design and Rationale

I used a generic qualitative research design to answer the following questions:

Research Question: What are the perceptions of tech-savvy educators using smartphones for self-directed professional development?

Subquestion 1: How does the knowledge gained by using the smartphone influence educator beliefs about the use of the smartphone as a learning device?

Subquestion 2: How do tech-savvy educators perceive using a smartphone for self-directed professional development influences their professional practice?

In this study, I examined the perceptions of tech-savvy educators regarding their use of the smartphone for PD. I used a generic or basic qualitative design to answer the research questions (see Denzin & Lincoln, 2013) and to allow me to infer the meaning of tech-savvy educators' experiences with smartphones for learning (see Creswell & Poth, 2017). I chose a generic qualitative design because it aided in the description of the ways in which tech-savvy educators use their smartphones for personal and personalized

learning, their beliefs about the device, and how they craft learning ideas using the smartphone.

A generic qualitative design was the best approach for this study because it focused on tech-savvy teachers' awareness of the smartphone as a learning device, as well as the meaning they attributed to their experiences using this device as support for self-directed PD. The qualitative approach also provided valuable data from in-depth interviews with tech-savvy educators regarding what knowledge they view as important (see Creswell & Poth, 2017). The generic qualitative design allows the researcher to understand how participants interpret, establish, and connect with their learning experiences (Merriam & Tisdell, 2016).

Using a generic qualitative methodology was appropriate in support of the goal to explore the perceptions of the tech-savvy educators and the meaning they ascribe to their experiences learning with the smartphone (see Merriam & Tisdell, 2016). Neither a quantitative design nor a mixed methods design was used because the focus of this study was on the perceptions of a specific population of educators, which was best supported using an exploratory methodology. Other qualitative designs could have been used, including grounded theory to generate a theory regarding tech-savvy educators' learning processes or case study to consider specific boundary or geographical variables (see Merriam & Tisdell, 2016). However, to support the purpose of this study, I chose a generic qualitative design to explore tech-savvy participants' perspectives and experiences using the smartphone for self-directed PD (see Booth et al., 2017).

Role as a Researcher

For this qualitative study, I served as the primary investigator. My role as the researcher was that of an observer to objectively describe the learning experiences of tech-savvy educators regarding their use of smartphones for self-directed PD. In describing this learning phenomenon, I acted as the primary instrument of data collection (see Denzin & Lincoln, 2003) with the intention of clarifying the information I collected through careful analysis and interpretation (see Merriam, 2009) using strategies that improved trustworthiness of this qualitative research. My role also involved the selection of an appropriate research design; the selection of participants; and the development of the protocol for recruitment, participation, and data collection. My role as the researcher did not conflict with my present position as an instructional innovation specialist. I have been in the learning and instructional innovation discipline as a teacher or consultant for more than 25 years and have earned several nationally recognized teaching awards. I have taught in both private and public schools and hold a Master's Degree in Education and The Art of Teaching specializing in technology integration in learning. In addition, I design workshops and provide PD for educators in K–12 and higher education in the United States. Because of my interest in technology in learning, I am a member of several national technology organizations and online active technology educators in assorted chat and social media platforms.

I work as an instructional innovation specialist, so I belong to several professional organizations whose members can be described as tech-savvy teachers. By virtue of being a member of several tech-savvy teacher organizations where I selected participants

for my study, there was potential for bias because I risked personalizing my experiences, especially in the interview phase. I did not have a supervisory relationship with any of the participants and did not have an impact on their livelihoods or careers.

To mitigate biases, participants were given a copy of their interview transcript to check for accuracy and resonance with their perceptions. I used open-ended questions that encouraged participants to present their experiences and collected rich data about their concrete ideas about how they use the smartphone for learning. In addition, careful case notes of preliminary impressions and interpretations that might stretch beyond the interview transcripts were taken (see Bald et al., 2016). A semistructured interview approach was used as a primary means of data collection to protect each participant's views and to avoid inserting my own personal views (see Creswell & Poth, 2017; Hatch, 2002). The interviews were conducted via video conference to eliminate location barriers, and all conversations were audio recorded and transcribed. After each interview, participants received a copy of their interview transcripts to review and, if needed, to clarify or provide additional information and insights linked to interview responses (see Creswell & Poth, 2017).

Methodology

A basic or generic qualitative design was used in this study. The perceptions of tech-savvy educators using the smartphone for self-directed PD were explored. In this section, I explain the participant selection logic, data collection instruments, and the data analysis plan.

Participant Selection Logic

Participants for this study included tech-savvy educators. Tech-savvy educators are individuals who self-identify as (a) lifelong learners, (b) educators who are comfortable with technology, and (c) educators who use technology extensively in their personal lives and implement it with ease in professional teaching and learning (Schrum et al., 2008). To gather participants, I used a purposeful sampling procedure. According to Coyne (1997), purposeful sampling refers to the intentional selection of a sample of participants who can provide in-depth information essential to the purpose of the research. Participants who met the criteria were able to articulate and offer information-rich answers (see Coyne, 1997).

A listserv and a partner organization emailing list were used to send emails to potential participants to recruit 10–15 self-described tech-savvy educators from various school-related subjects, grade levels, and teaching experiences who use the smartphone for self-directed learning. A listserv is a peer-based electronic platform designed to allow like-minded participants to exchange knowledge with experts and colleagues from around the world via email lists (Schoch & Shooshan, 1997). Although some listservs are used only to distribute one-way messages, tech-savvy educators' listservs allow for a two-way exchange in which messages can be distributed to participants who subscribe to the list (Stockton & Doğan, 2019). Listservs often focus on a specific topic based on the interest of the members of the list and usually require an adherence to a particular set of guidelines to subscribe and to maintain one's subscription. The listserv that was used for

this study (blend-online@listserv.educause.edu) focuses on instructional technology topics.

I also posted invitations to participate in this study on instructional technology social media groups on various platforms. Social media groups are increasingly popular platforms for sharing knowledge and information (Swart et al., 2019). I sought participants on social media platforms such as Facebook, LinkedIn, and Twitter, which share the following descriptions: (a) are web-based services, (b) allow the user to create personal profiles and upload original content, and (c) allow users to share messages by connecting with other users within the system. These platforms' characteristics made for an ideal opportunity for recruiting 10–15 knowledgeable tech-savvy educators who fit the selection criteria. According to Patton (2005), qualitative researchers can expect the participant sample size to fluctuate depending on variables such as interview time and place. Therefore, a flexible sample range of 10–15 participants was intended to mitigate unexpected fluctuations and provide opportunities to reveal a quantity of new information to reach data saturation (see Patton, 2005).

Instrumentation

For this study, one data collection instrument was used to collect pertinent data, although a demographic survey (see Appendix A) was also used to verify that participants fit the purposive sampling criteria. The principal data collection instrument was a researcher-developed interview instrument (see Appendix B). Individual participant interviews were audio recorded to ensure accurate collection of the data.

The open-ended researcher-developed interview questions focused on the participants' professional perceptions of whole group and self-directed PD, their learning preferences, and their attitudes about using the smartphone for self-directed learning. The interview questions that were used were open-ended, neutral, and clearly written to evoke answers that revealed the tech-savvy educators' perspectives (see Patton, 2005). According to Merriam (2009), the questions used in the interviews can be influenced by the conceptual framework of the study, which in the current study was the 3 x 3 model of 21st century learning (see Kereluik et al., 2013). There were three categories described by this framework: (a) what knowledge people need to know (foundational knowledge), (b) how people act on the reflection of that knowledge (meta knowledge), and (c) the values people bring to their knowledge and actions (humanistic knowledge; Kereluik et al., 2013). These three categories guided the questions and the data analysis efforts (see Merriam, 2009).

Procedure for Recruitment, Participation, and Data Collection

To recruit tech-savvy educators for this study, I sent an email to a senior manager at PBLworks, a partner organization whose permission was already granted. The email included a Google Form survey link that housed the invitation to participate in the study, the letter of informed consent, and the demographic survey. The national faculty members of PBLworks are professional online and in-person project-based learning workshop providers, and many identify as tech-savvy educators. A Google Form survey link was posted on the Blended-Online@listserve.educause.edu listserv and was also be posted on social media platforms (e.g., Facebook, Twitter, and LinkedIn). The first page

of the Google Form survey link included the letter of informed consent. By providing an email address and clicking "continue" on the survey, participants consented to participate in the study.

A sample of 13 participants was selected. Selected participants were then invited via personal email to participate in a 40–50-minute individual interview. Participants were advised that they could exit the study at any time and did not require a reason to leave. All interview transcripts were shared with participants to clarify or provide additional information and insights directly linked to interview responses (see Creswell & Poth, 2017).

The data regarding the tech-savvy educators' perceptions were collected through one-on-one interviews with participants that took place via an online video/audio conference platform. At the beginning of each interview, the participant received additional information about the purpose of the study and was assured of the methods that were used to maintain confidentiality. Participants answered questions posed to them from the researcher-developed data collection instrument (see Appendix B). The interview questions were informed by the categories in the 3 x 3 model of 21st century learning framework and were used to focus the interview session.

Although video conferencing software was used to record the interview sessions, participants were given the option to mute their web cameras to ensure confidentiality. Only their voices were recorded. Any interruptions that occurred during the interview were noted in the audit trail. The recorded interview audio files were transferred to a password-protected computer file and purged from the video conferencing software. The

recorded interview audio files were then transcribed and checked for accuracy. Each participant received a copy of their interview transcript and was asked to review the content to ensure the accuracy of the transcript (see Miles et al., 2014) and to clarify or provide additional information and insights directly linked to the interview responses.

Data Analysis

The interview transcripts furnished data on the perceptions of each of the participants. The data were first organized using an open coding method. Each transcript was scanned several times to identify tentative labels to summarize observations. Using both deductive and inductive thinking, I grouped the more dominant labels using the a priori categories in a structured and focused way (see Gale et al., 2013). The a priori codes were derived from the three main categories of the 3 x 3 model of 21st century learning framework (see Koehler et al., 2013): (a) foundational knowledge, (b) humanistic knowledge, and (c) meta knowledge. The data associated with each a priori code were further analyzed and organized into the subcategories to delve deeper into the perceptions of tech-savvy educators using the smartphone for self-directed PD. Inductive thinking is used to provide a more detailed analysis of the data to derive concepts, themes, or a framework through the researcher's interpretation of the raw data (Thomas, 2006).

The code "foundational knowledge" described responses that the participants made regarding their cross knowledge and self-directed use of the smartphone to search and find new PD content, which referred to core content knowledge, cross-disciplinary knowledge, and digital literacy or ease of use of the device. The code "humanistic

knowledge" was used for responses that described ways in which the smartphone changed participants' values about learning, which referred to life/job skills, ethical/emotional awareness, and cultural competence. The code meta knowledge described participants' perceptions of the way their actions changed due to their changing values and beliefs about using the smartphone to search and consume new content knowledge. This knowledge referred to creativity and innovation, problem solving and critical thinking, and communication/collaboration.

Each of these three framework categories was subdivided into three additional subcategories that will be used inductively on a second, third, and maybe fourth pass to delve deeper into the specifics of the perceptions of tech-savvy educators using the smartphone for self-directed PD. The inductive coding approach created additional subcategories under the predetermined categories to fit the data and prevent the discarding of data outside the a priori categories (O'Leary, 2007).

The transcript analysis furnished data on the perceptions of each of the participants within the prepared categories in a structured and focused way (Gale et al., 2013) and the collected data related to the inductive codes not provided in the 3 x 3 model of 21st century learning (Cross et al., 2005; Lautamatti, 1978). Because the interviews were semi-structured, participants shared stand-alone information which in some cases create discrepancies, which was recorded and reported in the audit trail. There was special care in ensuring that the data did not generalize and interpreted to represent a wide population of educators. Instead, the analysis accentuated the fact that it is specific in focusing on capturing the perceptions of a purposive group of educators, who use their

smartphones for personal learning (Gale, et al., 2013). The codes were then applied to the analysis to focus on where clear themes emerged (Clarke & Braun, 2013). As common patterns appeared, the rationale and nuances were interpreted taking care not to ignore new subthemes that might emerge and possibly extend the a priori template (King & Brooks, 2016). To interpret the codes, I first conveyed a broad overview of the data and then different types of perceptions of using the smartphone for self-directed PD (King & Brooks, 2016).

Issues of Trustworthiness

Because human beings were the primary data collection instrument in qualitative research, it is important that said data is accessed in an authentic and trustworthy way in which the researcher's bias, dispositions, and assumptions are addressed.

Credibility

According to Merriam (2009), credibility, which is also known as internal validity relates to how findings of a study correlate to the internal reality or how well the study is done. Unlike quantitative research, qualitative research is not a single, immovable, objective anomaly waiting to be discovered and studied. In a qualitative study, what is being examined is people's construct of reality and how they understand the world. Also, it is difficult for the researcher to solely use interviews and/or observations without injecting their own experiences and bias (Ratcliffe, 1983). Internal validity, therefore, relies on the meaning and interpretations of reality.

The following strategies can be used to improve the credibility of qualitative research as recommended by Merriam (2009): (a) Triangulation which is the practice of

weighing multiple methods of data collection to compare and crosscheck, (b) using

multiple investigators to collect and analyze the same data (Patton, 2005), (c) utilizing

respondent validation or soliciting feedback from interviewees, (d) saturation or when no

new information emerges from new data, (e) peer review where a peer thoroughly

examines the raw data to ensure that the findings are plausible based on the data.

      The first was a researcher-developed interview instrument (see Appendix B). The

second consisted of a member check email to participants following the interview,

inviting them to review their interview transcripts.

Transferability

      Transferability refers to the degree in which the findings in a study can be tested

and/or generalized in other situations (Merriam, 2009). For this study, purposive

sampling was used to address the issue of transferability and participants that had specific

characteristics were recruited. Choosing participants that self-identify as tech-savvy

educators ensured that they were proficient in their use of the smartphone and could share

meaningful information about their perceptions on using this tool for self-directed PD

(Lincoln & Guba, 1986). Tech-savvy educators refer to individuals who self-identify as

(a) lifelong learners, (b) educators who are comfortable with technology, and (c) use it

extensively in their personal lives and implement it with ease in professional teaching and

learning (Schrum et al., 2008). In addition, a detailed audit trail was maintained to record

report notable events and enough contextual information to aid in the description of the

data collection experience. Although video conferencing software was used to record the

interview sessions, participants were given the option of muting their cameras to ensure

confidentiality. Only their voices were recorded. Any interruptions that occurred during the interview were noted in the audit trail. The recorded interview audio files were transferred to a password-protected computer file and purged from the video conferencing software. The recorded interview audio files were transcribed and checked for accuracy.

Dependability

Dependability can be defined as the degree in which the findings of a study can be replicated by other researchers (Merriam, 2009). In qualitative research, human behavior is difficult to align and cannot be isolated. Therefore, the goal of a dependable study is to clarify aspects of the world as the participants experience it. In other words, the objective is not to replicate but to find consistencies (Merriam, 2009). For this study, dependability was maintained by using the audit trail, which ensured other researchers can authenticate the findings in my study, according to Lincoln and Guba (1986).

Confirmability

Confirmability refers to the researcher's objectivity and how the results of a study can be accepted by other people. In this study, the findings are based on the participants' responses and not on any personal motivation or bias (Ravitch & Carl, 2016). In the audit trail, every step of the data analysis was highlighted to explain the rationale of decisions made. To establish confirmability, the Braun and Clarke (2006) thematic analysis steps were used as a sequential method of handling the data, starting by looking for patterns then using the a priori categories inspired by the 3 x 3 model of 21st century learning framework to funnel the search and identifications of themes. I also used an inductive

code process and be flexible in adding themes based on patterns not in line with the a priori categories (Dey, 1993).

Ethical Procedures

The ethics of the researcher highly influences the credibility and validity of the study (Merriam, 2009). There are essential elements that can ensure credibility in a study which involve the degree of training, the track record, and professionality of the researcher as well as their competence and intellectual rigor (Merriam, 2009; Patton, 2005). As a researcher, it is vital to ensure that the participants are protected from harm, and their right to privacy is protected. It is also essential that participants give their consent after they have been well informed as to the nature and outcome of the study.

For this study, ethical procedures were followed by submitting the appropriate application to Walden University's Institutional Review Board, which provided additional protection to the participants of the study by inspecting the proposal and providing recommendations. The participants received a consent form that provided detailed information about the background, purpose, privacy protection, and procedures of the study. Participants were reminded in writing and during each interview that their participation was voluntary and that they had the option of rescinding their consent at any point during the study. They were also advised that their names and all collected personal information would be kept confidentially to establish an environment where they could speak freely and without personal and/or professional repercussions.

In addition, the consent form was included the contact information of the Walden University Research Participant Advocate as well as my contact information. The data

and information collected in the online demographic survey, audio-recorded interviews, and transcripts was stored securely in a password-protected private-use file for five years at which time, all relevant files will be deleted and/or destroyed.

Summary

This qualitative study examined the perceptions of tech-savvy educators using smartphones for self-directed PD. In this chapter, I have defined the research design and the data collection instruments I used. The data analysis plan and strategies to manage issues of trustworthiness, credibility, transferability, dependability, confirmability, as well as how I ensured ethical procedures will be followed were included. Chapter 4 introduces and shows the results from the data collection and the data analysis.

Chapter 4: Findings

The purpose of this study was to examine the perceptions of tech-savvy educators regarding the use of smartphones for self-directed PD. To achieve this purpose, I used a generic qualitative design guided by the following research questions:

Research Question: What are the perceptions of tech-savvy educators using smartphones for self-directed professional development?

Sub question 1: How does the knowledge gained by using the smartphone influence educator beliefs about the use of the smartphone as a learning device?

Sub question 2: How do tech-savvy educators perceive using the smartphone for self-directed professional development influences their professional practice?

The research questions aligned with the problem and purpose of this study. In this chapter, I report the results of the study. This chapter also includes the research setting, demographics, data collection, data analysis for two levels of coding, issues of trustworthiness, and a summary.

Setting

This generic qualitative study was conducted in an online setting using a video conferencing platform called Whereby.com, and the participants were from across the United States. Participants who volunteered to participate in this study were of diverse backgrounds not only in the physical location and description of their educational setting but also in their racial and socioeconomic groups (see Ravitch & Carl, 2016). The participants' lived experiences with mobile technology and personal use of the smartphone were factors that contributed to their responses

This study was conducted during the second wave of COVID-19 stay-at-home mandates in certain geographical locations in the United States, a significant factor influencing the results. Prior to the pandemic, many educators throughout the United States were practicing in hybrid conditions (teaching in an online and face-to-face model), and these educators reported an increase in mental health issues caused by the disruptive, stressful, and labor-intensive nature of the sudden teaching pivot to 100% distance learning (Akpinar, 2021). Additionally, educators reported increased smartphone screen time use (Hodes & Thomas, 2021). Educators required screen time for online staff meetings and collaboration with students, colleagues, and parents, disrupting academic continuity (Moja, 2021).

In January 2021, when the data collection for this study took place, three major traumatic events took place in the United States: a second spike in the number of COVID-19 related infection cases leading to a second stay-at-home order for many educators; the January 6, 2021, riots and attacks on the nation's capital building due to a bitterly contested presidential election cycle; and the national security alerts that many capital cities were under on the week of January 20, 2021, due to the credible domestic terrorist threats to the inauguration ceremonies of Joseph Biden as the 46th president of the United States (Ho, 2021). These events increased a national and international fixation with viral videos and conspiracy theories that flooded digital mailboxes with disinformation and multiple looped news cycle headlines (Horton, 2021; Su et al., 2021). These events also affected many people's perceptions of how they used their smartphones to access social media platforms (Zhong et al., 2021). These factors may have influenced

the current participants' perceptions of the use of smartphones for self-directed PD, and the interpretation of the study results. The participants worked in different sectors and levels of education and may have had different experiences based on their professional roles during the study.

Demographics

Participants were asked to complete a short demographic survey (See Appendix A). Participants who consented to take part in this study were of various backgrounds. They resided in different locations in the United States and came from various educational settings, racial makeups, and education levels. The participant sample included 13 educators with an age range from 20s to 60s who were self-described tech-savvy educators. Six of the participants identified as Black, six as White, and one as Asian/Pacific Islander. Two participants reported having completed terminal degrees, nine of the participants completed a master's degree plus additional graduate credits, one held a bachelor's degree, and one was in the process of earning a master's degree.

Eleven of the 13 participants were experienced educators. Two participants reported being in the education field between 21 and 25 years, five participants between 16 and 20 years, two participants between 11 and 15 years, and two participants between 0 and 5 years. One participant reported being in the field for more than 25 years. Two of the participants serviced primary schools (Grades K–5), one was a middle school educator (Grades 6–8), five worked in secondary schools (Grades 9–12), one served both primary and secondary levels, and four were postsecondary education professionals. All

the participants owned their smartphones (not school provided). Eight preferred the iPhone operating system (IOS), and six preferred the Android operating system.

Data Collection

After receiving approval from Walden's Institutional Review Board (#01-07-21-0316084), I began posting messages on major social media platforms like Twitter, LinkedIn, and Facebook. The posts included links to the letter of consent and a demographic survey. The demographic survey also included participants' contact information that was used to confirm interview dates and times. I also notified PBLworks, the partner organization representative, via email, and they sent an internal email to potential participants. The recruitment period was between January 11 and March 12, 2021.

Within the recruitment period, 13 participants consented to participate in the study and scheduled the date and time. Only one participant rescheduled their interview time due to a family emergency. The interviews were designed to take place via a video conference platform called Whereby.com instead of face-to-face. The shelter-in-place orders that most participants were placed in during COVID-19 quarantine did not appear to affect the data collection efforts. Most of the participants were working from home at least 1 day a week during the interview period. The first interview took place on January 18, 2021, and the last was on March 12, 2021. Before each interview, I repeated each item in the letter of consent to ensure that each participant understood the terms of their voluntary participation. The interviews lasted between 29 and 40 minutes and were recorded using a smartphone app that also transcribed speech to text. Although I did not

take notes during each interview, I immediately described any interruptions or unplanned events using an audit trail afterward. No significant unusual circumstances occurred during the interviews because the participants were in their homes. One interview was interrupted two times by a child asking for homework help. The child did not appear on the web camera. Another participant had a baby who cried for a few minutes during the interview.

For this generic qualitative study, the data were collected from semistructured interviews with a purposeful sample of 13 tech-savvy educators who consented to participate. The interviews were done remotely via video conference, and the participants were from multiple locations in the United States. Each interview was audio recorded and transcribed. At the end of each interview, I stopped the recording and reminded each participant that a copy of their interview transcript would be sent for them to review and return. The transcription app rendered each recording into text and audio components. I used the app to send the text and audio files from my smartphone to OneNote, the writing platform I used to organize the data. After each interview, I replayed each audio recording as I read the corresponding transcript to remove errors, add punctuation, bold the research questions, or correct mis-transcribed words. Then, I sent each participant a copy of their interview transcript and audio files to verify the content for accuracy. When the participants returned their transcripts and audio files, I reviewed them again and began to hand code each transcript. All participants indicated via a return email that their perceptions had been captured accurately and had no further comments to add to their interview transcripts.

Data Analysis

This study's research question and subquestions focused on tech-savvy educators'

perceptions of using smartphones for self-directed PD. Participants were asked open-

ended questions to delve into their perceptions (see Appendix B). The data were analyzed

using a thematic approach to identify emergent themes that described the perceptions of

the participants. The thematic analysis process requires the researcher to read the data

multiple times to identify preliminary patterns or themes that become the categories to

analyze (Rice & Ezzy, 1999). A hybrid deductive and inductive approach was used to

allow themes to emerge directly from the data (see Boyatzis, 1998). The inductive

approach was also used because unlike the deductive approach, which can be guided by a

priori classifications or research questions, inductive analysis allows the researcher to

code the data without predetermined categories (see Braun & Clarke, 2006).

Because the interviews were semistructured, participants sometimes shared

information that created discrepancies in the audit trail. The findings were not

generalizable to a broad population of educators. Instead, the analysis focused on

capturing the perceptions of a purposive group of educators who use their smartphones

for personal learning (see Gale et al., 2013). The codes were then applied to the analysis

to extract clear emergent themes (see Clarke & Braun, 2013).

Clarke and Braun (2013) described six simple but effective steps to identify,

analyze, and report qualitative data using thematic analysis. These six steps were used in

a flexible and nonlinear way to analyze the data and answer the research questions (see

Braun & Clarke, 2006). Table 1 illustrates the steps taken in each step of the data

analysis:

Table 1

Six Action Steps Taken

Stage	Action taken with analysis
Step 1. Familiarization: understanding the data	• Created transcripts from data from audio recordings using Otter app, a smartphone recording and transcription application • Read the transcripts while listening to the audio recordings multiple times • Used OneNote, a Microsoft digital notebook to organize audio recordings and transcripts (an interview tab and each • Used the OneNote highlight color feature to highlight salient words or phrases in transcripts in OneNote sections and tabs • Annotated tentative or makeshift labels to help summarize observations
Step 2. Generating initial codes	• Used Google Doc Insert Table feature to create a thematic table • The table formed 2 columns: RQs, open codes • Related open codes were systematically coded using OneNote highlight color feature • Compiled color-coded patterns using words or phrases to create tentative or makeshift pre-codes • Collected purposive samples statements
Step 3. Search and identifying dominant themes	• Interpreted to extract preliminary categories. • Used a priori categories to organize emerging related categories using deductive approach (see Appendix C) • Codes → A priori → Broad Themes • Codes that did not align with the a priori inspired categories were set aside for further inductive analysis
Step 4. Reviewing themes	• Combined and refined themes from previous step by confirming with transcripts • Used research questions to create a thematic table to help align refined themes and formed subthemes with further theme refinement (see Appendix C) • Codes → A priori → Broad Themes → Refined Themes→ Subthemes • Reviewed transcripts inductively to analyze data that fell outside the deductive analysis findings to find possible divergent themes
Step 5. Defining and narrowing themes	• Defined themes within driving questions to capture essence of each of them • Extracted a narrative of the data that surfaced in each theme • Refined Themes→ Subthemes → Defined Themes • Reviewed, analyzed, and defined 'leftover' and 'exceptional' data
Step 6. Producing the report	• Created a concept map to represent the narrative that emerged from the data • Described compelling examples extracted from participants' answers related themes • Relayed the results of the analysis using empirical evidence to address research question, sub questions, and the literature

Note. Adapted from Clarke and Braun (2013).

Step 1: Understanding the Data

First, each participant's recorded interview was transcribed using a smartphone audio-recording transcription application called Otter. The interview transcripts were scanned for errors and corrected, and each participant received a copy of their transcript to check for accuracy. I used OneNote, a Microsoft digital notebook, to organize audio recordings and transcripts for easy access and reference. Each interview recording and transcript was scanned several times to identify tentative labels to summarize observations. Initial thoughts and reflections were annotated in the margins or jotted on sticky notes. The OneNote highlight color feature was also used to underline salient words or phrases in each transcript. To prepare for the coding process, I created a codebook using Google Doc tables to serve as a template employing the research questions as a guide (see Crabtree & Miller, 1999). Each research question headed a different table to maximize the provided space within the digital tools.

Step 2: Generating Initial Codes

To generate initial codes, I used a manual open coding approach. Open coding allowed me to approach the data without preconceived notions and to modify codes throughout the process. Initial codes consisted of significant statements that were selected based on their meaning and relation to the research questions. After coding each transcript in this fashion, I scanned the initial code again to search for frequency patterns. I began reviewing for similar semantic patterns, but the patterns indicated no typical distributions of words or phrases because participants described unique experiences using the smartphone. The multifaceted nature of the smartphone creates usability in a

multitude of combinations (Alhasanat, 2020). By design, the smartphone is highly customizable and can be utilized in unique ways using combinations of numerous applications (Alhasanat, 2020; Anshari et al., 2017). Most initial semantic codes did not appear multiple times but were evidence of each participant's unique perceptions and ways of using their smartphone. Because the research questions were used to frame a perimeter for the analysis of the open codes, issues related to each question began to emerge. For example, participants shared ways they used the smartphone to simplify ordinary tasks, which formed a relationship with SQ1 because this notion addressed their perceptions about using the device. This analysis approach was used to examine the underlying idea of each code instead of focusing on frequency patterns. Forty-two unique codes emerged in this step (see Appendix C).

Step 3: Search for Themes

The a priori classifications were used at this point, as inspiration, to draw tighter relevant relationships and to group the codes into themes (Braun & Clarke, 2006). The a priori categories were derived from the 3 x 3 model of 21st century learning framework: (a) foundational knowledge, (b) humanistic knowledge, and (c) meta knowledge (Koehler et al., 2013). Although a priori codes are usually used earlier in the data analysis process, they were used at this point to help group codes that did not have a typical distribution of semantic or frequency patterns. This approach allowed a focused and structured way to capture "good codes" of participants' perceptions to identify meaningful themes aligned with the research questions (Boyatzis, 1998; Braun & Clarke, 2006, Braun et al., 2016). For example, one participant shared that they dared to traverse the country alone because

of the utility of a smartphone turn-by-turn mapping application. Another shared that they

tackled the complicated task of fixing their broken washing machine by watching tutorial

videos on their smartphone. Both notions were summarized and aggregated into a "good

code" labeled *opportunity to use [the smartphone for...] new approaches to ordinary*

tasks. This code reflected elements of the a priori code *Foundational Knowledge* because

it described the participants' knowledge and self-directed use of the smartphone to search

and find new content to apply to their personal or PD. To fit the *Foundational*

Knowledge a priori classification, "good codes" had to relate to the participants'

understanding of technology and the smartphone, self-directed learning, and how to use

the smartphone for self-directed learning. Open Codes that fit the a priori classifications

were analyzed again and further collated into descriptive themes. A descriptive theme

illustrates patterns in the data that align with the driving questions (Boyatzis, 1998). For

example, codes like *new solutions to ordinary tasks* and *exploration of new ideas* were

collapsed into a broad theme labeled *elements that drive the use of device for*

learning (See Appendix C)*. As related themes were selected, the rationale and nuances

were interpreted to avoid ignoring new possible subthemes that might emerge and

possibly extend the a priori template or discrepant data (King & Brooks, 2016).

Step 4: Reviewing Themes

To review the themes, each was examined iteratively to understand whether the

data supported it. For example, the initial theme labeled *elements that drive the use of*

device for learning was reviewed against the data, which created an opportunity to relabel

related codes. The "good code" called *Exploration of New Ideas,* which became absorbed

into the broad theme of *elements that drive use for learning* was extended to combine

more of the related data and became a theme called *Personal/Professional Improvement*

(new ideas, *new skills*, *new practices, new learning).* In reviewing the broad themes in

this way, more specific groupings emerged and became more defined

subthemes. Developing subthemes provided further clarity within themes that overlapped

(Braun & Clarke, 2006). Subthemes were grouped based on their relation to the research

questions. For example, themes aligned with participants' ability to synthesize new and

meaningful information to pursue a specific goal were grouped into a subtheme

labeled *Value of Smartphone as Learning Tool.* Creating subthemes gave a better

impression of the perceptions of the participants (See Appendix C).

Step 5: Defining Themes

This step was used as a final analysis to understand the significance of the refined

themes and subthemes, how they related to each other, the data, and the research

questions. Each theme and subtheme were scrutinized against the data to find meaning

and name it in a way that was not only understandable but summative. For example, a

refined theme that aligned with how participants used the smartphone was

labeled *Solutions for personal/professional issues*, which in turn was supported by three

subthemes labeled:

1. Essential awareness of the phenomenon

2. Essential awareness of the device

3. Essential awareness of navigating device

In determining the common through-line within these elements, the theme of *solutions for personal/professional issues* was relabeled *Curiosity* (see Nowell et al., 2017). Table 2 illustrates how the collapsed codes, refined themes, and subthemes were derived in relation to the data.

Table 2

Defining Themes Progression

	Step 4		Step 5
Refined Themes	Subthemes		Defined Themes
	Elements that breakdown and support theme		
Data Review: Participant' beliefs about the use of the smartphone	Participants' need to know more and ease of use of device are drivers in their use of smartphone for learning		1. Curiosity Participants' need to know more and ease of use of device are drivers in their use of smartphone for learning.
How? To find solutions for personal issues	a) Essential awareness of phenomenon b) Essential awareness of the device c) Essential awareness of navigating device		
Grouping 1 Codes • Problem solving • Personal/professional improvement (ideas, skills, practices, learning) Why? Because of sense of purpose and independence • Independence • Purposeful	Participants had various ways of defining self–directed learning which demonstrates their ability to synthesize new meaningful info to pursue a specific goal Participants indicated their preference for self-paced, independent learning options. a) Value of smartphone as learning tool		2. Autonomy Participants indicated their preference for self-paced, independent learning options.

After defining the themes, the data were again scanned inductively to analyze codes that did not initially fit into the study parameters. Braun and Clarke's (2006) six thematic analysis steps were again used for the inductive coding process. As explained in the data analysis introduction, unlike deductive analysis, which can be guided by a priori classifications or the research questions, inductive analysis allows the researcher to code

the data without predetermined categories (Braun & Clarke, 2006). Some codes were deemed outliers and not included in the study through this process, but some were reread, summarized, and grouped with similar notions, then subdivided into sub-sub themes (see Appendix D).

The 'exceptional data' were related to the central theme of the study but deviated from the information needed to answer the driving questions (see Phoenix & Orr, 2017). Examples of 'exceptional' data are mentioned below because they may prove interesting to future researchers:

- Age gap in participants affected used the smartphone

- How tech-savvy educators that have minimal access to Wi-Fi, lack resources, or opportunities use the smartphone for PD

- Choice of device operating systems based on the system selected by and used in their academic institution

- Access and use of the smartphone for tech-savvy educators with different abilities

- Different use of smartphones by tech-savvy educators based on their choice of operating systems

Step 6: Producing a Report

Finally, I defined and narrowed down the themes pertinent to the research questions to connect them to the final narrative. Each theme was compared to the data to understand how each correlated by mapping out all the extractions. Aligning all the elements informed me whether more refinement was needed (see Nowell et al., 2017). To

relay the narrative extracted from the data that answered the research questions, a series of salient quotes were presented as evidence of the participants' perceptions.

Findings

The research questions established understandings of the multiple ways tech-savvy educators use the smartphone for self-directed PD. The research question in this study asked the perceptions of tech-savvy educators using the smartphone for self-directed PD. Although the research question was straightforward, the multiple ways in which the smartphone can be used required a more nuanced presentation of the tech-savvy educators' knowledge gained using the device, the know knowledge they valued and how that knowledge advanced their professional practice. The answer to the research question can be summarized as tech-savvy educators perceive the smartphone as (a) essential for autonomous learning and purposeful self-improvement, (b) essential for accessible collaboration and reflection, and (c) essential for self-directed professional development.

The themes and subthemes revealed by the specific learning activities shaped by the answers to SQ1 and SQ2 which laid out the tech-savvy educators' perceptions of using the smartphone for self-directed PD. The two themes and ensuing sub-themes that emerged to address SQ1 determined the influence of knowledge participants gained by using the smartphone for learning (see Table 3). Sub-question 2 asked about the influence of smartphone use on their thinking and perceptions of their professional practice. One theme and two ensuing sub-themes emerged from the analysis of the data to explain sub-question 2 (see Table 3).

Table 3

Themes and Subthemes

Subquestion	Theme	Subtheme
SQ1	1. Curiosity to pursue desired interest	1a Essential awareness of tech phenomenon
		1b Essential knowledge of device
		1c Essential awareness navigating smartphone
	2. Autonomy to access new information	2a Value of device as learning tool
		2b Cultural competence
SQ2	3. Collaboration	3a Application of new information
		3b Creativity and communication

The findings of this generic qualitative study were organized into the themes that emerged from the data analysis and aligned with the research question and sub-questions. As explained in the Data Analysis section, participants' descriptions of their unique uses of the smartphone provided data that did not neatly fall within semantic or frequency patterns. However, the multiple and varied examples of smartphone use extracted from the data provided the three umbrella themes. Each theme depicts a distilled summary of the participants' diverse responses to interview questions.

Themes Addressing the Research Question

To delve deeper into the perceptions of tech-savvy educators using the smartphone for self-directed PD, two subquestions were prepared. The themes that emerged to addressed SQ1 focused on the tech-savvy educators' knowledge of the smartphone, the benefits they gained using the device influenced their beliefs about it as a learning device and the emotional connection to the device.

Themes Addressing Subquestion 1

Theme 1: Curiosity to Pursue Desired Interests

The theme of curiosity emerged as one of the reasons the participants were driven to be self-directed. This theme emerged from the codes that described the instructional technology experience, the knowledge of the smartphone as a tech tool, their knowledge of self-directed learning, and self-directed learning. Though they had unique descriptions of their early experiences with technology, all participants reported that they developed an early interest, as self-described self-directed learners, in understanding the workings of emerging instructional technology and how they could use it to enhance their personal and their professional practice without external directives. For instance, P2 grew up surrounded by technology as a Gen Z/Millennial, so they readily adopted instructional technology tools recommended in college classes. P5 reported that their journey in becoming a tech-savvy teacher grew from a need to "extend student learning beyond the classroom walls and into the real world." Their approach to adopting technology aligned with the definition and characteristics of tech-savvy educators described in the literature Similarly, P8 shared that their interest in instructional technology emerged out of frustration with their college professors, who did not use technology and insisted on printing all course materials. Soon after they became a teacher, their peers began to seek them out for technology support. P10 began their tech journey by adopting email in the late 1990s and realizing their new ability to communicate with people worldwide. The participants' strong desire to know or pursue their interest was described in multiple significant ways, which created opportunities to group their responses into the subthemes.

Subtheme 1a: Essential Awareness of the Tech Phenomenon

Subtheme 1a represented the proficiencies participants explained of how the smartphone can be applied in self-directed learning or PD context. It demonstrated their ability to synthesize new and meaningful information in order to pursue a specific end goal. All 13 participants described themselves as self-directed learners or self-starters characterized by Hamilton's self-directed learning definition (2018). Analysis of the data revealed that participants had a wide range of interpretations of the concept of self-directed learning. However, the central motif focused on the opportunities to use new approaches to ordinary tasks and the ability to perform those tasks without explicit directives. P5 defined self-directed learning as "this idea that I see where I have gaps or where I would like to advance my learning." P8 defined it as "self-directed learning is more than just self-paced. It has a purpose and not just task completion." In their own way, all participants explained that self-directed learning is driven by the desire to answer a question or problem, and an enjoyment of the learning process.

Participants' understanding of self-directed learning revealed four elements in their understanding of the phenomenon of the use of the smartphone: (a) Problem-solving, (b) self/professional improvement, (c) independence, (d) self-paced and purposeful. These elements fall within the recognized definition of self-directed learning in the field of education. As defined in Chapter 1 self-directed learning is a set of processes, such as a constant evaluation of the effectiveness of learning activities, self-motivation, the relevant goals and well-defined outcomes, and the ability to monitor the progress of improvement, that require a proactive learner.

Subtheme 1b: Essential Awareness of the Device

Subtheme 1b represented the academic or basic knowledge of the smartphone as a tech tool. Participants shared their understanding of the complexity and processes of the smartphone, its multi-faceted design, and its applications. Participants' responses revealed that they acquired the knowledge of the use of the smartphone as a device for learning through social media platforms such as Twitter, Tik Tok, YouTube, and Facebook and their multiple features (Tweet chats, Facebook groups, etc.). The data analysis revealed that social networking sites through smartphone apps present extensive benefits to adult learners regardless of negative perceptions of those platforms.

Two participants (15%) are self-described Digital Natives because they have had a smartphone since high school or college, so they have never been without the device in their professional lives. Newer sources of knowledge about smartphone use came from their older school students, who helped in their goal of remaining relevant educators. Three of the 13 participants (23%) encourage their students to use their smartphones in the classroom for similar reasons. All participants shared that they have the ability to fluidly use a combination of devices such as their laptop, desktop, and smartphone depending on what tasks they are performing or what type of information they are seeking.

To understand the participants' essential awareness of the device, it was necessary to note their choice of smartphone operating systems and the influence of their decision. Seven participants (54%) reported owning Android devices while the rest reported owning IOS (Apple iPhone Smartphone) devices. The focus of this study was not on the

smartphone brands but on the nature and influence of the participants' choice of smartphone operation systems (OS). Participants in the K-12 level who chose the IOS smartphones indicated that their choice was influenced by design compatibility and social influence. P2 indicated that they had owned an IOS smartphone since high school, and it was a family decision. P10 shared that their choice of IOS was based on "a long-standing reputation of being a company that's more creative and for creative people." They also indicated that they chose the IOS option because it was compatible with their academic institution's choice of operating systems. In other words, they were more likely to purchase an iPhone if their school equipped them with iPads or MacBooks.

The participants who owned an Android smartphone indicated a personal decision based on their more limited financial means when they purchased their first smartphone. P4 explained that the reputation of the IOS computers conditioned their early perceptions of smartphones, "I lived in the hood. If you had a Mac II or Apple II computer you were *bougie* to the top of the degree", referring to a term meaning anything perceived as "upscale" from a blue-collar point of view (Cakesy, 2008). P5 and P7 also indicated their loyalty to the Android smartphone stemmed from their distaste of the social class status façade accredited to iPhone users. P6 indicated a personal choice for the Android operating system long before their school selected iPads for the students and their decision to continue to use Android regardless. P8 indicated that they migrated from IOS to Android when their iPhone seemed redundant after purchasing an iPad. P14 indicated that their preference for Android centered around their personal computer (PC) ecosystem and their perception of the usability of specific device features.

Subtheme 1b, essential knowledge of the device, also included the participants'
attitudes about the expectations from the PD offerings in their school or educational
institution. These elements were a valuable inclusion since the data revealed that
participants' views opposed their perceptions of their concept of self-directed learning.
Participants reported that they did not think highly of the PD options, which agrees with
many existing studies broadly aligned with Self-determination Theory. As mentioned in
Chapter 2, self-determination theory explains the intrinsic and extrinsic factors that
motivate autonomous progress in the educational setting. Their negative perceptions of
school-provided PD ranked within three levels: (a) not very advanced, (b) irrelevant, and
(c) condescending. For this reason, as the data were analyzed, there was a focus on two
issues: (a) their description of school provided PD to be substandard and (b) their
description of their ideal PD:

Participant expectations of in-house school PD were low and of little benefit. P3
reported that the school-provided PD seemed to be designed to meet the district goals
rather than engage well-rounded educators. P13 reported that their school PD was
"mostly fillers for the district required PD hours we must fulfill each year." The lack of
relevance, advancement, and differentiation of school-provided PD led participants to
seek more timely and progressive PD. P12 shared that PD should be accessible to
everyone no matter what operating system or mobile learning device. Participants gave
examples of more open-ended PD options like spending the weekend surrounded by tech-
savvy innovators at a nearby Airbnb house, combing educator social media channels.
Tech-savvy educators expect that PD designers at their district level would understand

the "PD anywhere, anyway, and any time" theme that was popularized at the turn of the 21st century by education leaders.

In contrast, three participants (23%) reported that they were the person who designed and delivered instructional tech PD in their institution. They explained that their goal was to provide new PD sessions where their colleagues would learn new information and apply it in their classroom immediately. P7 noted that they believe PD should be relatable and applicable. P14 reported that good PD begins with "understanding where the learners are and what baseline to lift them from." P6 reported that their school provided little to no tech-related PD, which was "a factor that made the COVID-19 transition even more difficult." P6 shared that the minor PD opportunities they received were transitory, and their colleagues were left to their own learning, which was convenient for self-starters but detrimental for educators that need more structured PD.

Participants also shared how they practiced self-directed PD before the advent of the smartphone. Except for two participants, all were of an age to speak experientially about their work in the professional realm before they had access to a smartphone. Participants explained that before the smartphone came to be, they used their laptops or PCs to do internet searches or email colleagues. A subset of participants even shared their self-directed learning experiences pre-internet. For example, P4 reported that they used an old encyclopedia set their family was able to collect piece by piece due to their financial situation. They also reported that the public library was the place where they could borrow library books and magazines at no cost to them and their low-income

family. They also pointed out that much of the tragic black history of the 1920s US that

occurred in their city was not included in those library books or encyclopedia sets.

Subtheme 1c: Essential Awareness of Navigating the Smartphone

Subtheme 1c represented the participants' knowledge of the smartphone as an

information and communication device. Specifically, their ability to fluently navigate,

seek out, and evaluate information using a range of platforms and applications via the

smartphone. Participants shared the type of professional searches or information they

sought using their smartphones and the type of information they considered valuable

when they searched using their smartphones. They described their favorite search

options, topics, and platforms where they looked for specific information and solutions to

real-time problems, inspiration, new networks, and ways to contribute their content for

others. Some participants reported that their professional search options were highly

affected by the COVID-19 pandemic and the worldwide Black Lives Matter protest of

the summer of 2020.

Participant 1 reported that they used blogs and walkie-talkie apps like Voxer to

update his knowledge of Psychology, Social Emotional Learning (SEL), Project Based

Learning (PBL), anti-racist podcasts and find new teaching approaches in subjects he

taught like history and math. P4 reported that they used their smartphone to Google

information, especially to find solutions to specific problems in real-time. P5 shared that

they explicitly look for educators in the field who use trending buzzwords and are

innovative in their practice. The content they look for focuses on ideas for engaging

students from educators who teach outside the norms. P8 reported that they search Reddit groups and Twitter for tech and writing advice to help create content for students.

Surprisingly, P12 reported that even though they are inseparable from their smartphone, they do not often use the device to search for information because of their screen size and only use their smartphone for searches at home where they had no access to their work computer monitor. P14 shared that they have several newsfeeds on different topics that send relevant articles to their in-box daily that they access during their morning routine. P14 also shared that they find their most valuable resources in academic and peer-reviewed journal aggregators like Google Scholar.

According to Hart (2021), the visible anti-racism movements of the summer of 2020 in the US were a reoccurring factor that influenced educators' informational searches. Educators in the United States were faced with examining their practice for elements of solidarity and antiblackness content and social activism (Wiggan et al., 2020). The following report focuses on participants who mentioned the summer 2020 anti-racism movement and the COVID-19 pandemic. The participants shared the following information:

P1 and P3 shared that they used their smartphones to find new strategies, content, and teaching tools to address inequality in their classrooms. For example, P1 shared that they listened to anti-racism podcasts, P3 felt emotionally compelled to learn more about implicit bias, and P6 looked for content by black authors like the Amanda Gorman inaugural poem *"The Hill We Climb" (Gorman, 2021)*. P3 relied on Twitter chats for information about the social-emotional wellbeing for educators, behavior and special

education, anti-bias teaching because their "eyes were open this summer," referring to the worldwide Black Lives Matter anti-racism protests that stemmed from the brutal murder of George Floyd, a black man, by a white police officer in the streets of Minneapolis on May 25, 2020. "I am looking for ways to grow as an educator for my Life Skills class, even though COVID, I am looking for ways to grow with my students and then just ways to grow professionally."

Some participants also shared that they felt obliged to search multiple platforms for information, teaching and classroom management approaches, and tech tools for remote learning during the COVID-19 quarantine confinement. In March 2020, schools throughout the United States abruptly ended face-to-face instruction and pivoted to emergency distance learning. In the following months, a national survey of teachers uncovered the challenges of remote instruction (Marshall et al., 2020). The participants' experiences in this study aligned with the findings in the national survey, where educators shared the challenges of searching for solutions to the education issues the quarantine revealed. For example, P5 reported that because the sports world was shut down due to pandemic-related stay-at-home orders, they exchanged their habitual sports news search for deep research dives into the effects of quarantine. P6 used their smartphone or iPad to look for videos on YouTube to improve their self-directed learning during the quarantine.

Because of the national quarantine, P7 reported that the TikTok app became a new PD source to learn new remote learning strategies in a few seconds. P10 shared pedagogical resources and information about the subject they teach; since they have not been in a crowded space in a year, the type of searches they do on their smartphone has

changed. For example, isolation allowed them to search for and view uncomfortable content away from strangers: content like graphic police cam videos, mental health articles, etc. P8 reported that it became a priority to look for content to enhance remote learning. They also sought to connect with other tech-savvy educators to discuss building community online, creating or displaying academic content, and creating better access for students who struggled with technology. P13 also used Twitter to follow content posted by tech-savvy 'edufamous' influencers for new strategies related to remote learning. P13 reported that the pandemic drastically changed her approach to PD and where they obtained their resources.

Theme 2: Autonomy to Access New Information

In Chapter 2, I described the relationship between autonomy and self-directed learning was described as proactive learner-driven vehicles that require the ability to constantly evaluate the effectiveness of learning and the self-monitoring for improvement. The theme of autonomy emerged as a summary of how the smartphone improved participants' self-directed personal learning experiences in a broader social and global context. Participants described how their device advanced their life and jobs skills as well as their cultural competence. They also articulated memorable learning experiences using the smartphone and why those experiences were unique. Participants revealed that the smartphone was essential to them because of its accessibility, it connected them with other educators, they were able to constantly learn and advance their practice, as well as create and resolve issues in real-time.

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They expressed feeling self-endorsed when given many choices and indulge their

ability to utilize those choices to master tasks intrinsically. Coupled with the reciprocity

of their online networks, they describe the sense of group belonging. They described of

using the smartphone for connectivity, cultural influences, and access to steady streams

of information. In order to access information of interest with autonomy, the data

revealed that participants demonstrated that they valued the smartphone as a learning tool

and that they understood the cultural phenomenon, world views, and attitudes toward the

device.

Subtheme 2a: Value of Device as Learning Tool

Subtheme 2a represented the participants' use of the smartphone for constant

learning in search of straightforward solutions to current and emerging problems. P1 told

the story of a time they were able to avoid expensive appliance repairs when they used

their smartphone to call up videos to help fix the family's washing machine using a small

$3.00 part. P2 indicated that they used an audiobook app to search for book

recommendations between class periods. P6 related the story of when they were teaching

a phonics program and encountered a word they genuinely did not know how to

pronounce. They used their smartphone and played the automated pronunciation response

in the dictionary app.

The data analysis also revealed that the participants' recognized that the

smartphone eased their disposition for self-directed learning and their search for solutions

to emerging problems. Participants acknowledged the tool's accessibility for self-directed

learning anywhere and anytime. The smartphone's ease of use allowed them to conduct

deeper searches and seek knowledge externally from others. For example, P12 shared that they can improve their life and job performance simply by listening to inspiring podcasts in the car during commutes or in the gym during workouts. Participants explained that scrolling through different platforms on their smartphone is how they found impactful news and strategies from the teaching world and apply it to their craft the following day.

Subtheme 2b: Cultural Competence

Subtheme 2b represented the participants' understanding of the smartphone as a cultural phenomenon, being aware of their world view and attitude toward the device's social implications. Participants' responses from the interview revealed that connectivity with other educators was a significant commodity introduced by the smartphone. Participants were allowed to openly share their personal beliefs about the smartphone unimpeded by a focused guiding question: Is there anything else you would like to say about the smartphone that I did not ask? They shared anecdotes that define the cultural adjustments to their lives and global understandings they have gained having a mobile internet-connected device on their person at all times.

Participant 1 explained that they were in awe that through their smartphone, they could attend online conferences on equity featuring 20-30 influential and nationally renowned speakers from different countries during the COVID-19 quarantine. P3 reported that they connect daily with educators worldwide through group chats and social media, which has expanded their knowledge and "unknown aspects of education." P5 explained experiencing the cultural phenomenon known colloquially as FoMO or Fear of Missing Out, which is a sense of anxiety that dramatic events may be happening

elsewhere, "I was constantly in this state of trying new apps, getting rid of apps, you know, replacing them, implementing with my students right away, and then seeing what works and what didn't work." P8 described the sensation of being in multiple places at the same time "So I may not be talking to the person standing in front of me at Starbucks but all of a sudden I'm chatting with somebody on Twitter across the world, who is also professionally connected with me." P13 shared that they wished other educators did not view adult use of the smartphone in the school as unprofessional. They explained that when they take their smartphone out at work, they must often explain to students and adults why they are using it to not offend or upset anyone

Participants revealed that the smartphone was essential to them because of its accessibility, connected them with other educators, they can constantly learn and advance their practice and create and resolve issues in real-time. Data results align with their argument that smartphones have created a new era in human-machine relationships and support their strong beliefs about the benefits or the smartphone in the learning process.

Access and accessibility emerged as a concept that wove through the participants' interview answers and most specifically the data that aligned with theme 2, Autonomy. Though this concept did not emerge a standalone theme, it represented the ethical awareness participants displayed as they shared the complex relationship with their smartphones. The literature is saturated with studies about the problematic use of the smartphone in terms of emotional issues like stress, anxiety, depression, and other psychopathologies. Although the literature aligns with the universal emotional and ethical concerns about smartphone use and related problems, I specifically focused on the

participants' explanation of their ability to use the device to interact with others with a profound understanding of human emotions. Participants shared unique instances and experiences using the smartphone.

Participant 4 felt relief in having their smartphone in their classroom because they appreciated that they no longer had to pretend they knew everything. P5 reported having deep and meaningful conversations with other educators about self-care while doing their walks around their neighborhood. P8 shared their habit of searching for the profiles of speakers at conferences and workshops to understand the facilitators' expertise. P10 reported that their unique experiences revolved around their ability to document daily events and share them with friends, family, and colleagues. Events that without the smartphone, they would not have been able to share. P11 reported, "My whole life is on my smartphone. I would not be as productive without it"

In addition, participants shared their concerns about having a bi-lateral relationship with the device. On the one hand, they perceived the smartphone to be an indispensable tool. However, they also explained their unease with the emerging societal changes created by using the device and their own undesirable habits while using the device. P4 reported that their smartphone made it difficult to power down from the internet. Working on their laptop or desktop clearly indicated that they were at work and could walk away after work hours. However, the smartphone blurred the lines between work and leisure. P5 explained a noticeable cultural change when walking through the university. They explained that "If you see someone with their earbuds or their air-pods, you don't say anything to them. I am concerned with that idea of phones, smartphones

disconnecting us from that human element that contact with people that are in your presence".

As mentioned, the events of the year 2020 surrounding the COVID -19 global pandemic, the murder of George Floyd in the US that gave rise to the Black Lives Matter protests worldwide, and the January 6th, 2021, attacks on the US Capitol by disgruntled voters, many educators in the United States to examine their practice in topics of antiblackness and social activism. Although the research questions were not designed to delve into their relationship with current events in mind, participants shared that these events greatly influenced their search topics, searching frequency, and the cultural exchanges they experienced through the smartphone. Participants' answers showed evidence that their interactions with their phones were unconscious and how they are propelled by a complex set of habits and routines that they have developed over time. Statements about these historical events were subdivided into three small but notable sub-subthemes that defined participants' emotional and ethical concerns about using the smartphone during real-time current events:

1. Easy access to misinformation and disturbing content

2. Mitigating addictive use of the device

3. Heightened social content and detachment to the real-world

For example, P4 shared concerns that the quick access to disturbing images and videos of police brutality or constant access to misinformation may desensitize and cause mental health of their students. P4 also shared that they had difficulty powering down and learning how to balance work and life, "because when I'm on a laptop, or I am on my

computer, I know I'm working and I can set it down for the day," however, their smartphone is next to them making to shut down, "that ping of an email, that ping of an inquiry, that ping of a chat or a text." Participants also shared that they feared an unhealthy dependence and shared difficulties functioning if their smartphone is not with them. P7 reported no concerns at all with their emotional connections with their smartphones. They can give themselves a technology cut-off time and have strategies like charging the smartphone far from their bed at night to minimize overuse. On the other hand, P8 shared that they slept with their smartphone under their pillow and considered the nightstand too far to place it during the night.

Participants shared concerns about a noticeable cultural phenomenon. P10 explained, "You know that when you're in public spaces, you see people who default to their phone. Like if there is a lull in the conversation, people go straight to their phone, and so I think that that's a significant issue". They further explained that even though their children live in the house, they do not see each other often, but when they are sitting in the living room together, everyone defaults to their smartphone. Participants shared similar concerns about how smartphones affect our eyesight, and physical health along with constant need to mitigate the addictive use of smartphones and the ease of encountering bullying and unpleasant events. P14 shared that they had to develop new habits to mitigate undesired behavior on their smartphone. For example, they explained that they no longer leave their smartphone on the table when eating with someone. It stays in their pocket, "It's nowhere to be seen because I want the person, I am with to know they have my full attention."

Themes Addressing Subquestion 2

A third theme that emerged from the participants' responses aligned with SQ2 and addressed their attitudes toward using the smartphone for self-directed PD and how the knowledge they gain by using the device influences their professional practice.

Theme 3: Collaboration

The theme of collaboration emerged as the data represented the participants' experiences working together to obtain, create or produce something. In order to understand how the participants' perceptions of using the smartphone for self-directed PD influenced their professional practice, I focused on the changes the smartphones made in their professional practice and personal actions. Participants describe how their teaching or professional practice changed because of the smartphone. They also shared how the device affected their personal and professional life. The theme of collaboration was subdivided into two subthemes that describe the access and application of new information and what participants did with new information (see Table 7).

Subtheme 3a: Application of New Information

Subtheme 3a represented the participants' use of smartphones to make informed decisions and apply new information to resolve issues in their professional practice using emerging and evolving applications and online information. Participants' responses from the interview revealed the transformational outcomes of the smartphone to their professional practice, personal actions, and professional lives. According to Melumad et al., (2019), the portable nature of the smartphone encourages users to focus on the overall

experience rather than the specific content they are consuming. Participants' responses agreed with this assertion.

Participants shared how using the smartphone for self-directed PD influenced advanced professional practice. For instance, P1 related that the smartphone has made them more reflective by following education influencers, reflecting on new strategies, and applying new recommendations to classroom practices. P4 reported that many educators in their school building, including administrators, are reconsidering allowing the smartphone as a tool for financial reasons. For example, they realized the students no longer needed to purchase graphing calculators when free or inexpensive apps were accessible through their smartphones. In addition, participants that allowed the use of the smartphones in their classrooms reported that the device provided creature comforts like white noise or music apps during independent work time which increase student productivity. Other smartphone features like, word-to-text also create additional accessibility factors in creating more learning autonomy for students such as, resolving their spelling problems.

To mitigate smartphone distractions in the classroom, participants like P7 intentionally building lessons that seamlessly integrate the device, for example, using QR codes around the room or asking students to tag them on lesson-related Instagram posts. They even use learning apps like Pear Deck or Nearpod that encourage students to participate via their smartphones.

Each participant shared unique and creative combination of ways in which they apply new information that improved their professional practice. For instance, by using

the voice and video recording features they could improve lesson delivery and used collaborative tools to access affinity groups to alleviate isolation. P14 reported that their students no longer had to struggle alone since they could problem solve with instructors via text messaging from the beach.

Subtheme 3b: Creativity and Communications

Subtheme 3b represented the participants' knowledge and use of the different features and applications of the smartphone in their individual and collaborative contributions to the practice. In other words, it represents the participants' ability to generate new notions, new experiences and to use the smartphone to refine ideas with new tech-based solutions. Participants explained how they use a variety of ICT applications and platforms to generate and consume new ideas and resources to seek greater understanding and affirmation of their practice. They shared how they use their smartphone for additional activities other than for PD, for which participants volunteered data about creative and resourceful ways they used the different device features personal as well performance. All 13 participants agreed that the smartphone transformed mundane activities and events into novel emotional experiences that align with the literature. For example, P1 reported that YouTube is their most valuable source for professional and personal Do-It-Yourself tutorial informationP3 shared their amazement at their ability to join worldwide Zoom activities and events during the quarantine, which "really opened my eyes to just the amount of wealth and knowledge out there, because I think that as educators, we can't become stagnant. We have to keep learning". P5 shared a unique experience they had while listening to a Podcast where they were able to

emotionally connect to a story that validated and gave meaning to a specific incident in their lives. They also mentioned that this endorsement of his lived experiences would have never occurred without the smartphone as the bridge to this unique story. P6 reported using the text message feature to verify or triangulate information with their colleagues during school hours. For example, they coordinated bus schedules and could easily verify the location of a particular bus, a student, or a parent during the afterschool bus pick-up period. P7 preferred using apps that offered abbreviated content, like TikTok, to find 30-second healthy cooking recipes and wellness advice. Similarly, P12 reported that they depended on their smartphone to enhance and adhere to their fitness routines.

Participant 8 marveled at their ability to have a unique thought and then "send a message out to the world to somebody, to whoever, and then all of a sudden, there is a response and a connection." They shared that they could reconnect and rekindle a relationship with their current spouse because they kept the same smartphone number for 15 years. In addition, P8 reported that they have driven across the country several times, and they would have never had the confidence to embark on a solo trip without their smartphone, which they use for banking, driving directions, communication, and real-time travel information. These trips have created life-changing events. P10 commented on creating global content that can result in national and international events such as the video recording of the murder of George Floyd during the summer of 2020 or the footage taken through multiple smartphones during the attack on the US Capitol on January 6, 2021. P11 also reported a story of capturing a video of an intimate moment with their music idol at a concert as evidence of the meeting for their friends, family, and posterity.

P13 shared that when they do an internet search, they depend on search algorithms to send notifications of similar searches and make keeping up with new trends easier.

Discrepant Cases

It is essential to note a peripheral but important factor that did not emerge as a theme but is a meaningful consideration. Participants made a clear distinction between whole group PD and informal self-directed learning. This factor is an important contrast because it speaks to the type of learning tech-savvy teachers find most effective and motivational. Seven out of the 13 participants (54%) reported that they oversaw or had some control over the PD offered in their academic institutions. Their approach to designing PD for their peers differed from the traditional PD described unfavorably by the other participants. There was a general agreement that whole PD or PD provided by the participants' academic institutions needs to become broader to meet educators' interests and needs. For instance, P8 suggested that school administrators should aim to provide differentiated PD options,

> Here are 10 things that we want you to know and here's 10 different time slots that you can use to learn this stuff. Figure out what you need to delve into, and you go, and you learn and come back and maybe talk to us about it, or you know whatever so it's some kind of self-directed adventure.

It is of interest that in describing school provided PD, educators who identified as recent graduates or having taught less than 5 years reported experiential learning provided by their college or university more relevant than the school provided PD.

Participants also shared that the PD must be more timely, hands-on, accessible, collaborative and far reaching in order to share with educators outside of their institutions. These learning descriptors seem to align with smartphone features designed for information gathering and learning and the definition of effective self-directed PD as events based on the educators' own initiative and willingness to learn.

Evidence of Trustworthiness

As explained in Chapter 3, because humans are the primary data collection instrument in qualitative research, it is important that said data is accessed in an authentic and trustworthy way in which the researcher's bias, dispositions, and assumptions are addressed. In this section, I describe how I established credibility, transferability, dependability, and confirmability in the research process.

Credibility

According to Merriam (2009), credibility, which is also known as internal validity relates to how findings of a study correlate to the internal reality or how well the study is done. However, in a qualitative study, it is difficult for the researcher to solely use interviews and/or observations without injecting their own experiences and bias (Ratcliffe, 1983). Internal validity, therefore, relies on the meaning and interpretations of reality (Merriam & Tisdell, 2016).

The following strategies can be used to improve the credibility of qualitative research as recommended by Merriam (2009): (a) Triangulation which is the practice of weighing multiple methods of data collection to compare and crosscheck, (b) using multiple investigators to collect and analyze the same data (Patton, 2005), (c) utilizing

respondent validation or soliciting feedback from interviewees, (d) saturation or when no new information emerges from new data, (e) peer review where a peer thoroughly examines the raw data to ensure that the findings are plausible based on the data.

To ensure internal validity, participants were invited via email, to review and analyze their interview transcripts and results for inaccuracies. Only one participant added a negligeable amount of new information, but most were satisfied confirming that the results reflected their perceptions of how they used their smartphone for self-directed learning (Patton, 2005). I did not modify or add to the process outlined in Chapter 3.

Transferability

Transferability refers to the degree in which the findings in a study can be tested and/or generalized in other situations (Merriam, 2009). To address the issue of transferability in this study, I selected a purposive sample of tech-savvy educators with specific characteristics described in the "Background" section of Chapter 1. Choosing participants that identify as tech-savvy educators ensured that they were proficient in their use of the smartphone and could share meaningful information about their perceptions on using this tool for self-directed PD (Lincoln & Guba, 1986). Tech-savvy educators refer to individuals from online instructional technology organizations who are (a) lifelong learners, (b) who are comfortable with technology, and (c) use it extensively in their personal lives and implement it with ease in professional teaching and learning (Schrum et al., 2008).

In the 'Demographics" sections of this chapter, I provided a detailed description of the participants making sure that their identity remained uncompromised. Participants

volunteered demographical information including age, gender identity, ethnicity, years in education and abilities using the smartphone.

Dependability

Dependability can be defined as the degree in which the findings of a study can be replicated by other researchers (Merriam, 2009). In qualitative research, human behavior is difficult to align and cannot be isolated. Therefore, the goal of a dependable study is to clarify aspects of the world as the participants experience it. In other words, the objective is not to replicate but to find consistencies (Merriam, 2009). In this study, I interviewed participants hailed from across the United States and from diverse backgrounds. The participants served in different sectors and levels of education industry (complex) and may had different experiences based on their professional roles during the time of the study.

The interviews occurred during the second spike of COVID-19 quarantine and stay-at-home orders in the United States and in the "Settings" section of this chapter, I describe the extenuating set of circumstances created by a worldwide pandemic, and other stress-filled fixation in historical events in the US that played out on social media. These factors may have influenced the data and the interpretation of the study results.

I followed the methodology process described in Chapter 3. I aligned the interview collected data with the a priori categories and subcategories, which in turn, aligned with my conceptual framework to relay the narrative of the perceptions of the tech-savvy educators using smartphones for self-directed PD. Also, during each

interview, used an audit trail, to capture any unintended events and to ensure other researchers can authenticate the findings in my study (Lincoln & Guba, 1986).

Confirmability

Confirmability refers to the researcher's objectivity and how the results of a study can be accepted by other people. In this study, the findings are based on the participants' responses and not on any personal motivation or bias (Ravitch & Carl, 2016). In the audit trail and/or reflexive journal, every step of the data analysis was highlighted to explain the rationale of decisions made. To establish confirmability, a sequential and funneled data analysis plan was used, starting by looking for patterns in the major a priori categories inspired by the 3 x 3 model of 21st century learning framework and then organizing the data into a priori subcategories. I also used an inductive code process as a flexible secondary lens to develop a subcategory based on patterns not in line with the a priori categories (Dey, 1993).

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Summary

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The purpose of this study was to examine the perceptions of tech-savvy educators using smartphones for self-directed PD. Thirteen tech-savvy educators from different areas of the United States participated in individual semistructured interviews via a video conference platform. The data analysis provided a sample view of how participants used the smartphone in professional and personal settings.

In this chapter, I described the research design and the rationale for selecting a qualitative method to address the initial research question. I outlined the population sample and the recruitment criteria, the setting, as well as the data analysis approach.

Participants shared their stories of how they became tech-savvy educators, how they used the smartphone for problem solving, self-improvement, how they defined self-directed learning, their views on PD provided by their academic institution, their cultural understanding of the range of the smartphone, and their multi-faceted relationship with the device.

Each interview transcript was hand-coded using three a priori inspired themes. Themes were subdivided into subthemes using an inductive analysis approach to delve deeper into the specifics of participants' perceptions. Chapter 5 discusses the interpretations of the findings, limitations of the study, recommendations, implications for social change, and conclusions.

Chapter 5: Interpretation

The purpose of this study was to examine the perceptions of tech-savvy educators regarding the use of smartphones for self-directed PD. Recent studies indicated that the absence of individualized or customized PD offerings for educators that are not based on short-term whole group instruction. In whole group instruction, all participants learn the same content at the same time through a single source such as an instructor or facilitator providing direct instruction (Wyatt & Chapman-DeSousa, 2017). In the current study, a generic qualitative design was used to gain a better understanding of participants' perceptions and answer the research questions (see Merriam & Tisdell, 2016).

The research question focused on the perceptions of tech-savvy educators using the smartphone for self-directed PD. Tech-savvy educators described using the smartphone and its multiple features in practical ways that affect their personal lives as well as their professional practice. The participants shared their journey to becoming a tech-savvy educator, their understanding of self-directed learning, how current events affected their internet search habits and use of the smartphone, their use of the smartphone in professional and personal settings, and their perceptions of the viability of the smartphone as an essential connectivity and learning tool.

Interpretations of the Findings

The findings of this study contribute to the field of education technology and the field of PD for educators by demonstrating an individualized professional learning approach that could differentiate PD for educators. The findings of this study represent the perceptions of tech-savvy educators using the smartphone for self-directed PD.

Key Findings for the Research Question

The data revealed that tech-savvy educators' understanding, and practice of self-directed learning align with their early grasp of instructional technology and the smartphone as a viable educational device. Although the only research question was straightforward, the multiple ways the participants used the smartphone required an understanding of the knowledge they gained using the device, what knowledge they valued and how the knowledge advanced their professional practice. Examining the tech-savvy educators' approach to learning and their specific learning activities shaped the answers to SQ1 and SQ2, which laid out their perceptions of using the smartphone for self-directed PD. In other words, the themes and subthemes revealed by SQ1 and SQ2 present how tech-savvy educators perceive using the smartphone for self-directed PD. Their perceptions can be summarized in that tech-savvy educators see the smartphone as (a) essential for autonomous learning and purposeful self-improvement, (b) essential for accessible collaboration and reflection, and (c) essential for self-directed professional development.

Chapter 5 includes a discussion of the overall findings in relation to the literature reviewed in this study. Factors related to the COVID-19 pandemic may have influenced each participants' perceptions of using the smartphone for self-directed PD. Early studies cautioned against the temptation of generalizing educators' perceptions of the nature of PD (Donavant, 2009; Gitomer & Latham, 2000; Van Driel, et al., 2001). In the current study, a purposive sample of participants reported their perceptions of using the smartphone for self-directed PD, but findings may not be applicable to all tech-based PD.

The findings confirm, disconfirm, and extend knowledge from the literature. The chapter ends with a discussion of the connection between the perceptions of the tech-savvy teachers using their smartphones for self-directed PD and the framework

Subquestion 1: Findings Related to Previous Literature

The findings from Subquestion 1 indicated the factors that drove participants' use of the smartphone for learning. The themes of curiosity to pursue desired interest and autonomy to access new information were two important themes shared by the participants. They shared their basic awareness of the device, their understanding of self-directed learning, and their perceptions of the bridge between the smartphone and self-directed learning. The findings also revealed factors that drove changes in the participants' personal and professional actions or ways in which the use of the smartphone changed their beliefs about learning. The theme of accessibility surfaced as an underlying factor in participants' relationship with the smartphone.

Two themes aligned with findings from previous studies indicated the reasons why participants used the device for personal and professional learning: (a) curiosity and (b) autonomy. Educators became tech savvy because they were curious about how technology worked and how they could use emerging tech tools to solve problems, to improve their professional practice, and to improve learning for students. De Clercq (2019) confirmed that tech-savvy educators have the ability to integrate tech tools like the smartphone with learning objectives and strategies in their professional and personal lives. Current participants' perception of their need to seek deeper knowledge centered around engaging with like-minded professionals on social media platforms to process

digital literacy and integrate new knowledge from multiple information sources. For

example, P13 reported that they "stay up all night, building things, learning things,

reading things that have to do with new technology." They shared multiple strategies and

the variety of platforms they explore. Some participants shared a sense of curiosity before

they owned a smartphone, others were interested in the connectivity with the world

outside the educational "four walls" with the aid of their smartphone, and others were

inspired by academic assignments or institutional programs.

The participants confirmed findings from previous studies in the assertion that

whole group PD is often ineffective (see Darling-Hammond et al., 2017; Kalinowski et

al., 2019) and that tech-savvy educators do not often apply the content of whole group

PD to their practice (Mishra & Mehta, 2017; Stewart & Sigrist, 2017). Darling-Hammond

et al. (2017) defined effective PD as an experience that changes the knowledge and the

practice as well as improves learning. According to the current participants, curiosity was

a factor in their intrinsic motivation and an important component in their readiness to

seek new knowledge. Through curiosity, participants sought out and examined online

information that piqued their interest, which led to more sources. Finding new knowledge

online became a reliable way to solve problems and improve their practice. Their major

influence in adopting new ideas and instructional technology was through popularized

sources and education influencers on social media (see De Clercq, 2019). The journey

that led them to become tech-savvy educators aligned with the definition and

characteristics of tech-savvy educators described in the literature (see Buenvinida et al.,

2020; Dudeney & Hockly, 2016; Liao et al., 2016). PD for educators, especially those

who are tech savvy, should be more effective and led by the educators' curiosity rather than providing training that aligns only with the institutional initiatives (Burda et al., 2018). Within the educational setting, the smartphone should be accepted as a tool that educators can use to satiate their curiosity in real time. Participants who were PD designers and providers within their academic institutions did not disparage their PD offerings but described interest-based PD experiences in which the trainee had multiple topic options and learning approaches.

Participants' understanding of self-directed learning revealed four factors that defined their autonomous learning needs: problem solving, self/professional improvement, independence, and self-paced/purposeful learning. These factors fall within the recognized definition of self-directed learning in education (see Hamilton, 2018). In contrast, the perception of tech-savvy teachers toward whole group PD provided by their institution was generally viewed as (a) not very advanced, (b) irrelevant, and (c) condescending. The participants' assertions align with Mitra and Dangwal's (2017) findings in that in the age of immediate access to information, skills like critical thinking, problem solving, innovation, communication, and collaboration foster the development of self-directed learning, which in turn renders the traditional content knowledge delivery practice obsolete. However, the views of the participants did not align with the view of researchers who criticized technology-aided self-directed learning trends and suggested that learning requires the guidance of a knowledgeable expert to mitigate difficulties (see Mishra & Mehta, 2017; Rutherford, 2017; Tarek, 2017).

As mentioned in Chapter 2, the practical experiences of tech-savvy educators in the use of smartphones for learning are directly associated with their self-determination. Self-determination theory is a theoretical construct that explains people's basic needs for learning: (a) autonomy, which is a state where one feels self-endorsed and has multiple choices; (b) competence, which creates a sense of wellness related to how effective and to what level of mastery one feels; and (c) relatedness, which is a mutual feeling of being cared for and having a sense of belonging to a group (Deci & Ryan, 2016; Ryan & Deci, 2017). According to Herb (2020), connected educators like tech-savvy educators find smartphone app-based platforms like Twitter more effective as tools for self-directed PD than for personal use because of the ability to find customized resources. All 13 participants in the current study shared that they sought education trends on Twitter or in Facebook groups that were interesting to them and applied them to their professional practice. Their preference for seeking out topics, resources, and influences informally and in real time seemed highly motivational to the participants.

Participants also shared their favorite internet search topics they sought using the smartphone. The events of the year 2020 surrounding the COVID-19 global pandemic, the murder of George Floyd in the United States that gave rise to the Black Lives Matter protests worldwide, and the January 6, 2021, attacks on the U.S. Capitol by disgruntled voters influenced the participants' search topics, search platforms, and searching frequency. These three events led many educators in the United States to examine their practice in topics of anti-Blackness and social activism (Wiggan et al., 2020).

Despite reports of frequency and problematic use, the participants indicated that the smartphone was essential to them because of it afforded accessibility, connected them with other educators, and allowed continuous learning to advance their practice in real time (see Elhai et al., 2017; Horwood & Anglim, 2020; Squires et al., 2020). On the one hand, participants perceived the smartphone to be an indispensable tool, but also shared their unease with the emerging cultural changes created using the device and their own undesirable habits while using the device. This dichotomy aligned with how other researchers described smartphone users' perceptions of the connectivity, cultural influences, and access to steady streams of information (see Banskota et al., 2020; Filieri & Lin, 2017; Godwin-Jones, 2017).

A key finding indicated accessibility as the outstanding reason participants sought the smartphone for self-directed learning that motivated intrinsic changes to their personal actions and professional practice. Consistent with the literature, easy access to seemingly unlimited information creates a complex reliance on the smartphone as a tool for change (Abbas et al., 2019; Anshari & Sulaiman, 2019). The smartphone is essential to tech-savvy educators because of its accessibility and connection to other educators. However, educators also have problematic interactions with the device.

As mentioned in Chapter 2, motivation is an essential yet often ignored characteristic in any type of learning experience, which in turn determines the level of learner participation (Ciampa, 2016; Ciampa & Gallagher, 2021). Current participants overwhelmingly reported that another factor in using the smartphone for self-directed PD was the access to anytime, anywhere, anyway learning. The portability, ease of use, and

efficiency of the device, in contrast to the laptop, allowed participants a steady stream of learning and contact with a larger network of educators (see Ciampa & Gallagher, 2021). The need for access to a wider community of educators was made more apparent at the onset of the COVID-19 pivot to social distancing norms in the spring of 2020 (Bergdahl et al., 2020). Tech-savvy teachers in the current study searched for affinity-based experts and factual resources that informed national conversations about the ramifications of the global pandemic, educator psychological distress, and the unpacking of systemic racism in schools. For instance, P8 reported seeking information about antibias and emotional wellness issues. According to Talidong and Toquero (2020) and recent researchers, educators communicated with their online social networks to find coping mechanisms, including mental health issues brought on by the pandemic norms (Cervantes-Guevara et al., 2021; Garcia-Priego et al., 2020; Rajkumar, 2020).

In the current study, tech-savvy educators' beliefs and values about the smartphone as a learning tool were deeply connected with how the device had affected their personal and professional lives. Participants believed that the smartphone allowed for connectivity, cultural influences, and access to steady streams of information to improve their practice. Although their perceptions of the accessibility of the smartphone were overwhelmingly positive, they also acknowledged the complex nature of their relationship with their smartphone's constant connectivity to information. As indicated in Chapters 2 and 4, the literature is saturated with studies about the problematic use of the smartphone in terms of emotional issues like stress, anxiety, depression, and other psychopathologies (Elhai et al., 2017; Horwood & Anglim, 2020; Squires et al., 2020).

According to Heitmayer and Lahlou (2021), many smartphone interactions go unnoticed by the user, who over time develops a set of undesirable routines and experiences. Most current participants admitted to being troubled by the confusing dependency on the device and the now ubiquitous cultural habits created by the wide use of the smartphone. Tech-savvy educators reported the following concerning ethical and deeply emotional occurrences that negatively impact their use of the smartphone:

- barrage of disturbing images and videos of police brutality,

- difficulty powering down,

- missing real-time physical events and opportunities,

- difficulty functioning without their smartphone,

- consequences of emotional posts on social media,

- undesirable changes in physical social spaces,

- effects to physical health (like eyes, neck, and back), and

- negative perceptions of using the smartphone in an academic context.

Subquestion 2: Findings Related to Previous Literature

As described in the literature, instant collaboration or access to other professional perspectives is a critical argument that encourage a deep reflection in one's practice (Bald et al., 2016). Tech-savvy educators in the current study use the smartphone to consume information and become content creators to inform others. Although the preponderance of the literature suggested that learner autonomy is an essential ingredient in intrinsically motivated learning, the current participants' academic institutions provided little opportunity for formal self-directed reflection on their professional practice (see

Anderman, 2020; Hamilton, 2018; Reeve et al., 2018; Ryan & Deci, 2020). According to

Curran et al. (2017), school administrators who plan PD tend to dismiss the relevance of

the principles of self-determination that propel te motivation of tech-savvy educators

seeking personalized learning online. Institutional PD creators can focus on releasing

control of certain aspects of formal learning for educators to provide greater autonomy,

improve job performance, foster intrinsic self-reflection, and curb educator attrition rates

(Johari et al., 2018; Smith & Ulvik, 2017). For example, P8 described their institutional

required PD as

> you're sitting in a room with 50 people and half of them hate being there. And the
>
> other half are completely lost. It is frustrating. Then, I have had other PD where
>
> this is the same PD we had two weeks ago.

Nolen and Koretsky (2020) explained the cultural differences between the context of PD

and whether traditional practices fulfill the needs of the participants.

Participants in this study perceived whole group PD as neither sufficient nor

timely for educators with their characteristics and are thus feel compelled to seek just-in-

time knowledge that advances their thinking elsewhere (Jeno et al., 2017). Adult learning

theory also supports the idea of teachers designing and following their own learning

needs (Louws et al., 2017b). For example, P4 reported that "self-directed learning to me

is when you discover a problem, and there is no one there to actually teach you how to do

it." These explanations fell within the recognized definition of self-directed learning in

the field of education defined in Chapter 1 as a process of constant evaluation of the

effectiveness of learning activities, self-motivation, the relevant goals and well-defined

outcomes, and the ability to monitor progress of improvement, that require a proactive learner (Hamilton, 2018). Keay et al. (2019), stress how educators should be given the professional space to deepen their knowledge and skills through self-directed inquiry, professional connections, and new challenges. Within tech-savvy educators' beliefs regarding how the smartphone changed their personal and professional thinking, one notable theme that surfaced was collaboration.

The findings in this study indicated that tech-savvy educators welcomed the access to meaningful collaboration their connected smartphone provided. As asserted by Tour (2017), they described using their smartphones to participate in reciprocal education-related online communities to find professional and personal benefits. Participants agreed that learning using their smartphone influenced and transformed the way they thought about their professional practice, personal actions, and professional lives. For instance, P4 explained being able to mentally "leave" the confines of the four walls of their classroom to find companies to provide career experiences for their special education students and being able to instantly connect and collaborate with the leaders of those companies. P8 shared that smartphone notifications drastically changed the way they communicate and collaborate with peers since they gained the ability to take this pocket computer everywhere and are now able to attend Zoom meetings, and comment on collaborative Google documents from their smartphones, from anywhere.

The data also revealed that online collaborative communities provided an interpersonal professional culture that buttressed the tech-savvy educators' sense of self-efficacy (Tour, 2017; Zhang et al., 2017). The tech educators describe opportunities to

easily participate and to contribute to informal learning communities as explained by

Prestridge (2019). For example, P13 reported searching for specific information using

keywords to browse academic journals and peer-reviewed papers using Google Scholar.

Under the theme of collaboration two significant divisions emerged regarding the

participants' perceptions of tech-savvy educators collaborating with others to generate

new notions, and to use the smartphone to create new experiences: (a) tech-savvy

educators as consumers and (b) tech-savvy educators as content creators:

Tech-savvy educators use the smartphone to quench the need to consume

information for problem solving, self/professional improvement, independence, self-

paced and purposeful learning. Participants in this study provided examples of

smartphone-accessible search engines, social media networks, and messaging

applications they used to these ends. Social media platforms like Twitter and Facebook

allowed the tech-savvy educators to opt to passively browse for information or actively

ask questions as consumers (Prestridge, 2019). For example, P7 explained that they use a

variety of social media platform to bolster their instructional coaching role like Tik Tok,

Instagram, LinkedIn, Pinterest and a variety of audiobooks or podcasts. Many of the

participants, like P12, reported they use their smartphone to specifically follow the

content of education influencers looking for innovative ideas and innovative ways of

using old ideas. They reported that their searches focused on pedagogical strategies,

academic resources like lesson plans, emerging tech tools, collaborative opportunities,

informational searches, etc. For example, P8 observed that if not for having Map apps on

their smartphone, they would have never braved cross country solo drives each summer.

Some shared they attended remote meetings, webinars, and conferences for informal PD while traveling in their cars or standing in the cashier's line in the grocery store, as well as listened to audio books and podcasts while on the move. As tech-savvy educators, they leaned toward using their smartphone to access online solutions to everyday issues and understood how to reflect on new information, and implement it into their practice (Buenvinida et al., 2020; De Clercq, 2019; Han, 2021).

Current events also seem to dictate the type of information and topics participants consumed. The events of the year 2020 surrounding the COVID-19 global pandemic, the murder of George Floyd in the United States that gave rise to the Black Lives Matter protests worldwide, and the attacks on the U.S. Capitol by disgruntled voters, greatly influenced the participants' search topics, search platforms, and searching frequency. These three events led many educators in the United States to examine their practice in topics of antiblackness and social activism (Wiggan et al., 2020).

Tech-savvy educators overwhelmingly do more than use the smartphone to consume online resources passively. Participants in this study gave examples of how they posted content to enrich their professional learning communities or inform other educators online and to receive feedback on their contributions. For instance, P1 described a time when their students were able to collaborate with students in a South Asian country to create a problem-solving application for others to use. As tech-savvy educators, they seemed able to easily move between the role of content consumer and content creator which aligns with descriptors of this demographics throughout the literature (Bandura, 2018; Heath, 2017; Johnson, et al., 2019). They then report

consuming that information, in some instances, quickly sharing it with others in the way of retweets or reposts on social media platforms.

The tech-savvy educators also participated in Twitter chats, hosted webinars and online PD, and created instructional videos and similar content using their smartphones. These findings aligned with descriptors of attitudes of educators using new teaching and learning approaches (Ramsay-Jordan, 2020; Shelton & Brooks, 2019). Tech-savvy educators' high level of digital literacy and their ability to seek out, process, and transform information through multiple media platform often propels them to learn new content knowledge in a self-directed way rather than through traditional whole group PD. Tech-savvy educators' experiences evaluating and synthesizing a wide variety of online content without being constrained showcases the reflexive practice. As explained in Chapter 2, Heath (2017) and Krutka et al., (2019) explain that educators' beliefs and perceptions about their ability to use technology effectively are indicators of their likelihood to use technology, in this case, the smartphone for learning throughout their career. They elevate and synthesize a wide variety of online content without being constrained by the smartphone as a device.

Connections Between Findings and the Conceptual Framework

The conceptual framework used in this study is the 3 x 3 model of 21st-century learning, which asserts that current learning models fail to prepare the learner to be productive in their future (Kereluik et al., 2013; Mishra & Mehta, 2017). The following section explains the relationship between the conceptual framework and the findings in this study.

The 3 x 3 model for 21st century learning framework combines the common elements of 15 frameworks and prevalent definitions of 21st century learning, arriving at a consensus of three encompassing categories that help anchor a common understanding of what knowledge is worth in the 21st century. The three major categories of the conceptual framework are foundational knowledge, humanistic knowledge, and meta knowledge.

Engaging With Foundational Knowledge

As explained in Chapter 2, mobile learning, by definition, liberates the learner from traditional physical learning settings (Baran, 2018). Tech-savvy educators in this study exemplify self-directed learning skills in the way they navigate, evaluate, and create information effectively using a range of digital platforms from their smartphones. Fueled by curiosity and a sense of autonomy, tech-savvy educators use their high level of digital literacy to seek cross knowledge and apply it seamlessly to the cross-disciplinary process. To them, navigating vast amounts of digital content is not overwhelming or irrelevant because, as explained by the theory of self-determination, autonomy encourages their motivation to explore new information (Knowles, 1973; Mouri et al., 2018). Tech-savvy educators use the smartphone to learn intentionally.

In the conceptual framework, the foundational knowledge represents what a person knows and what knowledge they find essential (Kereluik et al., 2013). Tech-savvy educators use their abilities and experiences with tech tools to decide what knowledge is vital to them. In addition, their desire to know and their interests dictate the focus of their knowledge search. Having the autonomy to search anywhere, anytime, or because their

professional institutions did not mandate their knowledge searches, supports their engagement with foundational knowledge.

Engaging With Humanistic Knowledge

Having easy access to information tech-savvy educators find valuable while using tools like the smartphone, places them in a broader social and global context which in turn informs their life and job skills and cultural competence. It also provides them with opportunities to reflect on the ethical and emotional implications of having a broad access to anywhere, anytime information (Kereluik et al., 2013; Mishra & Mehta, 2017).

The tech-savvy educators in this study use their experiences and expertise to reflect and identify the gaps in their knowledge and search for relevant information to apply to their craft and personal lives. Prestridge (2019) found evidence that transferring knowledge gained through self-directed learning to the professional realm is more effective because it responds to the learners' intrinsic motivation. Their sometimes-conflicting relationship with their smartphone places these participants in the center of an ethical debate as to whether the access to vast amounts of information through the smartphone is beneficial or whether the smartphone is the cause of problematic dependencies (Heitmayer & Lahlou, 2021). In the findings of this study, accessibility drives how participants interpret value and how they develop new attitudes by critically reflecting on the new knowledge gained through their search for foundational knowledge. However, the essential value placed on new knowledge can be superimposed by emotional and unproductive dependencies on the smartphone.

Engaging With Meta Knowledge

Tech-savvy educators' ability to reflect upon new knowledge and act upon the knowledge to problem solve, collaborate with others, and create innovative content fuels their curiosity for new foundational knowledge. They understand the importance of having opportunities to reflect on their learning either by passively consuming engaging content or by actively sharing their content to receive feedback or inform others. The knowledge that tech-savvy educators value challenges their thinking and, most importantly, informs changes in their professional practice and innovative practices like creating new content for others to consume. The cycle then iterates with each search.

Limitations of the Study

As a generic qualitative study, the focus was solely on the perception and professional experiences of a purposive sample of participants. The study followed the credibility, transferability, dependability, and confirmability strategies, as explained in Chapter 3, to minimize the limitations to trustworthiness. This study was limited because it was conducted during the 2020-2021 Covid-19 second wave quarantine lock-down, which was a significant variable influencing the participants' responses and the interpretation of the study results. Educators practicing in hybrid conditions (online/face-to-face) reported increased mental health issues because of the disruptive, stressful, and labor-intensive nature of the sudden pivot to distance learning (Akpinar, 2021). Participants volunteered this topic without being asked. The study was also limited by the educators' reports of a state of mind that propelled an increased smartphone screen time use (Hodes & Thomas, 2021), as well as required online meetings and collaboration with students, and colleagues, and parents that disrupted academic continuity (Moja, 2021).

In addition to the second spike of Covid-19 related cases leading to the second set of stay-at-home orders for many educators, two other traumatic national events took place in the United States: the January 6th riots and attacks on the nation's capital building due to a bitterly contested election cycle, and the national security alerts that many capital cities were under on the week of January 20th, due to the credible domestic terrorist threats to the inauguration events of Joseph Biden as the 46th President of the United States (Ho, 2021). These events increased a national and international fixation with viral videos, conspiracy theories, and digital mailboxes flooded with disinformation and looped news cycle headlines (Horton, 2021; Su et al., 2021). As Zhong et al., (2021) mentioned, many people, including some of the participants in this study, suggested that they developed a different relationship with social media by way of their smartphones. In addition, the participants serve in different sectors and levels of the education complex and may have had different experiences based on their professional roles during the study. The data for this study was solely collected through one-on-one semi-structured interviews, which limited the possibility of triangulation against other possible data sources like a focus group or survey.

This study did not focus on the limitations of the smartphone as a learning tool. Newer studies have highlighted the limitations to the practicality of the smartphone. According to Anshari et al. (2017) and several authors, the smartphone in the learning environment does not only affect learner's performance but also behavior as well as sleep quality (Anshari et al., 2019; Huda, Maseleno, Teh et al., 2018; Razzaq et al., 2018). The target was the perceptions of tech-savvy teachers using smartphones for informal PD. My

experience as a tech-savvy educator may have been a limitation to this study. However, during the data analysis stage, I practiced reflexivity to keep my assumptions and preconceptions from affecting the interpretation of the data. As suggested by Patton (2005), my experience as a tech-savvy instructional innovator did provide productive points of reference during the interview process and enhanced the collegiality of our conversations. Creating a more comfortable interview session also strengthened the veracity of the data since I understood the participants' tech-savvy language and learning approaches.

Recommendations

As explained in Chapter 2, there is a wide gap between the beliefs about what modern pedagogies are expected for students and the current teaching practices (Barbosa & Aguiar, 2018; Mishra & Mehta, 2017). Mobile technology has changed the way students learn in the classroom, but changes to formal PD have been minimal (Ramsay-Jordan, 2020; Shelton & Brooks, 2019). This paradox has created a gap for tech-savvy educators to seek informal learning to choose accessible devices like smartphones. The tech-savvy educators in this study aptly described their dissatisfaction with the current required whole group PD models standard in educational institutions (Kereluik et al., 2013). They also indicated that in their experience, most of the whole group PD is propelled by administrative initiatives and not by the needs of the educators. The participants who were themselves the designers of their institutionally provided PD described methodologies in line with self-directed learning and self-determination theory. They also shared that because of their disposition as tech-savvy educators, they can

identify gaps in their knowledge and then use their expertise to fill that gap using their smartphones for informal PD.

PD for educators should be designed to be autonomous, collaborative, reflective, and based on the timely needs of the educators. According to tech-savvy educators in this study, PD learning could be informal, should support a learning environment free of redundancies, and be calibrated to include more advanced expectations, especially for tech-savvy educators. For this reason, I recommend that self-described, tech-savvy educators, as defined previously, be allowed to obtain professional learning credits for informal PD. Instead of clocking state-mandated continuing education hours by attending whole group PD workshops to maintain their teaching license, these tech-savvy educators could present a yearly body of work showcasing the outcomes of dynamic collaborations with other educators, their productive teaching innovations, and their extensive contributions to the larger global online community. These educators could be given professional time to develop their craft propelled by the areas indicated by the findings in this study. Rather than spending district funds for whole group PD, self-directed educators like these participants could be allotted PD funds to unobstructed access to pursuing, processing, innovating, and applying new knowledge as explained by this study's conceptual framework: Strategies like funded collaborations and paid academic sabbatical time to create and share content since, as indicated, tech-savvy teachers use personal time to pursue approved topics of interest to influence K-12 innovation internally and organically.

It is apparent by the data that tech-savvy educators, as they reported in this study, spend much extracurricular and personal time searching for knowledge to use professionally. They believe that the smartphone is an essential learning tool in their informal PD and suggest doing away with the stigma of using the device in the education environment. One participant wondered why the use of such a powerful learning vehicle is so strongly discouraged in K-12 classrooms. To minimize problematic use of the smartphone in the education setting, I recommend that young users be explicitly taught how to use the device productively and appropriately in schools. Productive and healthy use of the smartphone for learning should be introduced in the academic setting. Understanding how to use the smartphone could also influence the way lessons are delivered. The tech-savvy educators in this study related that their use of the smartphone for informal PD was propelled by curiosity, autonomy, instant access to new information, and opportunities for collaboration. The smartphone could become an essential resource in classrooms that use pedagogical approaches like Project-Based Learning, which often encourage students to learn within their area of interest in a self-directed way. One participant reported that the administrators in their school strongly opposed using smartphones in the classroom until they realized that the math program could save thousands of dollars in graphic calculators each year if the students used free or inexpensive smartphone apps. Especially in the K-12 realm, the smartphone, if introduced intentionally, could become the essential tool the tech-savvy educators describe and provide new avenues for self-directed learning.

Implications

The educators in a small elementary school in Maasai country in the outskirts of Arusha, Tanzania, became the inspiration for this study. In 2017, I founded a small school in an area where students are extremely far from opportunity. The teachers in the school do not have access to affordable PD outside of expensive formal university programs. The free programs that they can access through non-profit organizations in the area are not long-term nor hands-on. However, these teachers use their smartphones weekly to participate in informal PD activities with me. Access to off-brand inexpensive smartphones and pay-as-you-go WIFI connections has opened advancement opportunities like online banking, business and agricultural practices, and unlimited access to informal learning that has dramatically improved life in many areas of East Africa (Donovan, 2017; Mwantimwa, 2019). While living in the United States, I have been providing PD remotely for my African teachers using the smartphone solely. The teachers at my school have become tech savvy and have managed to build a school from the ground up, as well as transform learning for the children and mothers of their tiny village. These teachers have little access to formal PD and rely entirely on their smartphones to improve their practice and collaborate with other education professionals. This dependency on the smartphone propelled me to seek the perceptions of US-based tech-savvy educators, like these East African teachers, in their use of the smartphone for informal PD. I was implicitly interested in this phenomenon since my professional experiences align with the findings of this study. The use of the smartphone in the K-12 education setting is often viewed as unprofessional or distracting. The findings of this study could add PD for

educators to the long list of new opportunities inexpensive Wi-Fi connected smartphones have brought to those furthest from opportunity.

Positive Social Change

The use of smartphones for PD can affect positive social change for the lives and careers of educators furthest from opportunities. The positive social change occurs when world-class education opportunities are presented, and the outcomes are used to improve the lives and livelihood of people in the most impoverished areas of the world. To make positive social change possible tech-savvy content creators, instructional designers, and higher education institutions should create free advanced degree certificates and programs specially focused on this population. Currently, there is access to free online courses, like MOOCs (Massive Open Online Courses) from top universities worldwide that offer open learning opportunities. They also offer certificates of completion, badges, and micro-degrees. However, the micro-degrees are not free and still out of financial reach for many educators in impoverished areas of the world.

This study's findings highlighted and confirmed the ability of tech-savvy teachers to find the gap in their learning and use the smartphone to engage in informal PD to advance their practice. Their perceptions of the smartphone as an essential tool for learning, collaborating, and content dissemination can develop positive social changes within academic institutions as the stigma of using smartphones in the classroom lessens with time. With proper training, this powerful tool, more so than other mobile learning devices, can be used inexpensively to allow underprivileged educators the autonomy to pursue informal PD by following their curiosity and collaborating with other tech-savvy

teachers to introduce new online content and innovative practices into the profession. Contrary to many studies focusing on educators' difficulties in tech integration and application, tech-savvy educators understand how to use mobile technology like smartphones to improve their students' access to resources and learning experiences. In addition, they recognize the capacity for smartphones and use these features in increasingly imaginative and productive ways. Acknowledging the scholarship and dexterity of tech-savvy educators, like the participants in this study, and supporting their use of mobile technology devices and their search for constant new knowledge can advance positive social change in the innovations they can develop.

Conclusion

The proliferation of mobile devices and referencing-technology tools like the smartphone has attracted researchers' attention and educators because of their potential to enhance learning (Anshari & Alas, 2015; Richardson et al., 2018). However, there is still a disinclination to fully embrace the smartphone in academic environments, especially in K-12 (De Clercq, 2019; Quansah, 2018). Additional knowledge of how professional educators, especially tech-savvy educators use the smartphone for professional learning and development, will introduce changes in educators' perception of the device as a learning tool.

Tech-savvy educators use available technology to overcome challenges they recognize in their professional practice and utilize technology tools extensively in their personal lives. Their perspectives will lead to broader conversations about how we can use the smartphone for learning in the classroom in more productive ways. Tech-savvy

educators understand strategies, tools, and attitudes that highlight their depth of knowledge and the mindset needed to support informal PD using the smartphone. Their ability to find a gap in their knowledge, use new knowledge to change their thinking, and apply new understandings to advance their craft could be new skill sets introduced in educator PD. Rather than introducing specific PD trends as a school-wide initiative, educators could be offered a better understanding of how to use their curiosity in practical applications through collaboration and by taking advantage of the accessibility in the age of information.

Although autonomous or self-directed learning might have limitations for some educators, learning how to leverage the smartphone to consume relevant and timely pedagogical information will offer significant advantages for the profession. The data presented in this study indicates that allowing professional time for teachers to own their learning would encourage the creation of more meaningful content and learning experiences that would change the nature of the profession and markedly affect PD for educators furthest from opportunity.

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Appendix A: Online Demographical Survey Questions

Name:
Email address:

1. Age group: 20-29, 30-39, 40-49, 50-59, 60+

2. What is your ethnicity? Native American, Black, White, Asian/Pacific Islander, LatinX, Mixed Race, other

3. Highest educational level: Bachelors, Masters, Masters +, Doctorate, other

4. Years of teaching experience: 0-5, 6-10, 11-15, 16-20, 21-25, 26+

5. What grade levels do you currently service? Primary, Secondary, Post-Secondary, Other

6. For how many years have you used mobile technology in learning? 0-5, 6-10, 11-15, 16-20, 21-25, 26+

7. Do you own a smartphone?

a. If yes, what type of smartphone do you own? Android/iOS, other

8. Do you use your smartphone for personal and professional learning?

9. For how many years have you used your smartphone for personal or professional learning? 0-5, 6-10, 11-15, 16-20, 21-25, 26+

10. Can you competently comment about your use of the smartphone for work, home, and as a learning aid? Yes/No

11. Are you able to troubleshoot and/or find most fixes for basic tech issues regarding your smartphone? Yes/No/Most of the time

Appendix B: Research Questions and Interview Questions

Overarching Research Question *What are the perceptions of tech-savvy educators using smartphones for self-directed professional development?*	
Research Questions	Interview Questions
SQ 1: How does the knowledge gained by using the smartphone influence their beliefs about its use as a learning device?	*Focus: technology and smartphone* IQ 1: How did you become a tech-savvy educator? Tell me your tech journey. (e.g., early experiences with technology, etc.) IQ 2: What factors influenced your choice in the type of operating systems on your smartphone? (e.g., iOS, Android, Windows, etc.) *Focus: self-directed learning* IQ 3: How do you define *self-directed* learning? IQ 4: What are your expectations from the professional development offerings at your school? Probe: Before mobile devices like the smartphone, what did you use for self-directed professional development? *Focus: smartphone and self-directed learning* IQ 5: What type of professional searches or information do you usually seek using your smartphone? Probe: What topics do you cover? Provide examples (a day in a life) IQ 6: Using your smartphone, where do you find information, you consider valuable? (What online platforms, apps, etc.) IQ 7: What other learning activities do you do use your smartphone? (e.g., recording, mathematical functions, audiobooks, learning exchanges on social media, accessing tutorials, note taking, access online courses, blogging, etc.) *Focus: Participants' beliefs and values about the smartphone as a learning tool* IQ 8: How does the smartphone improve your self-directed personal learning experiences? Why? IQ 9: Describe your favorite/best learning experience(s) using the smartphone. Why? Probe: What was the major idea or concept? What factors do you believe make you connect with that (those) experience(s)?
SQ 2: How do tech-savvy educators perceive using the	*Focus: Changes in professional practice and personal actions* IQ 10: In what way would you say that your teaching practice has changed because of your smartphone? (Provide examples)

smartphone for self-directed PD influences in their professional practice?	Probe: Is there a difference between the way you use your smartphone and your laptop for learning? IQ 11: Describe your relationship with your smartphone and how it affects your professional life Probe: Do you have any concerns or reservations about your use of the smartphone for *self-directed* learning? IQ 13: Do you have anything else you would like to add about your attitude on using your smartphone for self-directed PD that I did not ask?

Appendix C: Sample Summative Coding Table

SQ1: How does the knowledge gained by using the smartphone influence their beliefs about its use as a learning device?					
Step 2:			Step 3	Step 4	
Unique Codes	A Priori	Good Codes	Broad Themes	Refined Themes	Subthemes
Summary of initial codes related to this research question	*Foundational knowledge*	*Condensed ideas describe/summarize participants' answers*	Elements that drive use of device for learning		*Elements that breakdown and support themes*
Codes • opportunity to use **new approaches to ordinary task** • **exploration of ideas and concepts** that you don't explicitly have someone telling you to do it • **skills and practices that I want to learn then being self-sufficient to learn about it** • When you discover a problem…[you] start your research to discover different solutions • where I would like to advance my learning • I don't necessarily need someone to show me what to do • **self-paced learning with a specific purpose** • **driven by the desire to answer a question or problem** • learner is able to work at their own pace • **wanting to learn independently** • **figuring out what is going on, what is necessary, what's next in the field** • **Willingness or wanting to learn independently** without somebody telling you to do it'	*Key Question: What does the participant know?* *Description* *Comments aligned with:* *Knowledge of the tech and smartphone* *Knowledge of self-directed learning* *Knowledge of using the smartphone for self-directed learning*	Codes • new solutions to ordinary tasks • exploration of new ideas • self-paced • self-sufficient • advancement of learning • purposeful learning		*Data Review: Participants' beliefs of the use of the smartphone* **How?** *To find solutions for personal/professional issues* **Grouping 1 Codes** • Problem solving • Personal/professional improvement (ideas, skills, practices, learning) **Why?** *Because of sense of purpose and independence* **Grouping 2 Codes** • Independence • Self-paced • Purposeful	**1. Curiosity** Participants' need to know more + ease of use of device are drivers in their use of smartphone for learning: **1a) Essential awareness of phenomenon** **1b) Essential awareness of the device** **1c) Essential awareness of navigating device** **2. Autonomy** Participants had various ways of defining self-directed learning which demonstrates their ability to synthesize new and meaningful info to pursue a specific goal Participants indicate their preference for self-paced, independent learning options. **2a) Value of Smartphone as Learning Tool**

Appendix D: Inductive Coding Progression Table

Step 2 *Unique Codes*	Step 3 *Broad Themes*	Step 4 *Refined Themes*		Step 5 *Defined Themes*
Codes that emerged during open coding and deemed "leftover" data	**Summarized broad themes aligned with this study**	**Data Review:** perceptions of problematic use of smartphone	Subthemes	**Relation with data:** How? Ethical conflicts Why? Emotional effects
• Age differences • Access for FFO • Access for Diverse Abilities • Choice of Operating system based on school resources • Access to disturbing videos and images • Difficulty powering down and finding work/life balance • Easy access to misinformation • Find ways to work around addictive smartphone behavior • Disconnected with the real world • Concern about culture of focusing on smartphone in public spaces • Lost family members and friends because of a social media comment made on the fly • Replacing expensive traditional tool	• Access to disturbing videos and images • Difficulty powering down and finding work/life balance • Easy access to misinformation • Find ways to work around addictive smartphone behavior • Disconnected with the real world • Concern about culture of focusing on smartphone in public spaces • Lost family members and friends because of a social media comment made on the fly	Relation with data: How? Ethical understanding of historical current events Why? Emotional effects of historical current events • Access to disturbing content • Cultural disconnect from the real world • Access to misinformation • Difficulty powering down • Heightened Social Media conflicts • Mitigating addictive behavior	• Access to disturbing content and misinformation • Difficulty powering down and mitigating addictive use • Cultural disconnect from real world and heightened social media conflicts	Subtheme 2b: Emotional connection to device *Sub-subtheme 1:* Easy access to misinformation and disturbing content *Sub-subtheme 2:* Mitigating addictive use of device *Sub-subtheme 3:* Social Media Conflicts and detachments from 'real-world'