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Awareness and Utilization of Smart Mobile Devices and Mobile Apps as Teaching Tools for Community College Faculty

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and Mobile Apps as Teaching Tools for Community College Faculty

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ABSTRACT

Awareness and Utilization of Smart Mobile Devices
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Over 90% of faculty members in higher education have access to smart mobile devices. However, data are lacking about community college faculty members' use of smart mobile devices and applications for instruction and content delivery. The purpose of this study was to examine Tennessee community college full-time faculty's use of smart mobile devices, to determine if there were any significant differences in the mean scores measuring attitudes and use of smart mobile devices by generational age grouping, teaching discipline, rank, years of teaching and to determine if Tennessee community college faculty members who under-utilize mobile technologies for teaching also hold negative opinions about them. This study measured Tennessee Community College faculty use of smart mobile devices and their attitudes and use of smart mobile devices by generational age groups, teaching discipline, rank, and years of teaching.

This study used quantitative, nonexperimental survey design. The survey instrument was an electronic questionnaire, consisting of 15 items that were divided into 7 dimensions. The dimensions were: Learning Preference, Institutional Training, Frequency, Attitude, Willingness to Attend PD Training, Willingness to Use, and Competence. Of the 267 possible participants, 93 (35%) responded to the survey. Data from the survey were used to analyze 5 research questions and 35 null hypotheses. Two research questions were analyzed using independent-samples t test and 3 analyzed using one-way analysis of variance. Testing the null hypotheses associated with the 5 research questions resulted in 7 significant findings and 28 findings that were not significant. The findings indicated that there were significant differences in professional development training scores by generational age, and by academic rank. There were significant findings in learning preference by teaching discipline and training by teaching disciplines. Last, there were significant differences in some of the dimensions by years of experience.

The results of this study may benefit administrators and educators in knowing what groups are open to professional development training for using smart mobile devices for instruction and in what areas to provide training.

DEDICATION

This dissertation is dedicated to my family, mentor, friends, and colleagues who believed in and encouraged me throughout this process. First, my mother, Lessie Mae Malloy, who was my biggest advocate and never wavered in her belief in me…who told me, in words and deeds, "I'm always with you, 100%." Her favorite saying to everyone was, "Love you, love you, love you!" And, her words lifted and carried me through the times I thought were going to break me. Though she receives this dedication in absentia, may she rest in peace, it will, nevertheless, go on record that this accomplishment was made in the echo of her living words.

To my favorite uncle, Simon Anthony Wells, thank you for your supportive weekly phone calls to check on me (sometimes twice a week when I was most stressed). Also, for taking me to the Empire State Building and the Twin Towers when I was a kid, setting the stage for me knowing what it feels like to be on top of the world. And, for always being a kind-hearted, even-tempered, logical, best friend-uncle. As mom would say, "Love you, love you, love you!"

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Chapter 1. Introduction

Mobile devices including smartphones and tablets are now familiar and common tools used by faculty and students on college campuses across the nation (Al-Emran et al., 2016; Melton & Kendal, 2012). The usage of mobile devices in education is increasingly popular, especially among digital natives who so easily and consistently connect to technology and innovative mobile devices (Jacob & Isaac, 2014). Two decades following a 1992 IBM creation called the Simon Personal Communicator, now known as a mobile/smart phone, the device landed on college campuses then quickly and in increasing numbers became tools students used for mobile learning (M-learning). At the time of its invention, more than 15 years prior to the iPhone, it was just a Personal Desktop Assistant (PDA) and cell phone hybrid, not used for much more than to make telephone calls, send and receive emails, faxes, and pages, along with a few other features (Tweedie, 2015). However, as the technology improved, the devices shrank in size their use became more popular and service contracts became more financially affordable to the masses, users began finding more uses for smart devices. In particular, college students found them useful for M-learning. However, many educators were not as accepting to this new technology. Nevertheless, researchers (i.e., Matteson & Husher, 2012; Melton & Kendall, 2012) found that when used appropriately, mobile devices (smart phones) can enhance teaching and improve learning.

Later research reported that a significantly low percentage of faculty members in higher education use mobile devices as instructional tools (FTI Consulting, 2015; Harold, 2015). Previous studies (i.e. Jacob & Isaac, 2014; Matteson & Husher, 2012) have addressed both student and faculty perceptions and attitudes regarding usage of mobile devices in secondary and higher education. The motivation for this study was to see if there are significant differences in attitudes and utilization of smart mobile devices among four distinct variables and to determine if faculty members who under-utilized mobile technologies for teaching also held negative feelings toward smart mobile devices (smartphones). Whether in universities or community colleges, faculty attitudes, perceptions, and their utilization of mobile devices and mobile applications as instructional teaching and learning tools are critical variables in understanding the feasibility and possibilities of these tools to enhance teaching and improve learning (Jaschik & Lederman 2017; Lederman & McKenzie, 2017).

Having access to these mobile tools does not necessarily ensure that faculty use them for teaching and learning (Pearson Harris Pole, 2015; Seilhamer et al., 2018). Researchers (e.g. Chen et al., 2015; Jaschik & Lederman, 2017) indicated that higher education faculty lack professional development, training, resources, and confidence in the effectiveness of teaching and learning with mobile technologies. Some studies (e.g. Al-Emran et al., 2016; FTI Consulting, 2015; Harold, 2015; Marrs, 2013), have indicated that faculty may not use (smart) mobile devices because they doubt the effectiveness of technology-enabled learning and the motivations for it.

Following national studies on the increased use and ownership of mobile devices among college students, the Tennessee Board of Regents (TBR) and East Tennessee State University (ETSU) collaborated on a pilot study to examine mobile device use at ETSU. The pilot study led to a broader study that took a system-wide snapshot of student and faculty use of mobile devices at all of Tennessee's public universities, community colleges, and colleges of applied technology (Novak, 2014). It must be noted here that although Novak's name is listed as the principle investigator, her research is in collaboration with Robbie Melton of TBR. Both studies uncovered that the types of mobile devices students were bringing to campus were numerous and presented challenges for information systems and communication network personnel. The devices could be effective teaching and learning tools when used appropriately. However, there was a lack of faculty commitment to using mobile devices for instruction even as the cost for some decreased. Many campuses faced similar financial barriers and professional development training limitations, and some faculty members remarked upon their limited access to devices that had yet to own. Last, student and faculty satisfaction regarding the use of mobile devices did not match. Students wanted to use them but many professors barred smart devices in their classroom. Thus, students' use of smart mobile devices was met with conflict in more than a small number of cases. Melton and Novak's 2011 and 2014 results reflected similar findings of national Pearson Education Polls (2014/2015) studies and reports on teachers' opinions about using mobile devices, the feasibility of students and faculty usage of mobile devices and educational applications, how students and faculty use their mobile devices, barriers and challenges to using mobile technologies, and the need for faculty professional development.

Each found that students in higher education increasingly brought mobile devices to campus, brought more than one mobile device with them, and used them for communication and learning. In addition, each found that faculty owned devices such as smartphones and tablets but were reluctant to use them in the classroom in 2011. Melton and Novak (2014) reported an increased usage of mobile devices among students and faculty. Ownership of mobile devices increased rapidly as well as people's dependency on them and uses for them (PEW Research Center, 2017).

National studies (e.g. Pearson, 2014; PEW Research Center, 2015a; PEW Research Center, 2017) documented increases in mobile device personal use in households, PreK-12 school environments, as well as on college campuses. Jacob & Issac (2014) showed an increase in popularity in the use of mobile devices for mobile learning, as digital natives are comfortable using technology and innovative mobile devices. Almost half of all college students surveyed regularly used a tablet, and 8 in 10 college students regularly used smartphones in 2014, up from seven in 10 the previous year (Pearson Harris Poll, 2015).

Learners and teachers who process and forward information acquired using mobile devices and media, reinforce the platform's relevance, utility, significance, and enhances students' learning experiences (Al-Emran et al., 2016; Barry et al., 2015). The presence of mobile devices on higher education campuses significantly impacts how faculty and students communicate, collect, and connect information (Boruff & Storie, 2014).

Despite studies (e.g. Meishar-Tal, H., & Forkosh-Baruch, A., 2018; Nykvist, S.S., 2012) showing increasing numbers of students using mobile devices, there are still limited uses of these devices in the college classroom and a low rate of faculty members using them as instructional teaching and learning tools (Marrs, 2013). Higher education faculty appear unfavorable to using mobile technologies for teaching and learning (O'Bannon & Thomas, 2014). Tweed (2013) investigated whether the lack of implementation of mobile technologies in the classroom could be explained by the age of an educator, her years of teaching experience, quality of professional development and self-efficacy. According to Tweed, only the self-efficacy of teachers was significantly positively related to classroom technology use by teachers.

Professors have expressed concerns about the increased use of mobile media, citing a loss of control, more time commitment to preparation, and the possibility of information overload for students (Wu et al., 2013). However, students continue to bring their devices with them to campus and into the classroom even given limited usage of them in the college classroom and despite the small number of faculty utilizing mobile devices as instructional teaching and learning tools (Al-Emran et al., 2016).

Statement of the Problem

Smart mobile devices such as smartphones, tablets and mobile apps are ubiquitous and can be effective teaching tools for postsecondary educators (FTI Consulting, 2015; Harold, 2015; Marrs, 2013). Currently, over 90% of faculty members in higher education, including community college faculty members, have access to smart mobile devices and apps; but, since mobile and smart technologies have been on the market, only a small percentage of the instructors in higher education have used them as teaching tools devices (Pew Research Center, 2017). Thus, community college faculty members may be missing out on opportunities to enhance their teaching and workforce development curricula (Torrence, 2016).

The purpose of this study was to examine Tennessee community college full-time faculty's use of smart mobile devices, to determine if there were any significant differences in the mean scores measuring attitudes and use of smart mobile devices by generational age grouping, teaching discipline, rank, years of teaching and to determine if Tennessee community college faculty members who under-utilize mobile technologies for teaching also hold negative opinions about them. This study measured Tennessee Community College faculty use of smart mobile devices and their attitudes and use of smart mobile devices by generational age groups, teaching discipline, rank, and years of teaching.

Research Questions

The following research questions addressed faculty attitude and perception towards mobile devices and their use of them for education by examining whether or not there were significant differences in the mean scores of community college faculty use of smart mobile devices in regards to generational age group, academic rank, teaching discipline, years of teaching experience, and sex. The mean scores, referred to as dimensions, were measured against variables included on the survey instrument.

Research Question 1: Is there a significant difference in the mean scores on the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers)?

Research Question 2: Is there a significant difference in the mean scores of the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor)?

Research Question 3: Is there a significant difference in the mean scores on each of the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and "Other" (Business, Education, Workforce)?

Research Question 4: Is there a significant difference in the mean scores on the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more)?

Research Question 5: Is there a significant difference in the mean scores on the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey between male and female community college faculty members?

Significance of Study

There is a lack of data regarding community college faculty members' use of smart mobile devices and applications (Winston, 2013). The utilization of mobile devices and applications by faculty for instruction and content delivery in community colleges warrant further investigation. According to Melton and Novak (2011), Tennessee community college faculty, for example, tend to underuse mobile devices as instructional teaching and learning tools. National studies, that investigated universities, showed that faculty members tend to underuse mobile devices and applications in their curriculum (FTI Consulting, 2015; Harold, 2015; Marrs, 2013).

Relatively few empirical studies have focused exclusively on community college faculty use of mobile devices and mobile applications for teaching and learning. The few that have mentioned teachers at community colleges found that professors are often not fully using mobile devices as instructional teaching and learning tools (LearnED, 2015; Melton & Kendall 2012; Melton & Novak, 2014). There appears to be a gap in research on the use of mobile devices and applications by community college faculty for instruction and content delivery. Thus, investigations about community colleges and faculty use of technology for teaching, learning and workforce development warrants further study.

Definitions of Terms

The following defined terms are used throughout this study, and the definitions are provided to help understand the scope of it.

Applications: (Apps) A downloadable web-based or device-based program that provides access to information, content, gaming and allows users to perform tasks easier. (Melton & Novak, 2011).

Attitude: Disposition or flexibility toward the use of mobile devices and mobile device applications (FTI Consulting, 2015).

Digital Native: A person born or brought up during the age of digital technology, thus are familiar with computers and the Internet from an early age (Techopedia, n.d.).

e-Learning: The process that takes place on electronic digital and media tools, supported by mobile devices and wireless transmission, for the purpose of delivering educational content and learning activities over the Internet (Pinkwart, Hoppe, Milrad, & Perez, 2003).

Formal Use of Mobile Devices: Use of mobile devices for learning activities that are designed and implemented by the instructor of a class (Melton & Novak, 2011).

Informal Use of Mobile Devices: Use of mobile devices for learning that is not prompted by the teacher in the classroom. Informal use may occur at the will of the student inside or outside the classroom (Melton & Novak, 2011).

Mobile Applications: Computing applications for mobile devices of smartphones and tablets (Domingo & Garganté, 2016).

Smart Mobile Device: A handheld device, handheld computer or pocket-sized computing device, typically having a display screen with touch input and a miniature keyboard. Examples are smartphones (Apple, Android, Blackberry) iPad or other tablets and iPod Touch, (Melton & Kendal, 2012; Melton & Novak, 2011; Technopedia.com, n.d.).

Mobile Learning (M-learning): The use of Using a mobile device such as a tablet or smartphone to access study and learning materials and to communicate with peers, instructors or institutions. Mobile learning happens on-demand, anytime, anywhere (Ozdamli, F., & Cavus, N. 2011).

Mobile Tools: Mobile technology such as smartphones and tablets with multiple functions and capabilities which access the Internet.

Mobilization: The use of mobile devices for instructional

Personal Mobile Devices: Mobile devices that are owned by an individual rather than the institution (Melton & Kendal, 2012; Melton & Novak, 2011; Technopedia.com.com, n.d.).

Social Media: Via desktop computer, tablets and smartphones, this technology facilitates the sharing of ideas and information and the building of virtual networks and communities and offers users easy electronic communication of personal information and other content, such as videos and photos (investopedia.com, 2018; Pew Research Center, 2015b).

Tablet: A mobile computing device, larger than a phone, smaller than a laptop computer. It is used like a laptop but needs no keyboard because of its smartphone-like touch screen capabilities. However, a keyboard can be added as an attachment to help key in data (Melton & Kendal, 2012; Melton & Novak, 2011).

Delimitations and Limitations

Delimitations

This study is delimited to faculty members at three community colleges located in the Eastern, Middle, and Western divisions of the state of Tennessee. Delimiting this study to professors at these colleges limits the ability to generalize the results to the larger population of community colleges than the group under study. Though the results will be relevant and potentially useful to the target population it may be irrelevant to faculty and administrators at other community colleges. The results will be relevant and highly useful to the target population, they cannot necessarily be generalized to faculty and administrators at other community colleges.

Limitations

The survey limited respondents to choosing one academic teaching selection. Thus, if anyone teach more than one discipline, it will not be reflected in the study. Respondents will be limited to three community college academic teaching disciplines. Disciplines outside of the areas of social sciences, natural sciences, business, education, and earth sciences will not be reflected in this study. The survey was distributed with time constraints and have limited response categories, thereby limiting the range of responses. Respondents will not be able to ask clarifying questions and will be limited to the text in the survey itself. Closed-ended questions do not allow for explanations of respondents' answers.

Overview of the Study

This study is organized into five chapters. Chapter 1 contains an introduction to the study, context and history of the issue, statement of the problem, the significance of the study, definition of terms, and limitations and delimitations. A review of literature comprises Chapter 2. Chapter 3 contains the research methodology including research questions, population of the study, data collection, and the types of data analyses. The results of the study are provided in Chapter 4. Chapter 5 provides a summary of the findings, conclusions, and recommendations for further research and practice.

Chapter 2. Review of Literature

This literature review is organized into sections addressing aspects and issues regarding the use of smart mobile devices and applications by higher education educators. It is extensive in its reach of information to present a well-rounded perspective of higher education and its connection to mobile technology. The sections include: the history, impact, relevance of mobile devices and mobile learning; the adopters and adoptions of mobile devices and related utilities such as mobile apps; the connections made between professors use of mobile technologies and their students and workforce development; the relevance of a paradigm shift due to smart mobile devices; the meaningfulness of smart mobile devices in education and the challenges they bring; and, finally, faculty attitudes, smart mobile device use and professional development.

The literature includes a historical overview of professors' attitudes and perspectives regarding smart mobile devices. The literature indicates a paradigm shift and a real vs ideal use of mobile technology. Both have had some bearing on faculty attitudes and use of smart mobile devices and mobile applications as these began to gain credibility as teaching tools and regarded less as gadgets and distractions. Mobile applications, including social media apps, have become useful to some professors. Social media tools are low-cost or free for educators to implement. They can be used as collaborative element for the course and fostered a sense of community (Grant & Gikas, 2011). Social media as a teaching tool was perceived positively by some and negatively by other faculty; thus, as social media is relevant to this study, it is included in this literature review.

A salient issue is students' experiences with their professors' use and approach to mobile devices. Students stated their experience were not optimal. It was reported in an Educause study that "few faculty used technology for sophisticated learning tasks (e.g., engagement, creative thinking) and few asked students to use their own devices for in-class work" (Brooks & Pomerantz, 2017, p 5). Another issue was faculty use of smart mobile devices and their attitudes and perceptions of them. The review of literature for this research includes studies on the use of mobile smart devices among higher education faculty, particularly on faculty attitudes regarding the usage of smart mobile devices in teaching curriculum. Professors' attitudes and utilization of smart mobile devices were the most salient issues in the review of literature, as they are a main concern.

Weimer (2018) found that mobile and microchipped fast computing devices impacted teaching and learning, and the way higher education professionals interface with learners. This transformative modality of educating learners emerged as the wide-spread ownership and use of smart phones saturated the market and students and some educators began to use them for teaching and learning. The latter came not without some objections (Al-Emram, Elsherif, & Shaalan, 2016; Wallace, Clark, & White, 2012). Quantitative and qualitative studies showed differences in the attitudes of early adopting professors who embraced mobile learning and utilized smart mobile devices for instruction versus professors who rejected them or expressed some apprehension or reluctance in using them (i.e. Al-Emram, Elsherif, & Shaalan, 2016; Baran, 2014). Grant & Gikas (2011) provided some data regarding the usefulness of smart devices in instruction, while Kopcha's (2012) research addressed professor reluctance and rejection of smart mobile device use for instruction.

A Pearson Harris Poll (2015) study by education technology experts reported that higher education faculty under-utilized smart mobile devices for teaching and learning. Education technology experts Melton (2016) and Torrence (2016) reported trending research regarding faculty members' under-utilization of smart mobile devices at a Tennessee Board of Regents

Technology Think Tank: *Technology Innovations and Technology Transformation for Education Excellence.* Both remarked how some faculty wanted to use mobile devices such as laptops, tablets, and smart phones as instructional tools. However, many lacked the faculty development training to use them. On the other hand, some faculty who forbade the use of laptops and smart mobile devices in their classes. Tennessee colleges and universities reflected the national trend of little use of mobile devices in classes. Five years prior to the TBR Think Tank report, East Tennessee State University in collaboration with Tennessee Board of Regents included Tennessee community colleges in its mobilization study. The study revealed that like the national average, students' interest in using mobile devices, including laptops for education, increased at state supported community colleges and universities across the state of Tennessee (TBR 2011).

Because Tennessee professors were not using smart mobile devices in their curriculum, students were under-utilizing them in their instruction as well. Tennessee community college students reported wanting to use the devices they brought to campus with them and indicated that using their tablets would enhance their learning experiences. They also reported mixed opinions about the future use of mobile devices in the classroom (Novak, 2014). Melton (2016), a national leader in educational technology confirmed in a personal interview that the national trend still holds in Tennessee colleges and universities.

Ascertained from these studies is the fact that mobile devices have become a necessity in people's lives and are no longer considered just luxury gadgets, and according to Melton (2016), they have become indispensable tools for collecting information, as they have made their way into users' lives as tools of communication, leisure, instruction, teaching, learning, business, and workforce. Mobile devices serve multiple functions, as professionals, students, the retired, and everyone in between determines their use for them (Pew Research Center, 2018). Smart Mobile devices are ubiquitous in all areas of human life. They are game-changing information-acquiring and networking tools. They transform the lives of people their environments, as well as their experiences in their environments (Evans-Cowley, 2010; Smith 2011). Literature from various sources concluded that humans are more connected now than at any other time in human history (The Guardian, 2012; Heiser, 2016; StatCounter Global, 2016; Worldometers, 2017).

A Historical Perspective on Mobile Learning

In 1968, a decade before Apple produced its first machine, computer pioneer Alan Kay introduced "a children's computer" model he made from cardboard (Kay, 1972). Kay described a precursor to portable devices such as laptops, iPads, and tablets. At that time, Kay's conceptual learning medium was considered science fiction (Greelish, 2013). With drawings closely resembling the iPad and tablet PCs, Kay called his design a *Dynabook* (Children's Technology Review, 2009; Greelish, 2013). It was designed to be an interactive medium, more dynamic than a book, that encapsulated knowledge that could be controlled by children. The Dynabook was to be a tool, that children could control and manipulate their own learning, and according to their levels of maturity (Greelish, 2013; Kay, 1972).

Two decades later, Kay's "science fiction" emerged in the 1990s as advances in micro computer chips brought about more affordable, personal computers, leading to smaller and wireless devices such as personal digital assistants (PDAs) and mobile phones (The Dynabook of Alan Kay, n.d.; Greelish, 2013). The era of portable, affordable, increasingly mobile technology began and all-the-time communication and learning became reality. Today, these devices are owned by millions of people, and are used more frequently for a wide range of tasks, including pursuing higher education degrees, certificates, and workforce development training (Pew Research Center Research Center, 2018). Today, 95% of Americans own a cell phone of some kind and 70% of Americans own a smartphone, (Pew Research Center, 2018). Nearly six million of these mobile device owners took an online class in 2015 (Allen & Seaman, 2016). The significance of this three decades of background information is that a concept, once thought of as science fiction, has evolved into reality where people today are holding powerful, portable, and affordable micro computing devices that delivers knowledge on demand, on devices made for telecommunications.

Initial Response to Mobile Technologies in Higher Education

Articles and research such as The Harris Poll, (2015), Kopcha (2012), and Pearson Harris Poll (2015) mentioned that initially higher education professionals seemed reluctant to use smart mobile devices as teaching tools. Studies across the nation also concluded that higher education faculty were not fully using mobile devices and applications for instruction (Melton, 2016; Pearson Harris Poll, 2014, Pearson Harris Poll, 2015; Torrence, 2016). In an Online Learning In Higher Education: Impact on Learning Outcomes and Costs YouTube series, Susan Clemmons of Florida International University, advised in an interview on Institutional Policy that faculty and student buy-in is critical to the acceptance of using mobile and smart devices in educational curricula. However, according to Clemmons, the buy-in must be faculty-led, not administration led, otherwise faculty will not buy into it and faculty will push back (Danford, 2015a). Researchers reported some faculty wanted to use mobile devices such as laptops and tablets as instructional tools but had no faculty development training in how to effectively use them (Melton, 2016; Pearson Harris Poll, 2014; Pearson Harris Poll 2015). Clemmons noted that faculty may not be engaged in using mobile devices as teaching tools because they may be shown technologies but not shown how to use them. According to Clemmons, if faculty is only shown technologies but not given professional development training in how to use them then faculty may fall short of course outcome expectations of administrators (Danford 2015a). Some professors simply forbade students' use of mobile devices in their classes (Melton & Kendall, 2012; Torrence, 2016). According to Brooks and Pomerantz, (2017) faculty tended to prefer technologies that provided students with something, such as lecture capture, search tools, learning management systems (LMS), and "desired less technologies that required students to give something (e.g., social media, use of their own devices, in-class polling tools)" (P. 6). Students reported some faculty banned or discouraged the use of mobile devices, especially smartphones.

Researchers at East Tennessee State University conducted two studies commissioned by Tennessee Board of Regents that revealed learners wanted to use their mobile devices for education at state supported community colleges universities across the state of Tennessee (Novak, 2011; TBR, 2011, 2014). It was reported that Tennessee college students indicated mixed opinions about their use of mobile devices in the classroom because their instructors were not using them or had banned the use of them in the classroom (Novak, 2011). Community college students shared they wanted to use the devices they brought with them on campus, and indicated they believed that using mobile computing tablets would enhance their learning experiences. Just as the Pearson Harris Poll studies (2014; 2015) revealed, community college students in Tennessee said that they would like to use mobile technologies more often. However, they described that few of their professors utilized mobile devices (laptops and smartphones) in their curriculum (Novak, 2011; Pearson, 2015; TBR, 2011; 2014).

In 2014 the Tennessee Board of Regents conducted a comparison study of the 2011 ETSU pilot study. System-wide responses from public colleges and universities across the state of Tennessee where collected by the Emerging Technology Center at ETSU in 2014. The results of the 2014 study allowed for institutions to use their school's responses to mold strategic plans (Melton, 2016, personal interview). The research showed that students used laptops more in 2014 than they did in 2011. Faculty seemed to use fewer of everything than students: smartphones, laptops, tablets, iPads (Melton & Novak 2011). In 2011, faculty thoughts on using mobile technology to enhance learning was 58% positive, 12% negative and 31% gave a neutral response. By 2014, faculty positive responses increased to 73% and negative responses decreased by 2%. Students said they used mobile devices for classwork in 2011 and 2014, but said in the 2011 study that they thought their professors had not been trained to use mobile devices. Additionally, in 2014 both students and faculty thought professors had been trained; and ETSU's Emerging Technology Center reported both groups were more aware of educational apps (Melton & Novak,2014).

Researchers described mobile devices as "ubiquitous, necessary, and indispensable" tools for collecting information, having made their way into users' lives as tools of communication, leisure, instruction, teaching, learning, business, and workforce (Gikas & Grant, 2013; Pearson Harris Poll, 2014, 2015; Pew Research 2015a, 2017, 2018). Globally, mobile devices have exceeded desktops (StatCounter Global, 2016). Researchers Evans-Cowley (2010) and Smith (2011) both shared that smart mobile devices have become important information-acquiring, networking tools. Subsequent studies showed smart mobile devices allow more users to be connected now than at any other time in human history (Heiser, 2016; Worldometers, 2017).

Impact of Mobile Devices on Higher Education

The Pew Research Center (2018) reported that educators are among 77% of American adults who own smartphones. Pew and Pearson polls also showed that 90% of students and teachers own smartphones or other mobile devices, yet only 25% of educators use them for teaching and learning (Pearson Harris Poll, 2015; Pew, 2017). Over time, educators expressed uncertainty that smartphones and other mobile devices belong in the classroom and consider them gadgets and distractions, that take learners off-task, and force instructors to compete for attention (Earl, 2012; Kowalski, 2016; Lang, 2017; Weimer, 2018).

Mobile devices have critics and advocates for their place and use in classrooms (Weimer, 2018). Several researchers predicted that mobile technology will be a catalyst for change in education, despite the technical challenges they bring to campus networks, the classroom, and educators' concerns about distractions caused by mobile devices (Grant & Gikas, 2011; Mageau, 2011; O'Neil, 2013). Moreover, researchers indicated college students own several devices and that these devices are changing the nature of how, when, and where learners acquire knowledge, communicate with professors and collaborate with peers (Mirliss, 2014; Pearson Harris Poll, 2015; Pew Research 2018).

The usage of smart mobile devices for academic purposes increased in recent years, but challenges remain in implementing mobile technology in higher education. "These challenges include a disconnect between student and instructor views of mobile technologies, a lack of pedagogical support or training for instructors, and a lack of effective technical support for mobile learning," according to an online on mobile technology and education (Seilhamer et al., 2018).

Five phenomena in the review of literature stood out and motivated a deeper interest for the present study. Full mobility in education has rapidly approached and it is too late to turn back (Fuhrman, 2016). According to the literature, faculty are not adopting mobile devices as teaching tools as fast as students are demanding it (Fuhrman, 2016; Melton, 2016; Torrence, 2016). As most American adults are increasingly connected to the internet, students bring more smart mobile devices on campus with them, yet professors are not evolving with them (Danford, 2015b; Pearson Harris Poll, 2015; Pew Research, 2015, 2017, 2018; Winston, 2013). This will be the first generation of educators in human history whose students understand more about their learning tools than their teachers (Mageau, 2011; Winston, 2013). Last, education technology experts advised that when properly used, mobile devices can enhance teaching and improve learning (Melton & Kendall, 2012; Melton, 2016; Smith et al., 2011).

The Impact of Microprocessors on Higher Education

Microprocessors have changed the speed learner's access, send, and receive information and complete tasks, and have augmented educators' delivery of content and creation of academic content. They are teaching and learning tools that influence the speed of learning and the institution of education. If educators and learners are going to use them, then it is appropriate to understand just how significant something so small yet powerful impacts the enormous institution of education and workforce development (Torrence, 2016).

According to Pombriant (2013) and Schilling (2013), the processing speeds of microchips found in mobile devices such as smartphones, tablets, and laptops, that continue to shrink in size, and hypothesize that knowledge has gone from doubling every 25 years by the end of World War II to every two years by 2000. As technology advances, they postulate that human knowledge is on track to double every 12 hours by 2020 (Denning & Lewis, 2016; Lima, 2015; Pombriant, 2013). Some emerging technology experts differentiate human knowledge from artificial intelligence, stating that human knowledge is outpaced by computers, as the processors process and deliver information and can perform tasks much faster and more accurately than humans (Denning & Lewis, 2016; Lima, 2015; Pombriant, 2013). The latter has implications for teaching, learning and training in that educators will need to teach and train learners for jobs that are currently inexistent.

Emerging technology in general will generate new jobs, will force workers out of work, and will force workers to change jobs or retrain often to remain employed. It will also change how educators deliver and present learning material, that may impact what is taught (Chuayffet, 2018). Higher education professionals must first buy into using mobile technologies in their teaching curriculum according to Clemmons and Spear (Danford 2015a; 2015b). Interviewed for the same YouTube series as Clemmons and Spear, Robbie Melton of Tennessee Board of Regents shared that in 2014-2015, the laptop was the number one tool used for online teaching and learning. However, "students, in the future will pull out their phones to take a course online" (as cited in Danford, 2015c, 0:55). Their interviews with Danford (2015a; 2015b; 2015c) indicated that professors need to augment and adjust their teaching practices to remain current with educational technology tools, students' devices, to recruit and retain students, and to remain relevant in their respective fields and communities. Danford's interviewees' ideas were similar to Torrence's (2016) assessment regarding andragogy and the use of smart mobile devices for teaching and learning. It appeared that both bodies of work considered the job of higher education to be to educate and train learners to become proficient productive, well-prepared, employable citizens. According to Torrence, proficient use of computing devices in occupations is increasingly necessary. Practice using these tools professionally might begin in an academic setting or corporate trainings (2016).

Mobile devices are increasingly used to accommodate corporate training, workforce development, higher education teaching and learning, as they are tools used for learning and collaboration (Melton, 2016; Melton & Kendall, 2012; Torrence, 2016). These tools allow people of diverse status and experiences, teaching and learning levels to exchange human knowledge, collaborate in-depth and with greater breadth, faster than any other time in history (Schilling, 2013). In higher education, the microprocessor found in smartphones, tablets, and other mobile devices levels the learning playing field, allowing access to knowledge and training on demand (Melton, 2016; Torrence, 2016).

Mobile Device Relevance in Higher Education

eLearning initiatives make mobile device use relevant in higher education. These initiatives provide greater access for learners and "can contribute to increased enrollments and revenue, as well as enhance an institution's reputation and enrich the teaching and learning experience" (Bichsel, 2013). According to Bichsel, institutions offering two-year degree programs have lead in offering distance learning courses, attracting "post-traditional learners" (2013). In doing so, two-year institutions are likely to have a center dedicated to e-learning and offer significantly more online courses. As smart mobile device ownership and usage increases, learners might be in a position to take advantage of course offerings using their device (Danford, 2015c). Reliance on smartphones for online access to information is more common among younger adults, non-whites and lower-income Americans (Pew Research Center, 2017; Pew Research Center, 2018). The latter demographics are considered important in higher education (Melton, 2016; Torrence, 2016). To keep their door open and for institutions to stay relevant, colleges and universities should meet the needs of their learners, communities and industries by making educational content accessible (Danford, 2015b). The rapid growth in internet access "combined with the technical improvement of mobile devices and the development of dynamic learning content, has led to a great increase in the educational potential of information and communication technologies, notably in communities where books and schools are scarce"

(UNESCO, 2016, para. 3). However, major concerns about e-learning as noted by Bichsel (2013) have been the adequacy of staff and the technological skill set of faculty. Noticing the trend and significance of mobile device use in education as early as 2011, UNESCO experts provided insight into how mobile telephones could support teachers and their professional development while helping stakeholders share experiences and create international networks in this area (UNESCO, 2016).

Increasingly, students use mobile computing devices to handle their day-to-day operations and to complete tasks they had been doing on desktops, including school assignments, registering for courses, and taking online classes, and they are described as hyper-connected, – meaning they own 10 or more of these devices (Pew, 2017). Learners from these connected households arrive on campuses with at least three of their devices and they want to use them (Melton 2016; Torrence, 2016).

The ownership of "other" devices is equally noteworthy, as research showed early in 2017 that nearly 80% U.S. adults now own desktop or laptop computers; approximately one-half own tablet computers and around one-in-five own e-reader devices. As tools of information gathering they are pertinent to research and workforce development (Melton 2016; Torrence, 2016). Administrators generally agree that the use of these devices should be implemented into higher education curricula (Melton 2016; Torrence, 2016).

Tablet usage among college students for learning is increasing and many consider the devices a significant part of their college experience (Pearson Harris Poll, 2015). Seven in 10 students agreed that tablets help them study more efficiently and that tablets will replace textbooks; 52% of U.S. college students own tablets, up from 45% in 2014; in 2014, students were mostly likely to use laptops and smartphones every week for school, followed by tablet use (Pearson Harris Poll, 2015).

On a typical school day, three in four college students use a laptop for their school work. By contrast, two in five use a smartphone, while one in four uses a tablet (Pearson Harris Poll, 2015). Specifically, 73% use a laptop, 42% use a smartphone, 24% use a tablet, and 9% use a 2-in-1 hybrid, tablet or laptop combination (Pearson Harris Poll, 2015).

Pollara (2011) found that as capabilities of mobile phones improved, trends tended to show a consistent increase in mobile phone use and users worldwide. More recently it was determined that, 51.3% of all web visits originated from mobile and tablet devices worldwide compared to 48.7% of visits from traditional computing platforms (StatCounter Global Stats, 2016). In fact there was a constant increase of mobile device users worldwide from 2009 to 2016 with mobile and tablet devices accounting for 51.3% of internet usage worldwide in October 2016 (StatCounter Global Stats, 2016).

In the U.S. desktop machines accounted for 58% of web queries while mobile devices accounted for 42% (Heisler, 2016). However, this trend is reversed in emerging markets where mobile devices remain the primary point of Internet access for most individuals (Heisler, 2016). We are moving quickly into a decidedly mobile-oriented world, and it is happening rapidly (Heisler, 2016; StatCounter Global Stats, 2016).

What is clear is mobile computing devices are globally ubiquitous (Heisler, 2016; StatCounter Global Stats, 2016). They are increasingly used for communicating, training, teaching and learning. Thus, the prevalence and usage of mobile devices by diverse groups of people for various tasks makes a strong case for a legitimate reason for why they should be used in education (Melton, 2016; Torrence 2016).

Early Adopters in Higher Education

Seton Hall University acquired the distinction of being an early adopter of mobile technology in higher education. In 1996, the university provided a technologically advanced learning environment for students and faculty (Mirliss, 2014). The institution developed a strategic plan for an innovative mobile computing program which successfully addressed three interrelated components: access, student services, and curricular integration. The university's plan evolved as mobile technologies updated and its campus's technological needs grew. Seton Hall provided a campus IT infrastructure that could accommodate all devices and any cellular carriers (offering campus stakeholders with a device and carrier agnostic campus) making engagement and usability highly possible and providing for everyone. Thus, Bring Your Own Device (BYOD) was an early reality for Seton Hall. The lesson learned from this early adopter was that strategic planning is key to mobile device implementation to ensure positive deliverable results (Mirliss, 2014). Seton Hall has the distinction of being the first institution of higher learning in the U.S. to use Windows 8 PC tablets. And, the implementation of these mobile devices in Seton Hall classrooms affected positive outcomes (Global Learning Series, 2012). In a Global Learning Series televised interview, John Shannon, of Stillman School of Business said of Seton Hall's tablets initiative:

> [It provides] students with access to information that previous generations would not have been able to get to quickly or easily. It allows for them to engage in their learning in a much more deeper fashion than they would have even five years ago. [It] provides a rich learning experience for students, allowing them to engage in content, to collaborate with their peers, and survive in an always on environment. The students that are most flexible, most adaptable, the most creative, are going to

> be the ones to win the race when they launch their careers. I believe the tablets will give them another platform that will help them develop that flexibility, adaptability, and creativity (Runtime: 46–1:20)

Both Shannon (2012) and Mirliss (2014) indicated that when implementing mobile devices strategically and appropriately, those tools can enhance teaching and improve learning.

National Impact of Mobile Devices

The 2014 and 2015 Pearson Harris Poll Harris Poll College Student Mobile Surveys revealed U.S. college students were most likely to use laptops and smartphones for school on a weekly basis. Smartphone use is not surprising given that smartphone users were predicted to reach 2 billion by 2015 (Srivastava, 2014). The 2015 study also showed that tablet purchases and students' use of them increased from 2014 (Pearson Harris Poll, 2015). Seven in 10 students agreed in the 2015 Pearson Harris Poll study that tablets helped them study more efficiently and thought the devices would replace textbooks in five years. Supporting the claim that mobile device use was increasing and doing so rapidly, the Harris Poll showed that 52% of U.S. college students owned tablets in 2015, up from 45% in 2014 (Pearson Harris Poll, 2015). The availability of mobile devices on campuses influences all aspects of college learning. For example, online learning is the fastest-growing industries in education technology (Smith, 2015). Much of online learning takes place using a mobile device, as desktops are now surpassed by smartphones, tablets and laptops (Pew, 2015, 2017).

Mobile Device Impact on Higher Education

Danford (2015b) showed that use of mobile devices in teaching and learning spaces is important for student success and continues to help degree programs stay relevant. Mobile devices help learners access educational content and learn on-demand, on their terms and in their language. Thus, the trend of mobile learning is garnering higher education institutions' undivided attention (Danford, 2015c). Educators understand how mobile technology and mobile learning impressively influence revenue and student retention for higher education institutions across the nation (Danford, 2015c). Smith (2015) predicted that by 2020 the global mobile-learning market was on track to reach $37.8 billion and that by 2019, one-half of all college students will be enrolled in online courses. It is predicted that this type of revenue generating might incentivize more faculty to evolve and go where their students are headed, using those tools that everyone brings with them on campus. Students increasingly purchase mobile devices for use in online classes. Some educators mentioned that tapping into online revenue generating ventures and using smart mobile devices is beneficial to higher education institutions as state funding for education decrease (Danford, 2015b).

The numbers of online enrollment and revenue generate from it suggests that eLearning is big business. The global eLearning industry market was projected to reach $107 billion by 2015, with self-paced eLearning market revenues reaching an estimate of $49.9 billion (Pappas, 2015). Worldwide, the mobile learning market (products to access learning content using mobile devices such as smart phones, laptops and tablets) reached $5.3 billion in 2012, was estimated to reach $8.7 billion in 2015, and $12.2 billion by 2017 (Pappas, 2015). McCue (2018) confirmed that the market research firm Global Industry Analysts were correct in their prediction of eLearning reaching $107 billion in 2015. The firm, in 2018, predicted that eLearning will grow to $325 billion by 2025 (McCue, 2018). The number of online students increased to over 6 million in 2017, and enrollment growth is increasing (Online Learning Consortium, 2017). In the U.S., one in four students were enrolled in online courses in 2015 (Online Learning Consortium, 2016). By 2018, learners had become so comfortable communicating through technology and learning without going to campus for class, that growth in online learning outpaced total enrollment growth (State of Oregon Employment Department, 2018). Accordingly, The National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) reported that over 70% percent of all public degree-granted institutions offered online courses in 2018 (as cited in The State of Oregon Employment Department, 2018). There appears to have been a trend of increasing online enrollment as over-all enrollments for on-ground class decreased in higher education (Online Learning Consortium, 2016). In the 2016 Online Learning Consortium blog, Kathleen Ives called it an important shift in American higher education and noted, that most academic leaders concede this and understand online learning is critical to their institution's long-term strategy. Administrators across the United States appeared to agree it would be in the best interest of higher education institutions to have all their stakeholders onboard with a strategic plan to implement mobile devices and mobile learning (Danford, 2015a; Danford, 2015b; Danford, 2015c; Melton, 2016). Students perceptions of mobile devices indicated that mobile devices provide interactive, media-rich, and exciting new environments in which to learn (Montrieux, Vanderlinde, Schellens, & Marez, 2015). A few short years ago E-learning initiatives were considered ubiquitous in higher education (Bichsel, 2013). They have become mandatory for the survival of higher education institutions in the wake of COVID-19, Coronavirus pandemic in the year 2020. Higher education institutions are compelled to ready themselves for a "different kind of teaching" in Fall 2020, and "will need to deliver a better learning experience if they want skeptical students to return" (McMurtrie, 2020). The worry now of college presidents may be in keeping their institution doors open and avoiding economic ruin because students may not be able to return to campus for Fall 2020 (Tierney, 2020).

Connection Between College Courses, Workforce, and Mobile Technology

There are benefits to drawing connections between college courses, the workforce, and the use of mobile technology in teaching and learning. Smith's 2015 e-learning infographic showed that online classes tended to be 25% to 60% shorter than traditional, instructor-led classes and that course duration was important to students who held job-readiness concerns. Important to employers was that companies increased revenue by 26% when employees participated in distance learning and training.

Additionally, technology use in college courses boosts students' confidence in their job prospects (Conlan, 2016). A 2016 McGraw-Hill Workforce Readiness survey result showed that almost nine out of 10, or 89% of students used study technology at least occasionally. Study Technology was defined as any digital or online program or application that allows students to learn classroom concepts (McGraw-Hill, 2016). McGraw-Hill reported in their job-readiness study: 1) 65% of business and economic majors and 61% STEM majors most frequently used study technology, while only one-half of arts and humanities majors used them. 2) 85% of respondents agreed that, the frequent use of technology in their coursework would make them a stronger candidate for employment, up 5% from the previous year (p. 20).

The 2016 McGraw-Hill study appeared to contradict other studies on college faculty use of mobile technology. According to the study, students' overall satisfaction regarding technology usage in their degree programs, and that students were satisfied with how and to what degree their professors used technology in courses. In previous studies faculty nonuse of mobile devices for instructional use were more of the norm and that students were not overall satisfied about faculty use of technology in their college courses (Pearson Harris Poll, 2015). Students in the McGraw-Hill (2016) study indicated using mobile technologies made them feel more job or career-ready, however in other research studies students shared that their professors under-utilized them in the curriculum as part of a lesson or activity (Melton & Kendall, 2012; Pearson Harris Poll, 2014; Pearson Harris Poll, 2015). Consistently, the literature indicated that teacher attitudes, perceptions, and beliefs ought to be considered for why faculty under-use mobile devices (Danford, 2015c; Kopcha, 2012; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010).

Student-centered, technology-driven instruction have been elusive according to education experts (Danford, 2015a, 2015b, 2015c). Professors have been slow to transform how they teach, despite the massive influx of new technology into their teaching environments (Danford, 2015a, 2015b, 2015c; Torrence, 2016). Educators' hesitation about adopting mobile computing devices is evident in their attitudes and inactions, according to some administrators and ed-tech experts (Danford, 2015a, 2015b, 2015c). However, education technology experts insist that mobile devices when used appropriately can improve academic achievement of learners and alter how teachers teach.

Technology and education are interdependent and culturally significant as each rely on the other to advance equity in learning (Thomas, 2016). As microchips enable people to carry small, yet powerful computing devices with ease and convenience, more of them are brought on college campuses by students (Intel, n.d.). The technology in smart phones brings education one step closer to providing greater equity of access and all-the-time learning, everywhere, possible (Thomas, 2016). The accelerating power of mobile technologies (particularly, smart phones) commands a powerful place in education where learners and educators can communicate, process, forward, and reinforce information on-demand no matter their geographical location (Kurzweil Education, n.d.**).** Students use their smart phones for mobile learning, completing writing and other assignments, including content creations, contacting and interacting with professors and classmates, and now in the era of the COVID-19 pandemic, they are using them to virtually meet with their on-ground classes using Zoom conferencing tool, which has relaxed some of its meeting time constraints for education institutions (Gikas & Grant, 2013; Zoom, 2020).

Smart phones have become ubiquitously for most Americans (PEW, 2018). They are tools used for mobile learning, which has become an important component of education technology (Al-Emran et al., 2013). Students use them to participate in M-learning, where they collaborate and share ideas among each other (Al-Emran et al., 2013). They perform here-and-now authentic activities in the context of their learning (Martin & Ertzberger, 2013). Regarding these observations, researchers (i.e. Smith, 2015; UNESCO, 2016) have made the case that when used appropriately, mobile devices and mobile apps can enhance teaching and improve learning.

However, convincing some faculty members to use mobile devices as instructional tools remains challenging if they have negative attitudes and perspectives regarding the use of smart mobile devices in their curriculum (Jaschik & Lederman, 2017; Melton 2016; Melton & Kendall, 2012; Shraim & Crompton, 2015). Some factors hindering educators' adoption of mobile learning include perceived usefulness, ease of use, digital literacy, anxiety, and teaching self-efficacy (Callum et al., 2014). Several of these factors (particularly, perception) regarding things that influence teachers' motivations and intentions to integrate digital literacy were also observed by Sadaf & Gezer (2020).

As noted in several studies (i.e. , Jaschik & Lederman, 2017; Melton 2016; Melton & Kendall, 2012; Pollara, 2011; Shraim & Crompton, 2015) getting faculty to use mobile devices as instructional tools can prove challenging if they have negative attitudes and perspectives about using mobile technology in their curriculum. Danford (2015a; 2015b) also noted that the problem of negative attitudes may exist if faculty reject students' use of mobile devices in their classroom or when they may feel overwhelmed by the technologies.

Kopcha (2012), Melton (2016) and Ottenbreit-Leftwich et al., (2010) as well as multiple interviewees in Danford's *Online Learning in Higher Education* series discussed the importance of teachers and students having positive attitudes, open to innovative-thinking and shared growth in education. In the current mobile and emerging technological world, adaptability is important for education and in the workforce (Danford, 2015b; McGraw-Hill, 2016). Every three years, new devices and technology upgrades become necessary, and in some cases, devices and program applications become obsolete altogether (Danford, 2015c; Melton, 2016).

Paradigm Shift in Higher Education

The internet, wireless technologies, and use of mobile devices in higher education have become a game changer, as they have caused paradigm shifts in education (Jacob & Issac, 2017). The revolutionary concept of mobile learning (commonly called m-learning) for higher education is a direct result of the broad use of the Internet and wireless technologies. Mobile technology and m-learning has augmented the way educational content is delivered, how it is taught, and how it is consumed (Jacob & Issac, 2017). For example, Massive Open Online Courses (MOOCs) and for-credit online courses offer higher education another way to deliver content to increasingly more learners (Shah, 2016). The first MOOC was taught at Stanford University in 2011, and had expanded its reach to 58 million students and included more than 700 universities, and 6850 courses by 2016 (Shah, 2016).

Students seemed more in favor of mobile devices and online learning than their professors. Though online college courses filled with learners, consistently, enthusiasm for online and mobile learning was not mutual. The Online Learning Consortium (2016) reported that one in four students were enrolled in online courses and that online enrollment was up, while faculty confidence in the courses was down. Online learning was growing, but support from higher education institutions had dropped (Online Learning Consortium, 2016). Regardless of faculty disposition about online learning, students' desires and needs for alternative content delivery did not waiver. In fact, enrollment in online classes increased. Allen and Seaman (2016) reported an inverse relationship between dwindling higher education enrollment and soaring online enrollments and that the number of students taking online courses grew to 5.8 million nationally, over a period of 13 years. The trend indicated that contemporary learners turned to online learning options.

Faculty members had become less confident in online programs (Allen & Seaman, 2016). Over 29% of chief academic officers said their faculty members accept the value and legitimacy of online education (Allen & Seaman, 2016). Moreover, the number of academic leaders who regard online learning as critical to their long-term strategies dropped 7.5%, from 70.8 % in 2015 to 63.3% in 2016 (Allen & Seaman, 2016).

The shift happened as lifestyle changes dictated how and when students can take college courses and how and when students opted to learn. Online courses and programs and mobile devices made it convenient for learners, especially for learners older than 25 with busy work schedules to take courses (Crompton, 2013; Danford, 2015b). Increasingly, learners chose online courses (Online Learning Consortium, 2016). Danford (2015c) asserted that institutions needed to offer more online courses to remain competitive, viable and sustainable.

Mobile devices provide a way for learners to be taught differently than in any other century (Danford, 2015c, Melton, 2016). Millennial students want their learning content in their hands, on their respective devices. The Millennial learner pioneered this paradigm shift in education. Now, learning no longer takes place in the vacuum of a brick and mortar classroom (United States Department of Education Office of Technology, 2016). Students have unrestricted access to learning resources by Wi-Fi, hotspots, or anywhere there is internet access (Jacob & Issac, 2017). University students connected to their technologies made learning over Wi-Fi and broadband-enabled mobile devices attractive because that mode of accessing educational content popularized boundaryless learning (Jacob & Issac, 2014). According to (Trust, 2017), the International Society for Technology in Education (ISTE) recognized mobile education trends within the teaching and learning community then focused on using technology to support student learning, creativity, and to promote and model digital citizenship, professional growth and leadership. Educators who were first adopters of this paradigm shift in education readied themselves for boundary-less teaching, and tested out a number of digital resources, websites, ed-tech tool that fostered many avenues for learning. Technology has advanced tremendously, and expansion of access and improvement of internet connectivity can allow for educators to shift their focus from teaching with technology to using technology to learn, collaborate, lead and empower students. This is now the focus of ISTE (Trust, 2017).

Although many educators are among the 77% of American adults who own smartphones, research shows that they are still under-utilizing mobile technologies (Pew Research Center, 2018; Melton & Kendall, 2012; Weimer, 2018). Ninety percent of students and teachers own smartphones or other mobile devices, yet only 25% of both use them for teaching and learning (Pew Research Center, 2017; Pew Research Center, 2015; Pearson Harris Poll, 2015). Many educators seem unsure that cell phones and other mobile devices belong in the classroom and believe them to be distractions, taking learners off-task, and leaving teachers to compete for attention (Earl, 2012; Kowalski, 2016; Lang, 2017; Weimer, 2018).

Mobile devices are omnipresent and have critics and advocates for their place and usage in classrooms (Weimer, 2018). For example, everyone has access to instant knowledge anywhere and on-demand (Melton 2016). Improvements in the microchips make the devices more powerful and faster in accessing and process information (Yu & Conway, 2012). Studies described smart phones as ubiquitous, easily accessible to the masses, thus, more people are familiar with using them (Bennett, & Bauer, 2015). Researchers also remarked upon an increased usage of smart mobile devices by undergraduate students (Reese Bomhold, 2013). Researchers such as Grant and Gikas, (2011), Mageau (2011), and O'Neil (2013) each predicted that mobile technology would be a catalyst for change in education, despite the technical challenges they bring to campus and educators' concerns about the distractions they believed were caused by mobile devices. Moreover, research by Mageau (2011), Mirliss (2014), Pearson Harris Poll (2015), and Pew Research Center (2018) indicated that college students own and bring to campus several devices and that these devices are changing the nature of how, when, and where they acquire information, communicate with professors and collaborate with peers.

The adjective *ubiquitous* almost always used to describe laptops, smartphones, and tablets as evident in Bennett and Bauer (2015) Chen, Seilhamer, Jacob and Issac (2017), and Gikas and Grant (2013). Research by Lyytinen and Yoo (2002) and Smith (2015) noted that mobile devices support, mediate and organize daily activities. Chen et al. (2017) and Pearson Harris Polls (2014; 2015) acknowledged that college students value mobile technology so much that they carry multiple devices to campus with them. Studies by Jacob and Issac (2017) Melton

(2016) Melton and Kendall (2012) Sharples et al. (2009) mentioned that smart mobile devices are tools for collaboration, teaching, and learning as well as workforce development.

A top concern for campuses nationwide was to help professors use mobile technology (Fabis, 2015). Winston (2015) found that information technology departments nationwide shared the goal of helping faculty move smoothly into the digital age of learning. However, Fabris (2015) found that although professors know about high-tech teaching methods few use them. In Fabris's study, 40% of the professors surveyed were interested in using innovative techniques and technologies, however, only 20% had actually used them. In fact, one in four professors surveyed in a 2018 Campus Technology study banned cell phone use in their classroom (Kelly, 2018).

This paradigm shift brought about causes for concern for faculty. Seilhamer et al. (2018) reported that faculty required training and support to use mobile technology for instruction; and they feared embarrassing themselves in front of students. Seilhamer et al. also reported that faculty viewed mobile devices as potentially distracting. Their study found that nearly half of the instructors felt mobile devices benefited learning, although they expressed concern about them causing distractions, and discouraged or banned smartphone use in the classroom (Seilhamer et al., 2018). Winston (2013) noted growing concerns about the dependence upon mobile devices, the skill set of faculty members to use and integrate them in class, and concerns about the effectiveness of information technology spending. Another concern for campuses was the strain mobile devices were putting on their existing network given the need to upgrade their network systems to accommodate all the devices being brought on campuses (O'Neal, 2013).

Ideal vs Real Use of Smart Mobile Technology

What faculty say they do and what they actually do may not always match. Ideally, the implementation of smart mobile technology in curricula would be suitable as well as the practice of using them as normal tools of a course. The technologies would blend in and at some point, and become as common as the chalkboard once was. Instead, they are retrofitted in courses, in some cases, so that a box could be checked off to indicate or imply that some form of technology was used to teach or deliver a lesson. However, effective usage of smart mobile technologies still finds some resistance in higher education (Seilhamer et al., 2018).

What is ideal in a course is technology use that promotes student-centered learning, emphasizes authentic experiences, promotes problem solving skills, encourages active learning, enables students to achieve higher levels of thinking, supports collaboration, builds relationships among students and teachers, and results in the creation of new products (Ottenbreit-Leftwich et al., 2010). Faculty may advocate the use of technology in teaching and learning and may want to see their students benefit from it. However, the reality is most teachers use technology to complete administrative and communication tasks (email, for example) rather than to facilitate student learning (Ottenbreit-Leftwich et al., 2010).

Ideally, getting faculty to embrace mobile technologies so that they might 1) teach students to use them appropriately in class; 2) create innovative activities; 3) encourage students to use social media for collaborative class assignments and activities; 4) engage students; and 5) help prepare students for future employment, would be optimal (Al-Emran et al., 2016). Students and faculty that use mobile devices can save time in research, access information faster; teachers can use them to prepare lessons efficiently, communicate with and know the progress of their students (Morison, 2018).

Mobile learning initiatives in teaching practices were slow to start (Crompton, 2013). The perceived time and work it takes to change their teaching style to accommodate mobile learning is unappealing to some educators. Thus, teacher-perceived challenges and attitudes about the imposition or additional time-consuming work, among other concerns, limits both the adoption of mobile learning and mobile device use in curricula (Crompton 2013; Melton 2016). Although many educators say they are using mobile technology, they may not be using mobile devices vigorously or proficiently in their teaching fields (Al-Emran et al., 2016).

According to GoodWorksLabs (2015), mobile devices, including smartphones provide a better and more engaging way of imparting education. Newer avenues of teaching and learning are opening up through mobile apps. The company predicted mobile apps might be changing the traditional way of going to school or doing away with bringing books by mobile tablets and iPads. Mobile devices and apps have had a substantial impact on the education industry (GoodWorkLabs, 2015). According to Resilient Educator (2020), the education industry is being revolutionized everyday by innovations in mobile apps catering specifically this industry as well as the workforce.

Students readily expressed how digital or mobile technology impacted them in education. A higher education survey on the impact of mobile apps on education showed that 81% of students stated they used mobile devices to study; 77% said adaptive technology had helped them; 62% stated that technology helped them better prepared for classes, and 48% state technology helped save them time.

Smart Mobile Devices and Apps as Teaching Tools in Higher Education

In higher education, learners and educators communicate, process, forward, and reinforce information (Bowen et al., 2013). In fact, mobile devices have sparked an educational revolution in higher education. Mageau (2011) predicted that mobile devices would in the next decade become an unstoppable change agent in education. Mageau's prediction is reinforced by literature and research from Danford (2014), Melton (2016), and Torrence (2016). College students might understand these tools but they do not seem to know how to use them for educational purposes and their professors do not seem to know how either (Melton, 2016; Torrence 2016). It appears, students are using mobile devices in higher education, but not necessarily academically (Mageau, 2011; Torrence 2016).

Because of the commonality of mobile devices, owners increasingly depend on them for personal, educational, and professional needs (Mageau, 2011; Walters, 2011). There is an intertwining connectivity with everything and the institution of education is inherently impacted by the cultural transition taking place by technology (Mageau, 2011; Sharples et al., 2009). Since 2010, mobile phones have increasingly become essential to people in their everyday lives (Farley et al., 2015). Pew Research Center Research Center data revealed steady increases in mobile device use and ownership from 2002-2017 in the United States. As cell and smartphone devices increased in use and ownership, so did dependency upon them, and eventually the possession of those devices surpassed laptops and tablets (even desktops) by 2017.

Smart mobile devices allow users of various backgrounds and experiences to exchange knowledge and collaborate more in-depth and with greater breadth and faster than ever before in history (Danford, 2014). The Internet, and by default, some of its tools, i.e., Wikipedia, and social media allows readers to see the intricate nature of human knowledge and human interdependence, function as a network (Lima, 2015). The internet and (smart) mobile technologies are powerful and their benefits go beyond just making our work efficient. Smart mobile devices can increase productivity and help teachers achieve greater results in teaching curricula (Adeboye, 2016).

Mobile technology can be integrated into course design and assessment and used to integrate strategies of motivation and engagement; however, educators tend to use familiar technology to make them efficient and not necessarily effective by using it as learning currency (Adeboye, 2016; Alexander et al., 2019). The creativity of the user can determine the limitations or successes of mobile technology in a course (Adeboye, 2016; Alexander et al., 2019). Adeboye (2016) discussed five effective ways for teaching with smart mobile devices that would make effective use of mobile technology in the classroom. Audio recordings, live polling & quizzing, video creation, and quick response (QR) codes, engage students, emphasizes critical points, allows professors to assess early students' strengths and weaknesses, and increases understanding of concepts.

Mobile Apps as Teaching Resource Tools

According to GoodWorksLab (2015), mobile apps can be effective teaching tools as well as beneficial to the education industry. Five key benefits of mobile apps for the education industry per GoodWorksLab. Apps provide 1) a range of learning options –From language learning apps to Google Earth for geography or entire course programs on iTunes U. The options available for learner right on their smartphone or tablet extends to every discipline on college campuses. 2) There is easy access to knowledge and administrative resources via apps through learning management Systems and e-learning apps which concentrate on providing a visually lasting way of designing educational courses. 3) Apps offer learning without boundaries**,** making learning possible for a smartphone user anywhere, at any speed, at any time. 4) Collaboration between students, teachers and parents is possible via innovative apps like *Attendance* and *TeacherKit* that keep track of various aspects like performance assessment, grade records or attendance. Tools like *Dropbox* and *Evernote* facilitate seamless collaboration between teachers, students and parents and 5) Apps can improve engagement of students with tools such as *Science 360*, that help students learn from audio-visual media and have long-lasting memory of many types of sciences. Apps using audio-visual tools tend to help students retain science concepts better than textbooks. Another example are polling apps that get real-time feedback from users.

GoodWorksLab (2015) specifically addressed students' use of mobile technology for education. However, though students want to use mobile technologies more for education, research shows that few college professors do. Much of the research concerning faculty usage of mobile devices cover four-year institutions. There still appears to be a gap in research on faculty's usage of smart mobile devices at two-year institutions, though the usage of web 2.0 and social media platforms seem be increasing for pedagogy (Gikas & Grant, 2013). Web 2.0 and social media networks such as Facebook and Twitter have become channels of communication in helping to create collaborative learning communities/environments (Teaching with Social Media, 2017). How community college professors are using them is not that easy to determine. Hence, information about the challenges they face when trying to use them is lacking as well.

Instructors may use their social media apps to access and use social media as a teaching tool, but they also have concerns about privacy, accessibility, and equity (Teaching with Social Media, 2017). University of California at Berkeley has established guidelines for the use of social media as an instructional tool (Teaching with Social Media, 2017).

In 2011, TBR's Office of Academic Affairs Mobilization/eLearning, sponsored a study at East Tennessee State University (ETSU) to track students' and higher education faculty members' usage of mobile devices. The result was a snapshot of how both groups used mobile devices and computer applications. After the 2011 pilot study that measured only mobile device usage at ETSU, TBR broadened the scope of the study to gather a system-wide view of the phenomena. In 2014, TBR commissioned ETSU's Emerging Technology Center within the Computer and Information Sciences Department to survey Tennessee public colleges and universities that are under the Board's governance. On the campuses that chose to participate in the study separate surveys where distributed: one for faculty and the other for students (Emerging Technology Center, 2014). The intent of the study was to determine attitudes towards, and feasibility of, students and educators using mobile devices and educational applications (apps) for teaching (Novak, 2011).

The faculty survey used by Novak (2011) determined what mobile devices faculty possessed and used, how they used them (in and outside of the classroom), and their perceptions and attitudes towards mobile devices. Participating institutions were encouraged to use their school's results to develop strategic plans for professional development training of faculty, so that they might use mobile devices and apps in their curriculum, if they had not already started (Melton & Kendal 2011). Results of the mobilization studies found that despite the rapid growth of mobile technology use on campuses, very few teachers were utilizing mobile devices in their curricula (Melton & Novak, 2011; 2014).

Both students and faculty indicated that mobile devices were not being used in class because they believed mobile devices were distracting and promoted cheating (Novak, 2011). Faculty also indicated technological and financial disadvantages for some students (Novak, 2011). The study also revealed that some faculty did not own devices such as laptops and smartphones. Realizing that they could benefit from using certain mobile devices, applications, and services, most faculty (91%) were willing to attend training on mobile devices and apps (Novak, 2011). Students also indicated that the believed their professor had not been trained to use mobile devices as a teaching tool, with 58% either agreeing or strongly agreeing (Novak, 2011).

Smart Mobile Devices and Apps Teaching Resources for Postsecondary Education Teaching Disciplines

Several Researchers suggested that considering categorical classification of disciplines might be useful when developing curriculum designs, and teaching disciplines might be a logical area to check to discern which ones are using mobile devices and mobile apps effectively and frequently (Adeboye, 2016; Alexander et al., 2019; Goel, 2010). Biglan (1973b) classified and categorized a long list of teaching disciplines, and app curation sites such as www.appapedia.org and www.eduappcenter.com makes searching for discipline specific applications easier to find. Using Biglan's model, a well-rounded curriculum should ideally expose students to an array of categories of disciplines, familiarizing them to context, thinking approaches, professional concerns, design goals, research questions, and research approaches of diversified disciplines (Goel, 2010). Perhaps, it is here where the creativity of an app user (in this case, the professor or curriculum designer) can determine limitations or successes of mobile technology in a course (Adeboye, 2016; Alexander et al., 2019). These devices can be used to integrate strategies of motivation and engagement.

Biglan (1973a) classified academic disciplines along three dimensions, each broadly classified into two categories – hard vs soft, pure vs applied, and life vs non-life. The hard-pure disciplines rely more on linear logic, facts, and ideas whereas soft-pure disciplines take a holistic approach, and rely more on the breadth of intellectual ideas, creativity and expression. The hard-applied disciplines focus on problem solving and application of knowledge to create products and techniques, and are concerned with mastery of physical environment. Soft-applied disciplines focus on personal growth, reflective practice, and lifelong learning to create protocols and procedures, and are concerned with enhancement of professional practice.

Challenges of Using Smart Mobile Devices and Apps as Teaching Tools in Postsecondary Education

Mobile Technologies have triggered waves of change in higher education and with change come challenges. The paramount challenge of getting professors to use mobile devices and applications is getting them to change their negative attitudes about them (Melton & Kendall, 2012). Other researchers have also found that professors' beliefs and attitudes play a role in whether they use mobile devices or not, as well as how they use technology in general instructional practices (Al-Emran et al., 2016; Lederman & McKenzie, 2017; Melton & Novak, 2011). Studies addressed the importance of teachers and students having attitudes conducive to innovative-thinking and shared growth in education (Danford, 2015c). Professors who did not believe mobile devices were conducive to learning and who felt mobile devices hindered their flow in teaching, tended not to want to use them, banned students' use of them in class and labeled mobile devices as "distractions." (Al-Emran et al., 2016; Lederman & McKenzie, 2017). Faculty members' perceptions of mobile devices in Tennessee community colleges were not unique. Their perceptions were indicative of national trends observed in many studies (The Harris Poll, 2015; Kopcha, 2012; Melton, 2016; Melton & Kendall, 2012; Pearson Harris Poll, 2014; Pearson Harris Poll, 2015). Faculty perceptions tended to focus around perceived usefulness, enjoyment, anxiety, self-efficacy, concerns about distractions, cheating, losing control of the class, policies for use of them in the classroom, faculty development training for using the devices, knowledge of and how to use mobile applications, the cost of devices, and whether faculty cared to use them for instructional purposes (Benham, & Carvalho, 2016; Tweed, 2013).

Perceived benefits or barriers and negative feelings regarding mobile technologies tended to influence faculty behaviors and whether they accepted, delayed or rejected the implementation of mobile devices and mobile applications. (Bayless et al., 2013; Ottenbreit-Leftwich, Glazewski et al., 2010). Empirical barriers as noted by administrators and faculty members included strained budgets, high workloads, IT infrastructure, network security, costs, the constant need for training (Mbabazi et al., 2018). Some institutional steak-holders considered mobile devices as an added burden. The physical and mental barriers contributed to the use or non-use or delayed use of mobile technology for instructional and in content delivery (Mbabazi, Ali, Geoffrey, & Lawrence, 2018).

Various studies mentioned the same or similar challenges regarding faculty members under-utilization of mobile technologies. The list of challenges included the following: lack of skills and knowledge of how to implement mobile devices in curriculum, learning, lack of incentives to implement mobile technologies, apathy of administrators and faculty regarding the use of smart mobile devices such as smart phones, aging network infrastructure, lack of IT support to keep pace with mobile devices being brought on campus (Campus Computing Survey, 2016; Kopcha, 2012; Mbabazi et al., 2018). Additionally, several interviewees in Danford's (2015d) Online Learning videos series discussed barriers, perceived and real, that affect the adoption of online learning in higher education institutions. High on the list of factors thought to hinder the adoption of mobile and smart devices are negative attitudes and perceptions towards using mobile and smart technologies, the lack of professional development training, and the lack of faculty buy-in and engagement. One administrator specifically identified as the number one challenge to faculty buy-in was their negative attitudes towards the utilization of mobile technologies (Danford, 2015c). Important for faculty buy-in is faculty-led initiatives not administrator-driven ones (Danford, 2015a). Additionally, faculty members need to know how to use technology in a way that makes sense to them in delivering course material and designing student learning outcomes (Danford, 2015a). If faculty members think of technology as something separate from learning, instead of it being a blended classroom experience where it is considered part of the learning, there may be resistance to buy-in (Danford, 2015b). Whatever the challenges or barriers happen to be, the literature indicated favorable outcomes when faculty members were encouraged to use smart mobile devices as administrators developed strategic plans and put usability policy(ies) in place to address using those concerns (Danford, 2015a; Danford, 2015b; Danford, 2015c; Mac Callum et al., 2014).

Initial Push-back on Using Mobile Devices

Faculty members many times deferred to research to help label mobile devices as distractions and counterintuitive to learning (Crompton, 2013; Earl, 2012; Jaschik, & Lederman, 2017; Kowalski, 2016; Lang, 2017; Weimer, 2018). Educators also tended to agree with researchers that said that laptop and cell phone use in the classroom diminished attention and focus and that multitasking was not possible (Crompton, 2013; Earl, 2012; Jaschik & Lederman, 2017; Kowalski, 2016). For example, Fried (2008) found that college students who brought laptops to class performed significantly worse in the course than those who did not. Research by

Research by Hembrooke and Gay (2003) found that undergraduates who were allowed to leave their laptops open learned less than students who were told to leave them shut.

Concerns about the use of cellphones in class led to research on interruptions caused by texting and how that activity decreased attention and comprehension of college students. An investigation of 185 undergraduates found that the individuals who were regularly hindered by messaging (getting or sending at least 16 writings amid a 30-minute time span) later remembered substantially less information than undergraduates who sent or received less than seven texts (Rosen et al., 2011).

Educators were concerned that mobile devices would contribute to information overload and to student's inability to pay attention to lecture (Goleman, 2013). According to Goleman (2013), people are bombarded daily with too much information from news streams, e-mails, phone calls, tweets, blogs, charts, reflections about opinions about opinions, and these stimuli may be depleting our ability to concentrate. Goleman wrote that focusing is not easy and that "Selecting one sharp focus requires inhibiting a multitude of others. The mind has to fight off the pull of everything else, sorting out what's important from what's irrelevant. That takes cognitive effort" (p. 56). Goleman seems to believe as some educators, that mobile devices are distractions, that they hinder learning and gives students the false notion that they can multi-task.

Educators opposed to using mobile devices do not believe that mobile devices have rewired students' brains. Instead, they might point to Willingham (2010), who advised that students may have convinced themselves they can multitask, however, no human can do that. Willingham found that people are not doing at least two things simultaneously when multitasking; rather, they are switching back and forth between various errands—and doing each ineffectively and wastefully.

Studies following Willingham's examined the impact of receiving and sending text messages during a classroom lecture to determine if reports were true that multitasking impaired performance, particularly among heavy multitaskers (Rosen et al., 2011). Rosen et al. (2011) was the first to experimentally examine the direct impact of text message interruptions on memory recall in a university classroom environment and reported multi-tasking is possible and students could still learn. However, educators should teach students metacognitive strategies that focus on when it is appropriate to take a break and when it is important to focus without distractions.

Reconciling with Mobile Devices

Baran (2014) wrote that warnings about the harm of the use of mobile devices did not stop mobile devices from becoming wide spread. Mobile devices are present and so important, that they are hard to live without, and in some cases, essential for completing tasks. They have become almost universally accepted. In higher education mobile device use evolved with students taking the lead and early adopting faculty acceptance and use of them in the classroom. Eventually more educators began asking questions, about leveraging the potential of mobile devices, and devising strategic plans to do so (Baran, 2014; Center for Digital Education, 2020).

Mobile devices influence access to online courses. Mobile devices are credited for increasing online student populations and boosting educational institutions enrollment opportunities. Colleges and universities tailor their programs and services to the motivations and needs of today's online learners to increase or sustain enrollment figures (Learning House, 2019). Thus, faculty using smart mobile devices to teach online courses or on ground ones might influence student enrollment decisions because students want to use their mobile devices to complete course work. However, 17% of respondents in a 2019 college student survey indicated that their program does not offer mobile access, and students age 45 and older are significantly less interested in using mobile devices to complete coursework (Learning House, 2019).

Chapter 3. Research Method

The purpose of this study was to investigate current use of smart mobile devices for instruction by Tennessee Community Colleges full-time faculty to determine if there were any significant differences in the mean scores measuring attitudes and use of smart mobile devices by generational age groups, rank, teaching discipline, and years of teaching. Additionally, the researcher sought to investigate faculty attitudes regarding the use of smart devices in their teaching curriculum.

The topic and design of this study was influenced by 2011 and 2014 Mobile Device research conducted by East Tennessee State University (ETSU) commissioned by Tennessee Board of Regents (TBR), in which students and faculty were surveyed on their use and the of mobile devices for teaching and learning at Tennessee community colleges (TBR Mobile Survey, 2011/2014). Due to changes and upgraded technologies, some survey items from 2011 and 2014 study were no longer relevant for the current study, thus were not included. Relevant questions from the ETSU study were used for the current survey (Appendix B) and formed the basis of the present study. The original survey items were previously reviewed and evaluated for appropriateness, readability, relevance, accuracy, clarity, and were measured for reliability and validity by the original investigators.

The methodology for the current study was quantitative non-experimental survey research. This chapter describes the research questions, instrumentation, population, data collection, and data analysis used in the study.

Research Questions and Null Hypotheses

To determine if there were any significant differences in the mean scores measuring attitudes and use of smart mobile devices by generational age grouping, teaching discipline, rank, years of teaching among Tennessee community college faculty usage of smart mobile devices and to determine if those faculty members who under-utilize mobile technologies for teaching also hold negative feelings and thoughts about them, the following questions guided this study.

Research Question 1: Is there a significant difference in the mean scores on the dimensions of the survey Use of Smart Mobile Devices by Community College Faculty among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers)?

$Ho1_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

$Ho1_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

$Ho1_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

$Ho1_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

$Ho1_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

$Ho1_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

$Ho1_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency Using Smart Mobile Devices) among the three age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

Research Question 2: Is there a significant difference in the mean scores on the dimensions of the survey Use of Smart Mobile Devices by Community College Faculty among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor)?

$Ho2_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

$Ho2_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

$Ho2_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices among the three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

$Ho2_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage among the five academic ranks of community college faculty members three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

$Ho2_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

$Ho2_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use Smart Mobile Devices) among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

$Ho2_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency Using Smart Mobile Devices) among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

Research Question 3: Is there a significant difference in the mean scores on each the dimensions of the survey Use of smart mobile devices by Community College Faculty among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce)?

$Ho3_1$: Is there a significant difference in the mean scores on Dimension 1 (Learning Preference) among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

$Ho3_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

$Ho3_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

$Ho3_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

$Ho3_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

$Ho3_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

$Ho3_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices) among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

Research Question 4: Is there a significant difference in the mean scores on the dimensions of the survey Use of Smart Mobile Devices by Community College Faculty between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more)?

$Ho4_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

$Ho4_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

$Ho4_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

$Ho4_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

$Ho4_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) between the two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

$Ho4_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices between two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

$Ho4_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices between two years of teaching experience groups of community college faculty members (6 years or less and 7 years or more).

Research Question 5: Is there a significant difference in the mean scores on the dimensions of the survey Use of Smart Mobile Devices by Community College Faculty between male and female community college faculty members?

$Ho5_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) between male and female community college faculty members.

$Ho5_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices) between male and female community college faculty members.

$Ho5_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices between male and female community college faculty members.

$Ho5_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage between male and female community college faculty members.

$Ho5_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) between male and female community college faculty members.

$Ho5_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices between male and female community college faculty members.

$Ho5_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency Using Smart Mobile Devices) between male and female community college faculty members.

Instrumentation

The instrument was an electronic questionnaire consisting of 15 items divided into seven dimensions: Learning Preference, Institutional Training, Frequency, Attitude, Willingness to Attend PD Training, Willingness to Use, and Competency using smart mobile for instruction. Each dimension was compared with generational age range, gender identity, teaching rank, tenure status, geographic region, teaching discipline, and years teaching (Appendix A). The review of literature influenced the scope of the study.

A demographic section of the survey was used to collect respondents' age range, professional rank, teaching discipline, years teaching, and gender, while the perceptions section used a seven-point Likert-type scale to measure respondents' agreement to statements regarding attitudes regarding using smart mobile devices, willingness to attend professional development training, and willingness to use smart mobile devices. The ratings in the Likert scale regarding perception were assigned a number for statistical analysis: 1= strongly agree, 2= agree, 3= somewhat agree, 4= neither agree nor disagree, 5= somewhat agree, 6= disagree, 7= strongly disagree. A six-point Likert-type scale was used to measure respondents' smart mobile device learning preferences. The ratings in the Likert scale for dimension 1 (Learning Preference) was assigned a number for statistical analysis: 6= never, 5= very rarely, 4= rarely, 3= occasionally, 2= very frequently, 1= always. A four-point Likert-type scale was used to measure respondents' training. The ratings in the Likert scale for dimension 2 (Institutional Training) for smart mobile devices) was assigned a number for statistical analysis: 1= extensive training, 2= some training, 3= very limited training, 4= no training. A five-point Likert-type scale was used to measure respondents' frequency of use. The ratings in the Likert scale for dimension 3 (Frequency) of use of smart mobile devices was assigned a number for statistical analysis: 5= every time, 4= almost every time, 3= occasionally/sometimes, 2= almost never, 1= never. A four-point Likert-type scale was used to measure respondents' personal assessment of mobile device skills. The ratings in the Likert scale for dimension 7 (Competency) using smart mobile devices was assigned a number for statistical analysis: 1= not competent, 2= somewhat competent, 3= competent, 4= very competent.

Survey items were derived from the review of literature, which revealed characteristics about faculty who choose or choose not to use smart mobile devices for instruction. The primary researcher consulted with educational technology expert who was a principal investigator for the TBR/ETSU Mobile Device Survey research study in 2011 and 2014 for which the current study is influenced. It was determined that questions were appropriate, unbiased, the variables sufficiently operationalized and pertinent to this study. Moreover, the research would broaden the scope of the TBR/ETSU 2011 and 2014 study (R. Melton, personal communication, December 20, 2018 and June 1, 2019).

The survey used in the present study is the same one used in the Tennessee Board of Regents and East Tennessee State University *Using Mobile Devices for Teaching* study (2011; 2014), with few modifications to acknowledge the change in the type of mobile technologies students and professors bring to campus. For example, rarely does either bring a PDA to campus. Therefore, PDAs are not mentioned on the survey. Novak (2014) validated the survey questions a second time by using them in her *Faculty and Students Use of Mobile Devices for Enhancing Learning and Teaching* study.

Population and Sample

The target population for this quantitative study was full-time faculty members from community colleges in the state of Tennessee during the spring semester (January-April) of 2020. The participants were selected because in reviewing the literature, fewer studies were found on full-time faculty at community colleges' use of smart mobile devices than studies on the same topic about faculty at universities. Also, in Tennessee, TBR/ETSU's 2011 and 2014 studies appear to be the only study in this region to include faculty at both community colleges and universities. The number of full-time faculty and their demographic information for the study was obtained from Integrated Postsecondary Education Data System (IPEDS) provided by the National Center for Education Statistics (NCES) (https://nces.ed.gov), Tennessee Board of Regents College System Community Colleges/Our Institutions webpage and by phoning the participating institutions.

Data Collection

After securing approval from the Institutional Review Board (IRB) at East Tennessee State University, to contact and invite all community colleges to participate in this study, three institutions agreed to participate. An email was sent to the Offices of Institutional Research at the participating community colleges asking the appropriate manager or director for approval to collect data on full-time faculty at their institution. A copy of the survey, a cover letter describing the purpose of the study, directions for completing the electronic survey, and a link to the survey site accompanied this request. A return date was included in the correspondence.

After institutional approval, a letter describing the purpose of study, directions for completing the electronic survey and a link to the survey was emailed to full-time faculty. The survey was distributed to all full-time faculty members at the participating colleges with the assistance of the Office of Institutional Research and Effectiveness at the participating colleges.

Completion of the survey was considered consent for participation. Additionally, the survey required potential participants to click a button to confirm their consent before the questionnaire could advance to the survey items. No tangible incentives were used to attract participants to complete the survey. Potential participants were advised that the survey results might illuminate where more professional development is needed and influence targeted trainings for full-time faculty. No identifiable measures were obtained in the survey and the participants remained anonymous. Follow-up correspondence was used to increase participation when an email reminder was sent out again a week before the survey closed.

Data Analysis

Data collected from the electronic survey were imported into IBM-SPSS for analysis. Some survey items yielded simple percentages. The first component of the survey provided respondents' demographic information such as generational age range, professional rank, teaching discipline, years teaching, and gender. One-way analyse of variance (ANOVA) was conducted to analyze Research Questions 1, 2, and 3. Research Questions 4 and 5 were analyzed using an independent sample t-test. All analyses were performed using an alpha level of .05 to determine significance.

Chapter 4. Findings

The purpose of this study was to investigate current use of smart mobile devices for instruction by Tennessee Community Colleges full-time faculty to determine if there were any significant differences in the mean scores measuring attitudes and use of smart mobile devices by generational age, gender identity, teaching rank, tenure status, geographical region, teaching discipline and years of teaching experience. In this chapter, the statistical findings of the data collection and analyses are presented. Frequencies and percentages were used to examine the demographic factors. Means and standard deviations were used to explore the trends in the variables of interest. The research questions were addressed using one-way ANOVAs and independent samples *t*-tests. Statistical significance for all the inferential analyses was evaluated at the generally accepted level, $\alpha = .05$.

A quantitative, nonexperimental survey research design was employed by examining the results of the researcher-developed Smart Mobile Device Faculty Survey (Appendix A). Three Tennessee community colleges located in three regions of the state emailed the electronic survey to faculty members. Data from the survey were analyzed to address five research questions.

The population in this study was full-time faculty members at the three participating Tennessee community colleges during the time the survey was distributed (April-May of 2020). To access the survey, participants had to agree to the first question, which ensured the participant had read the informed consent (Appendix B), agreed to volunteer in the study, was a full-time employee who taught at the institution and was at least 18 years of age. The solicitation to participate email (Appendix C) and link to the survey were sent to 267 full-time faculty members. Of the possible 267 participants, 93 (35%) responded to the survey. However, three responses where unusable because the respondents were not full-time faculty.

Frequencies and Percentages of Demographics

A total of 90 participants completed the questio*n*naire. Generation of the participants was distributed between Generation Y (N = 28, 31.1%), Generation X (N = 31, 34.4%), and Baby Boomers (N = 31, 34.4%). Gender consisted of 40 males (44.4%) and 50 females (55.6%). Academic rank consisted of 32 instructors (35.6%), 20 assistant professors (22.2%), and 37 associate professors/full professors (41.1%). Tenure status consisted of 34 tenured (37.8%), 35 tenure track (38.9%), and 21 non-tenured (23.3%) participants. A majority of participants were in the middle region (N = 56, 62.2%). Most of the participants were in the STEM field (N = 45, 50%). Years of teaching experience was split between 6 years or less (N = 40, 44.4%) and 7 years or more (N = 50, 55.6%). Table 1 presents the frequencies of the descriptive variables.

Table 1

Frequencies and Percentages of Demographics

Variable	N	%
Generational age		
Generation Y	28	31.1
Generation X	31	34.5
Baby Boomers	31	34.4
Gender		
Male	40	44.4
Female	50	55.6
Academic rank		
Instructor	32	35.6
Assistant Professor	20	22.2
Associate Professor/Full Professor	37	41.1
Tenure status		
Tenure	34	37.8
Tenure track	35	38.9
Non-tenure	21	23.3
Region		
East	13	14.5
West	21	23.3
Middle	56	62.2
Teaching discipline		
STEM	45	50.1
Humanities	21	23.3
Social science	12	13.3
Other (Business, Education, Workforce)	12	13.3
Years Teaching		
6 years or less	40	44.4
7 years or more	50	55.6

Descriptive Statistics of Scales

Participants responded to the Use of Smart Mobile Devices by Community College Faculty survey. Composite scores were developed through a sum of the respective items in each of the scales. Three participants did not complete significant portions of Dimension 1 and Dimension 2 and were removed in the examination of the scales. Descriptive statistics for the dimensions are presented in Table 2.

Table 2

Descriptive Statistics for Dimensions

Variable	*N*	*Min*	*Max*	*M*	*SD*
Dimension 1 – Learning Preference	87	7.00	42.00	19.10	6.10
Dimension 2 – Institutional Training	89	6.00	24.00	16.08	5.27
Dimension 3 – Frequency	90	6.00	30.00	17.28	4.68
Dimension 4 – Attitude	90	4.00	15.00	10.87	2.48
Dimension 5 – Willingness to Attend PD training	90	3.00	21.00	16.31	4.74
Dimension 6 – Willingness to Use	90	10.00	35.00	25.87	6.61
Dimension 7 – Competence	90	8.00	32.00	18.89	5.72

To address Research Question 1, one-way ANOVAs were conducted to assess for differences in the dimensions of Use of Smart Mobile Devices survey among the three generational age groups (Generation Y, Generation X, or Baby Boomers). The continuous dependent variables corresponded to the mean scores of the seven dimensions. The independent variable corresponded to generational age group, with three possibilities: Generation Y, Generation X, or Baby Boomers.

Research Question 1

Research Question 1: Is there a significant difference in the mean scores on the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers)?

$Ho1_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 1 (Learning Preference) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 1 of the survey. The ANOVA was not significant, $F(2, 84) = 3.02$, $p = .054$, partial $\eta^2 = .07$. Therefore, $Ho{:}1_1$ was retained. There was not a significant relationship between age and scores on Dimension 1. Means and standard deviations for the three age groups are displayed in Table 3.

Table 3

Dimension 1 Means and Standard Deviations by Age Group

Age	N	M	SD
Generation Y	27	16.81	6.40
Generation X	30	20.53	4.49
Baby Boomer	29	19.73	6.79

$Ho1_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for Smart Mobile Devices among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 2 (Institutional Training) for smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 2 of the survey. The ANOVA was significant, $F(2, 86) = 3.32$, $p = .041$, partial $\eta^2 = .07$. Therefore, $Ho:1_2$ was rejected. There was a significant relationship between age and scores on Dimension 2.

Because the overall *F* test was significant, post hoc multiple comparisons were conducted to evaluate pairwise difference among the means of the three groups. A Tukey procedure was selected for the multiple comparisons because equal variances were assumed. There was not a significant difference in the means between the Generation Y and Generation X faculty members ($p = .090$) or between Generation X and Baby Boomer ($p = .967$) faculty members. The largest difference between means for Dimension 2 scores was between Generation Y and Baby Boomer faculty members ($p = .050$). The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the three age groups, are reported in Table 4.

Table 4

Dimension 2 Means, Standard Deviations and 95% CI by Age Group

Age	N	M	SD	Generation X	Baby Boomer
Generation Y	27	13.96	5.09	-.35 to 6.10	-.02 to 6.42
Generation X	31	16.84	4.66		
Baby Boomer	31	17.16	5.60	-3.43 to 2.79	
Total	89				

$Ho1_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 3 (Frequency) of use of smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 3 of the survey. The ANOVA was not significant, $F(2, 87) = 1.99$, $p = .143$, partial $\eta^2 = .04$. Therefore, $Ho{:}1_3$ was retained. There was not a significant relationship between age and scores on Dimension 3. Means and standard deviations for the three age groups are displayed in Table 5.

Table 5

Dimension 3 Means and Standard Deviations by Age Group

Age	N	M	SD
Generation Y	28	17.96	4.88
Generation X	31	18.00	3.30
Baby Boomer	31	15.94	5.45

$Ho1_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 4 of the survey. The ANOVA was not significant, $F(2, 87) = 0.21$, $p = .814$, partial $\eta^2 = .06$. Therefore, $Ho{:}1_4$ was retained. There was not a significant relationship between age and scores on Dimension 4. Means and standard deviations for the three age groups are displayed in Table 6.

Table 6

Dimension 4 Means and Standard Deviations by Age Group

Age	N	M	SD
Generation Y	28	10.79	2.92
Generation X	31	10.71	1.74
Baby Boomer	31	11.10	2.74

$Ho1_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 5 (Willingness to Attend PD Training) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 5 of the survey. The ANOVA was not significant, $F(2, 87) = 0.01$, $p = .991$, partial $\eta^2 < .01$. Therefore, $Ho{:}1_5$ was retained. There was not a significant relationship between age and scores on Dimension 5. Means and standard deviations for the three age groups are displayed in Table 7.

Table 7

Dimension 5 Means and Standard Deviations by Age Group

Age	N	M	SD
Generation Y	28	16.32	5.20
Generation X	31	16.23	3.17
Baby Boomer	31	16.39	5.68

$Ho1_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 6 (Willingness to Use) smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 6 of the survey. The ANOVA was not significant, $F(2, 87) = 0.07$, $p = .930$, partial $\eta^2 < .01$. Therefore, Ho:1_6 was retained. There was not a significant relationship between age and scores on Dimension 6. Means and standard deviations for the three age groups are displayed in Table 8.

Table 8

Dimension 6 Means and Standard Deviations by Age Group

Age	N	M	SD
Generation Y	28	26.21	6.90
Generation X	31	25.55	6.84
Baby Boomer	31	25.87	6.31

$Ho1_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices among the three generational age groups of community college faculty members (Generation Y, Generation X, or Baby Boomers).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between age and the mean scores on Dimension 7 (Competency) using smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, age, included three levels: Generation Y, Generation X, or Baby Boomers. The dependent variable was the mean scores on Dimension 6 of the survey. The ANOVA was not significant, $F(2, 87) = 2.29$, $p = .107$, partial $\eta^2 = .05$. Therefore, $Ho{:}1_7$ was retained. There was not a significant relationship between age and scores on Dimension 7. Means and standard deviations for the three age groups are displayed in Table 9.

Table 9

Dimension 7 Means and Standard Deviations by Age Group

Age	N	M	SD
Generation Y	28	20.68	5.36
Generation X	31	18.58	4.53
Baby Boomer	31	17.58	6.76

To address Research Question 2, one-way ANOVAs were conducted to assess for differences in dimensions of Use of Smart Mobile Devices survey among the three academic ranks (Instructor, Assistant Professor, Associate Professor/Full Professor). The continuous dependent variables corresponded to the mean scores of the seven dimensions. The independent variable corresponded to academic ranks, with three possibilities: Instructor, Assistant Professor, and Associate Professor/Full Professor.

Research Question 2

Research Question 2: Is there a significant difference in the mean scores of the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor)?

$Ho2_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 1 (Learning Preference) of the Use of

Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate Professor/Full Professor. The dependent variable was the mean scores on Dimension 1 of the survey. The ANOVA was significant, $F(2, 83) = 4.81$, $p = .011$, partial $\eta^2 = .10$. Therefore, Ho:2_1 was rejected. There was a significant relationship between academic rank and scores on Dimension 1.

Because the overall *F* test was significant, post hoc multiple comparisons were conducted to evaluate pairwise difference among the means of the three groups. A Tukey procedure was selected for the multiple comparisons because equal variances were assumed. There was not a significant difference in the means between the Assistant Professors and Instructors ($p = .598$) or between Assistant Professors and Associate Professors/Full Professors ($p = .210$) faculty members. The largest difference between means for Dimension 1 scores was between Instructors and Associate Professor/Full Professors ($p = .008$). The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the three academic ranks, are reported in Table 10.

Table 10

Dimension 1 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD	Assistant Professor	Associate Professor
Instructor	31	16.97	6.08	-2.38 to 5.65	-0.98 to 7.89
Assistance Professor	20	18.60	5.89		
Associate Professor	35	21.40	5.66	-6.72 to 1.12	
Total	86				

$Ho2_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 2 (Institutional Training) for smart mobile devices) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate Professor/Full Professor. The dependent variable was the mean scores on Dimension 2 of the survey. The ANOVA was significant, $F(2, 85) = 4.57$, $p = .013$, partial $\eta^2 = .10$. Therefore, $Ho{:}2_2$ was rejected. There was a significant relationship between academic rank and scores on Dimension 2.

Because the overall *F* test was significant, post hoc multiple comparisons were conducted to evaluate pairwise difference among the means of the three groups. A Tukey procedure was selected for the multiple comparisons because equal variances were assumed. There was not a significant difference in the means between the Assistant Professors and Instructors ($p = .914$). The largest difference between means for Dimension 2 scores was between Instructors and Associate Professor/Full Professors ($p = .041$) and between Assistant Professors and Associate Professor/Full Professors ($p = .030$). The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the three academic ranks, are reported in Table 11.

Table 11

Dimension 2 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD	Assistant Professor	Associate Professor
Instructor	31	15.03	4.40	-4.02 to 2.85	0.10 to 5.94
Assistance Professor	20	14.45	6.08		
Associate Professor	37	18.05	4.89	-6.93 to -0.28	
Total	88				

Ho2$_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices among the three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 3 (Frequency) of use of smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate Professor/Full Professor. The dependent variable was the mean scores on Dimension 3 of the survey. The ANOVA was not significant, $F(2, 86) = 1.29$, $p = .282$, partial $\eta^2 = .03$. Therefore, Ho:2$_3$ was retained. There was not a significant relationship between academic rank and scores on Dimension 3. Means and standard deviations for the three academic rank groups are displayed in Table 12.

Table 12

Dimension 3 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD
Instructor	32	17.84	5.13
Assistance Professor	20	18.00	4.84
Associate Professor	37	16.30	4.13
Total	89		

$Ho2_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage among the five academic ranks of community college faculty members three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate Professor/Full Professor. The dependent variable was the mean scores on Dimension 4 of the survey. The ANOVA was not significant, $F(2, 86) = 0.04$, $p = .958$, partial $\eta^2 < .01$. Therefore, $Ho{:}2_4$ was retained. There was not a significant relationship between academic rank and scores on Dimension 4. Means and standard deviations for the three academic rank groups are displayed in Table 13.

Table 13

Dimension 4 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD
Instructor	32	10.78	2.37
Assistance Professor	20	10.80	2.80
Associate Professor	37	10.95	2.49
Total	89		

$Ho2_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 5 (Willingness to Attend PD Training) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate Professor/Full Professor. The dependent variable was the mean scores on Dimension 5 of the survey. The ANOVA was not significant, $F(2, 86) = 1.67$, $p = .194$, partial $\eta^2 = .04$. Therefore, $Ho{:}2_5$ was retained. There was not a significant relationship between academic rank and scores on Dimension 5. Means and standard deviations for the three academic rank groups are displayed in Table 14.

Table 14

Dimension 5 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD
Instructor	32	16.87	4.68
Assistance Professor	20	17.25	4.76
Associate Professor	37	15.19	4.70
Total	89		

$Ho2_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 6 (Willingness to Use) smart mobile devices) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate Professor/Full Professor. The dependent variable was the mean scores on Dimension 6 of the survey. The ANOVA was significant, $F(2, 86) = 3.23$, $p = .045$, partial $\eta^2 = .07$. Therefore, $Ho{:}2_6$ was rejected. There was a significant relationship between academic rank and scores on Dimension 6.

Because the overall *F* test was significant, post hoc multiple comparisons were conducted to evaluate pairwise difference among the means of the three groups. A Tukey procedure was selected for the multiple comparisons because equal variances were assumed. There was not a significant difference in the means between the Assistant Professors and Instructors (p = .914). The largest difference between means for Dimension 6 scores was between Instructors and Associate Professor/Full Professors (p = .041) and between Assistant Professors and Associate Professor/Full Professors (p = .030). The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the three academic ranks, are reported in Table 15.

Table 15

Dimension 6 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD	Assistant Professor	Associate Professor
Instructor	32	27.88	6.44	-6.18 to 2.63	-7.68 to -0.23
Assistance Professor	20	26.10	6.47		
Associate Professor	37	23.92	6.51	-2.11 to 6.47	
Total	88				

$Ho2_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices among three academic ranks of community college faculty members (Instructor, Assistant Professor, Associate Professor/Full Professor).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between academic rank and the mean scores on Dimension 7 (Competency) using smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, academic rank, included three levels: Instructor, Assistance Professor, and Associate

Professor/Full Professor. The dependent variable was the mean scores on Dimension 7 of the survey. The ANOVA was not significant, $F(2, 86) = 2.76$, $p = .069$, partial $\eta^2 = .06$. Therefore, Ho:2_7 was retained. There was not a significant relationship between academic rank and scores on Dimension 7. Means and standard deviations for the three academic rank groups are displayed in Table 16.

Table 16

Dimension 7 Means and Standard Deviations by Academic Rank

Academic Rank	N	M	SD
Instructor	32	19.91	6.10
Assistance Professor	20	20.10	5.84
Associate Professor	37	17.16	4.96
Total	89		

To address Research Question 3, one-way ANOVAs were conducted to assess for differences in the dimensions of Use of Smart Mobile Devices survey among the four teaching disciplines (STEM, Humanities, Social Science, and "Other" (Business, Education, Workforce). The continuous dependent variables corresponded to the mean scores of the seven dimensions. The independent variable corresponded to teaching disciplines, with four possibilities: STEM, Humanities, Social Science, and "Other" (Business, Education, Workforce).

Research Question 3

Research Question 3: Is there a significant difference in the mean scores on each of the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and "Other" (Business, Education, Workforce)?

Ho3$_1$: Is there a significant difference in the mean scores on Dimension 1 (Learning Preference) among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and "Other" (Business, Education, Workforce).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 1 (Learning Preference) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 1 of the survey. The ANOVA was significant, $F(3, 83) = 5.24$, $p = .002$, partial $\eta^2 = .16$. Therefore, Ho:3$_1$ was rejected. There was a significant relationship between teaching discipline and scores on Dimension 1.

Because the overall *F* test was significant, post hoc multiple comparisons were conducted to evaluate pairwise difference among the means of the four groups. A Tukey procedure was selected for the multiple comparisons because equal variances were assumed. There was not a significant difference in the means between the STEM and Humanities ($p = .992$), STEM and Social Science ($p = .999$), Humanities and Social Science ($p = .999$). The largest difference between means for Dimension 1 scores was between STEM and Other fields ($p = .002$), Humanities and Other fields ($p = .003$), and Social Science and Other ($p = .015$). The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the four teaching disciplines, are reported in Table 17.

Table 17

Dimension 1 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD	Humanities	Social Science	Other
STEM	45	18.33	5.61	-4.40 to 3.56	-5.04 to 4.72	2.08 to 12.18
Humanities	21	17.90	5.66		-5.14 to 5.67	1.99 to 13.11
Social Science	12	18.17	4.57	-5.67 to 5.14		1.05 to 13.52
Other	11	25.45	7.08	-13.11 to 1.99	-13.52 to -1.05	
Total	89					

$Ho3_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and "Other" (Business, Education, Workforce).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 2 (Institutional Training) for smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 2 of the survey. The ANOVA was significant, $F(3, 85) = 2.99$, $p = .036$, partial $\eta^2 = .10$. Therefore, $Ho{:}3_2$ was rejected. There was a significant relationship between teaching discipline and scores on Dimension 2.

Because the overall *F* test was significant, post hoc multiple comparisons were conducted to evaluate pairwise difference among the means of the four groups. A Tukey procedure was selected for the multiple comparisons because equal variances were assumed. There was not a significant difference in the means between the STEM and Humanities (p = .992), STEM and Social Science (p = .999), Humanities and Social Science (p = .999). The largest difference between means for Dimension 2 scores was between STEM and Other fields (p = .002), Humanities and Other fields (p = .003), and Social Science and Other (p = .015). The 95% confidence intervals for the pairwise differences, as well as the means and standard deviations for the four teaching disciplines, are reported in Table 18.

Table 18

Dimension 2 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD	Humanities	Social Science	Other
STEM	44	16.27	5.05	-4.40 to 3.56	-5.12 to 3.58	-1.12 to 7.58
Humanities	21	14.05	4.79		-3.38 to 6.29	0.62 to 10.29
Social Science	12	15.50	6.37	-6.29 to 3.38		-1.45 to 9.45
Other	12	19.50	4.34	-10.29 to -0.62	-9.45 to 1.45	
Total	89					

$Ho3_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 3 (Frequency) of use of smart mobile devices) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 3 of the survey. The ANOVA was not significant, $F(3, 86) = 0.54$, $p = .656$, partial $\eta^2 = .02$. Therefore, Ho:3_3 was retained. There was not a significant relationship between teaching disciplines and scores on Dimension 3. Means and standard deviations for the four teaching discipline groups are displayed in Table 19.

Table 19

Dimension 3 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD
STEM	45	17.51	4.53
Humanities	21	17.52	4.19
Social Science	12	17.58	5.33
Other	12	15.67	5.58
Total	90		

Ho3_4: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 4 of the survey. The ANOVA was not significant, $F(3, 86) = 2.08$, $p = .109$, partial $\eta^2 = .07$. Therefore, Ho:3_4 was retained. There was not a significant relationship between teaching disciplines and scores on Dimension 4. Means and standard deviations for the four teaching discipline groups are displayed in Table 20.

Table 20

Dimension 4 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD
STEM	45	10.60	2.62
Humanities	21	10.67	2.42
Social Science	12	10.58	2.31
Other	12	12.50	1.73
Total	90		

Ho3_5: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 5 (Willingness to Attend PD Training) of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 5 of the survey. The ANOVA was not significant, $F(3, 86) = 1.03$, $p = .383$, partial $\eta^2 = .04$. Therefore, Ho:3_5 was retained. There was not a significant relationship between teaching disciplines and scores on Dimension 5. Means and standard deviations for the four teaching discipline groups are displayed in Table 21.

Table 21

Dimension 5 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD
STEM	45	15.82	4.85
Humanities	21	17.67	3.50
Social Science	12	16.92	5.99
Other	12	15.17	4.84
Total	90		

Ho3_6: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce).

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 6 (Willingness to Use) smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 6 of the survey. The ANOVA was not significant, $F(3, 86) = 2.25$, $p = .089$, partial $\eta^2 = .07$. Therefore, Ho:3_6 was retained. There was not a significant relationship between teaching disciplines and scores on Dimension 6. Means and standard deviations for the four teaching discipline groups are displayed in Table 22.

Table 22

Dimension 6 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD
STEM	45	25.36	6.62
Humanities	21	27.62	5.93
Social Science	12	28.17	6.15
Other	12	22.42	7.10
Total	90		

Ho3_7: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices among the four teaching disciplines of community college faculty members (STEM, Humanities, Social Science, and “Other” (Business, Education, Workforce). A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between teaching discipline and the mean scores on Dimension 7 (Competency) using smart mobile devices of the Use of Smart Mobile Devices by Community College Faculty survey. The factor variable, teaching discipline, included four levels: STEM, Humanities, Social Science, and Other. The dependent variable was the mean scores on Dimension 7 of the survey. The ANOVA was not significant, $F(3, 86) = 1.18$, $p = .321$, partial $\eta^2 = .04$. Therefore, Ho:3_7 was retained. There was not a significant relationship between teaching disciplines and scores on Dimension 7. Means and standard deviations for the four teaching discipline groups are displayed in Table 23.

Table 23

Dimension 7 Means and Standard Deviations by Teaching Discipline

Teaching Discipline	N	M	SD
STEM	45	19.27	6.07
Humanities	21	19.71	5.98
Social Science	12	18.83	5.15
Other	12	16.08	3.90
Total	90		

To address Research Question 4, t-tests were conducted to assess for differences in the dimensions of Use of Smart Mobile Devices survey between the two years of teaching experience groups (6 years or less, and 7 years or more). The continuous dependent variables corresponded to the mean scores of the seven dimensions. The independent variable corresponded to years teaching, with two possibilities: 6 years or less, and 7 years or more.

Research Question 4

Research Question 4: Is there a significant difference in the mean scores on the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey between the two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more)?

$Ho4_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) between the two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 1 (Learning Preference) differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 1 (Learning Preferences) on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was not significant, $t(87) = -1.83$, $p = .071$. Therefore, $Ho4_1$ was retained. The η^2 index was .04. Respondents from 6 years or less group ($M = 17.79$, $SD = 6.09$) tended to report similar Learning Preference scores as those in 7 or more years of experience group ($M = 20.17$, $SD = 5.97$). The 95% confidence interval for the difference in means was -4.95 to .21.

$Ho4_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices between the two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 2 (Institutional Training) for smart mobile devices differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 2 (Institutional Training) for smart mobile devices on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was not significant, $t(87) = -1.06$, $p = .293$. Therefore, $Ho4_2$ was retained. The η^2 index was .01. Respondents from 6 years or less group ($M = 15.41$, $SD = 4.95$) tended to report similar Institutional Training for Smart Mobile Devices scores as those in 7 or more years of experience group ($M = 16.60$, $SD = 5.50$). The 95% confidence interval for the difference in means was -3.42 to 1.04.

$Ho4_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency) of use of smart mobile devices between the two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 3 (Frequency) of use of smart mobile devices differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 3 (Frequency) of use of smart mobile devices on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was significant, $t(88) = 2.07$, $p = .041$. Therefore, $Ho4_3$ was rejected. The η^2 index was .05. Respondents from 6 years or less group ($M = 18.40$, $SD = 4.44$) tended to report significantly higher Frequency of Use of Smart Mobile Devices scores as those in 7 or more years of experience group ($M = 16.38$, $SD = 4.71$). The 95% confidence interval for the difference in means was 0.08 to 3.96.

$Ho4_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage between the two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 4 (Attitude) regarding smart mobile device usage differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 4 (Attitude) regarding smart mobile device usage on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was not significant, $t(88) = -1.88$, $p = .064$. Therefore, $Ho4_4$ was retained. The η^2 index was .04. Respondents from 6 years or less group ($M = 10.33$, $SD = 2.41$) tended to report similar Attitude Regarding Smart Mobile Device Usage scores as those in 7 or more years of experience group ($M = 11.30$, $SD = 2.48$). The 95% confidence interval for the difference in means was -2.01 to 0.06.

$Ho4_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) between the two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 5 (Willingness to Attend PD Training) differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 5 (Willingness to Attend PD Training) on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was not significant, $t(88) = 1.65$, $p = .102$. Therefore, $Ho4_5$ was retained. The η^2 index was .03. Respondents from 6 years or less group ($M = 17.23$, $SD = 4.11$) tended to report similar Willingness to Attend Professional Development Training scores as those in 7 or more years of experience group ($M = 15.58$, $SD = 5.12$). The 95% confidence interval for the difference in means was -0.33 to 3.62.

$Ho4_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices between two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 6 (Willingness to Use) smart mobile devices differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 6 (Willingness to Use) smart mobile devices on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was not significant, $t(88) = 1.37$, $p = .176$. Therefore, $Ho4_6$ was retained. The η^2 index was .02. Respondents from 6 years or less group ($M = 26.93$, $SD = 6.38$) tended to report similar Willingness to Use Smart Mobile Devices scores as those in 7 or more years of experience group ($M = 25.02$, $SD = 6.73$). The 95% confidence interval for the difference in means was -0.87 to 4.68.

$Ho4_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices between two years of teaching experience groups of community college faculty members (6 years or less, and 7 years or more).

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 7 (Competency) using smart mobile devices differed based on the years of community college teaching experience of community college faculty (6 years or less, and 7 years or more). The scores for Dimension 7 (Competency) using smart mobile devices on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was teaching experience. The test was not significant, $t(88) = 1.78$, $p = .078$. Therefore, $Ho4_7$ was retained. The η^2 index was .04. Respondents from 6 years or less group (M = 20.08, SD = 5.76) tended to report similar Competency Using Smart Mobile Devices scores as those in 7 or more years of experience group (M = 17.94, SD = 5.56). The 95% confidence interval for the difference in means was -0.25 to 4.52.

To address Research Question 5, t-tests were conducted to assess for differences in the dimensions of Use of Smart Mobile Devices survey between the two gender identity groups (male and female). The continuous dependent variables corresponded to the mean scores of the seven dimensions. The independent variable corresponded to gender identities, with two possibilities: male and female.

Research Question 5

Research Question 5: Is there a significant difference in the mean scores on the dimensions of the Use of Smart Mobile Devices by Community College Faculty survey between male and female community college faculty members?

$Ho5_1$: There is not a significant difference in the mean scores on Dimension 1 (Learning Preference) between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 1 (Learning Preference) differed based on the gender of community college faculty (males and females). The scores for Dimension 1 (Learning Preferences) on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(85) = 0.99$, $p = .325$. Therefore, $Ho5_1$ was retained. The η^2 index was .01. Male respondents (M = 18.38, SD = 7.11) tended to report similar Learning Preference scores as female respondents (M = 19.69, SD = 5.15). The 95% confidence interval for the difference in means was -3.92 to 1.31.

$Ho5_2$: There is not a significant difference in the mean scores on Dimension 2 (Institutional Training) for smart mobile devices between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 2 (Institutional Training) differed based on the gender of community college faculty (males and females). The scores for Dimension 2 (Institutional Training) on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(87) = 0.48$, $p = .631$. Therefore, $Ho5_2$ was retained. The η^2 index was < .01. Male respondents ($M = 16.38$, $SD = 4.89$) tended to report similar Training scores as female respondents ($M = 15.84$, $SD = 5.58$). The 95% confidence interval for the difference in means was -1.70 to 2.79.

$Ho5_3$: There is not a significant difference in the mean scores on Dimension 3 (Frequency of Use of Smart Mobile Devices) between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 3 (Frequency) of use of smart mobile devices differed based on the gender of community college faculty (males and females). The scores for Dimension 3 (Frequency) of use of smart mobile devices on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(88) = 0.31$, $p = .757$. Therefore, $Ho5_3$ was retained. The η^2 index was < .01. Male respondents ($M = 17.45$, $SD = 5.36$) tended to report similar Frequency of Use of Smart Mobile Devices scores as female respondents ($M = 17.14$, $SD = 4.10$). The 95% confidence interval for the difference in means was -1.67 to 2.29.

$Ho5_4$: There is not a significant difference in the mean scores on Dimension 4 (Attitude) regarding smart mobile device usage between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 4 (Attitude) regarding smart mobile device usage differed based on the gender of community college faculty (males and females). The scores for Dimension 4 (Attitude) regarding smart mobile device usage on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(88) = -1.17$, $p = .245$. Therefore, $Ho5_4$ was retained. The η^2 index was .02. Male respondents ($M = 10.53$, $SD = 2.53$) tended to report similar Attitude Regarding Smart Mobile Device Usage scores as female respondents ($M = 11.14$, $SD = 2.43$). The 95% confidence interval for the difference in means was -1.66 to 0.43.

$Ho5_5$: There is not a significant difference in the mean scores on Dimension 5 (Willingness to Attend PD Training) between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 5 (Willingness to Attend PD Training) differed based on the gender of community college faculty (males and females). The scores for Dimension 5 (Willingness to Attend PD Training) on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(88) = 0.82$, $p = .412$. Therefore, $Ho5_5$ was retained. The η^2 index was .01. Male respondents ($M = 15.85$, $SD = 5.41$) tended to report similar Willingness to Attend scores as female respondents ($M = 16.68$, $SD = 4.15$). The 95% confidence interval for the difference in means was -2.83 to 1.17.

$Ho5_6$: There is not a significant difference in the mean scores on Dimension 6 (Willingness to Use) smart mobile devices between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 6 (Willingness to Use) smart mobile devices differed based on the gender of community college faculty (males and females). The scores for Dimension 6 (Willingness to Use) smart mobile devices on the Use of Smart Mobile Devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(88) = 0.44$, $p = .663$. Therefore, $Ho5_6$ was retained. The η^2 index was < .01. Male respondents ($M = 25.53$, $SD = 7.08$) tended to report similar Willingness to Use Smart Mobile Devices scores as female respondents ($M = 26.14$, $SD = 6.26$). The 95% confidence interval for the difference in means was -3.41 to 2.18.

$Ho5_7$: There is not a significant difference in the mean scores on Dimension 7 (Competency) using smart mobile devices between male and female community college faculty members.

An independent-samples *t* test was conducted to evaluate whether the mean scores for Dimension 7 (Competency) differed based on the gender of community college faculty (males and females). The scores for Dimension 7 (Competency) using smart mobile devices by Community College Faculty survey was the test variable and the grouping variable was gender. The test was not significant, $t(88) = 0.53$, $p = .595$. Therefore, $Ho5_7$ was retained. The η^2 index was < .01. Male respondents ($M = 19.25$, $SD = 6.13$) tended to report similar Competency Using Smart Mobile Devices scores as female respondents ($M = 18.60$, $SD = 5.41$). The 95% confidence interval for the difference in means was -1.77 to 3.07.

Chapter 5. Summary, Conclusions, and Recommendations

The purpose of this study was to investigate current use of smart mobile devices for instruction by Tennessee Community Colleges full-time faculty to determine if there were any significant differences in the mean scores measuring attitudes and use of smart mobile devices by generational age, gender identity, teaching rank, tenure status, geographical region, teaching discipline and years teaching.

Summary of Findings

To address Research Question 1, one-way ANOVAs were conducted to assess for differences in the dimensions by generational age. There were significant differences in Institutional Training for Smart Mobile Devices by generational age. The ANOVA for Dimension 1 (Learning Preference) by generational age was not statistically significant (p = .054) indicating that there were no significant differences in learning preference scores by generational age. However, it is worth noting that the findings of the ANOVA approached significance. The ANOVA for Dimension 2 (Institutional Training) by generational age was statistically significant (p = .041) indicating that there were significant differences in training scores by generational age. Post-hoc analyses were conducted to further explore training scores. Generation Y training scores (M = 13.96) were significantly lower in comparison to Generation X (M = 16.84) and Baby Boomers (M = 17.16). The ANOVA for Dimension 3 (Frequency) by generational age was not statistically significant (p = .143) indicating that there were no significant differences in frequency scores by generational age. The ANOVA for Dimension 4 (Attitude) by generational age was not statistically significant (p = .814) indicating that there were no significant differences in attitude scores by generational age. The ANOVA for

Dimension 5 (Willingness to Attend) PD Training by generational age was not statistically significant (p = .991) indicating that there were no significant differences in Willingness to Attend PD Training scores by generational age. The ANOVA for Dimension 6 (Willingness to Use) by generational age was not statistically significant (p = .930) indicating that there were no significant differences in Willingness to Use scores by generational age, and the ANOVA for Dimension 7 (Competence) by generational age was not statistically significant (p = .107) indicating that there were no significant differences in Competence scores by generational age.

To address Research Question 2, one-way ANOVAs were conducted to assess for differences in the dimensions by academic rank. The ANOVA for Dimension 1 (Learning Preference) by academic rank was statistically significant (p = .011) indicating that there were significant differences in learning preference scores by academic rank. Post-hoc analyses were conducted to further explore learning preference scores. Instructors' learning preference scores (M = 16.97) were significantly lower in comparison to Associate Professor/Full Professor scores (M = 21.40). The ANOVA for Dimension 2 (Institutional Training) by academic rank was statistically significant (p = .013) indicating that there were significant differences in training scores by academic rank. Post-hoc analyses were conducted to further explore training scores. Associate Professor/Full Professor training scores (M = 18.05) were significantly higher in comparison to Instructor (M = 15.03) and Assistant Professor (M = 14.43) scores. The ANOVA for Dimension 3 (Frequency) by academic rank was not statistically significant (p = .282) indicating that there were no significant differences in frequency scores by academic rank. The ANOVA for Dimension 4 (Attitude) by academic rank was not statistically significant (p = .958) indicating that there were no significant differences in attitude scores by academic rank. The ANOVA for Dimension 5 (Willingness to Attend PD Training) by academic rank was not statistically significant (p = .194) indicating that there were no significant differences in Willingness to Attend PD Training scores by academic rank. The ANOVA for Dimension 6 (Willingness to Use) by academic rank was statistically significant (p = .045) indicating that there were significant differences in Willingness to Use scores by academic rank. Post-hoc analyses were conducted to further explore Willingness to Use scores. Instructors learning preference scores (M = 27.88) were significantly higher in comparison to Associate Professor/Full Professor scores (M = 23.92), and the ANOVA for Dimension 7 (Competence) by academic rank was not statistically significant (p = .069) indicating that there were no significant differences in Competence scores by academic rank.

To address Research Question 3, one-way ANOVAs were conducted to assess for differences in the dimensions by teaching discipline. There were significant differences in Learning Preference and Institutional Training for Smart Mobile Devices by teaching discipline. The ANOVA for Dimension 1 (Learning Preference) by teaching disciplines was statistically significant (p = .002) indicating that there were significant differences in learning preference scores by teaching disciplines. Post-hoc analyses were conducted to further explore learning preference scores. Learning preference scores for those in Other fields (M = 25.45) were significantly higher in comparison to those in STEM (M = 18.33), Humanities (M = 17.90) and Social Sciences (M = 18.17). The ANOVA for Dimension 2 (Institutional Training) by teaching disciplines was statistically significant (p = .036) indicating that there were significant differences in training scores by teaching disciplines. Post-hoc analyses were conducted to further explore training scores. Training scores for those in Humanities (M = 14.05) were significantly lower in comparison to those in Other fields (M = 19.50). The ANOVA for Dimension 3 (Frequency) by teaching disciplines was not statistically significant (p = .656) indicating that there were no significant differences in frequency scores by teaching disciplines. The ANOVA for Dimension 4 (Attitude) by teaching disciplines was not statistically significant, (p = .109) indicating that there were no significant differences in attitude scores by teaching disciplines. The ANOVA for Dimension 5 (Willingness to Attend PD Training) by teaching disciplines was not statistically significant (p = .383) indicating that there were no significant differences in Willingness to Attend PD Training scores by teaching disciplines. The ANOVA for Dimension 6 (Willingness to Use) by teaching disciplines was not statistically significant (p = .089) indicating that there were significant differences in Willingness to Use scores by teaching disciplines. Post-hoc analyses were conducted to further explore Willingness to Use scores. Instructors learning preference scores (M = 27.88) were significantly higher in comparison to Associate Professor/Full Professor scores (M = 23.92), and the ANOVA for Dimension 7 (Competence) by teaching disciplines was not statistically significant (p = .32) indicating that there were no significant differences in Competence scores by teaching disciplines.

To address Research Question 4, independent samples t-tests were conducted to assess for differences in the dimensions by years of experience. The t-test for Dimension 1 (Learning Preference) by years of experience was not statistically significant (p = .071) indicating that there were no significant differences in learning preference scores by years of experience. The t-test for Dimension 2 (Institutional Training) by years of experience was not statistically significant (p = .293) indicating that there were no significant differences in training scores by years of experience. The t-test for Dimension 3 (Frequency) by years of experience was statistically significant (p = .041) indicating that there were significant differences in frequency scores by years of experience. Participants who had 6 years or less (M = 18.40) of experience had higher frequency scores in comparison to participants who had 7 or more years of experience (*M* = 16.38). The *t*-test for Dimension 4 (Attitude) by years of experience was not statistically significant ($p = .064$) indicating that there were no significant differences in Attitude scores by years of experience. The *t*-test for Dimension 5 (Willingness to Attend PD Training) by years of experience was not statistically significant ($p = .102$) indicating that there were no significant differences in Willingness to attend PD Training scores by years of experience. The *t*-test for Dimension 6 (Willingness to Use) by years of experience was not statistically significant ($p = .176$) indicating that there were no significant differences in Willingness to Use scores by years of experience, and the *t*-test for Dimension 7 (Competence) by years of experience was not statistically significant ($p = .078$) indicating that there were no significant differences in Competence scores by years of experience.

To address Research Question 5, independent samples *t*-tests were conducted to assess for differences in each dimension by gender. The *t*-test for Dimension 1 (Learning Preference) by gender was not statistically significant ($p = .325$) indicating that there were no significant differences in Learning Preference scores by gender. The *t*-test for Dimension 2 (Institutional Training) by gender was not statistically significant ($p = .631$) indicating that there were no significant differences in training scores by gender. The *t*-test for Dimension 3 (Frequency) by gender was not statistically significant ($p = .757$) indicating that there were no significant differences in Frequency scores by gender, and the *t*-test for Dimension 4 (Attitude) by gender was not statistically significant ($p = .245$) indicating that there were no significant differences in attitude scores by gender. The *t*-test for Dimension 5 (Willingness to Attend PD Training) by gender was not statistically significant ($p = .412$) indicating that there were no significant differences in Willingness to Attend PD Training scores by gender. The *t*-test for Dimension 6

(Willingness to Use) by gender was not statistically significant (p = .663) indicating that there were no significant differences in Willingness to Use scores by gender, and the t-test for Dimension 7 (Competence) by gender was not statistically significant (p = .595) indicating that there were no significant differences in Competence scores by gender.

Conclusions

This study was an examination of current use of smart mobile devices for instruction by community college faculty. The dependent variables were the seven dimensions on the survey: Learning Preference, Institutional Training, Frequency, Attitude, Willingness to Attend PD training, Willingness to Use, and Competence. Independent variables were generational age, gender identity, teaching rank, tenure status, geographical region, teaching discipline and years teaching.

There were no significant different differences in Learning Preference (Dimension 1) by generational age, years of teaching (experience), or gender of the professor. However, Dimension 1 scores were significantly different by teaching rank, tenure status, region or teaching discipline of the professor. Faculty members choices to learn how to use a smart mobile device included the following survey items: 1) self-explore/discovery, 2) family member, 3) friends, 4) colleague, 5) professional development (PD), 6) YouTube/tutorials, and 7) store training.

Institutional Trainings (Dimension 2) provided by institutions in the use of smart mobile devices was not significantly related to faculty members' years of teaching (experience) or gender, but it was significantly related to generational age, teaching rank, tenure status, and teaching discipline. Receiving professional development training for usability of smart mobile devices by faculty members' institution included the following survey items: 1) as a teaching tool, 2) as a learning tool, 3) as a collaboration tool, 4) as a communication tool, 5) as a workforce development tool, and 6) as a productivity tool.

Faculty members' Frequency (Dimension 3) in use of smart mobile devices was not significantly related to generational age, academic rank, teaching discipline, years teaching or gender. Frequency of use included the following items: 1) as a teaching tool for lecture delivery and polls, 2) for apps within a teaching discipline, 3) for productivity (word processing, presentations, calendar, etc.), 4) for communication and collaboration with students and colleagues, 5) to access learning management system, and 6) for personal/non-teaching, i.e. Games.

The Attitude (Dimension 4) of professors regarding their use of smart mobile devices was not significantly related to generational age, academic rank, teaching disciplines, years teaching (experience), or gender. Attitude towards using smart mobile devices included the following survey items: 1) smart mobile devices and apps enhance teaching curriculum, 2) smart mobile devices and apps are distractions in the classroom, and 3) Web 2.0 tools such as social media are not useful instructional tools.

Professors' Willingness to Attend professional development training (Dimension 5) for using smart mobile devices was not significantly related to generational age, academic rank, teaching disciplines, years of teaching (experience), or gender. Willingness to Attend smart mobile device training included the following survey items: 1) best practices using smart mobile devices and apps as teaching tools, 2) best practices in-service training for smart mobile devices and apps to enhance learning, and 3) best practices for using smart mobile devices and apps as workforce tools.

Faculty members' Willingness to Use (Dimension 6) smart mobile devices was not significantly related to generational age, academic rank, teaching discipline, years of teaching (experience), or gender. Willingness to Use smart mobile devices included the following survey items: 1) Do not want to use a smart mobile device, 2) Do not see any benefits for education, 3) smart mobile devices are too expensive, 4) Cannot find apps that align with my text and curriculum, and 5) Do not need to use smart mobile device in my discipline.

Last, the teaching staff's self-rating of Competency (Dimension 7) in using of smart mobile devices was not significantly related to generational age, academic rank, teaching discipline, years of teaching (experience) or gender. Competency included the following survey items: 1) as a teaching tool, 2) as a learning tool, 3) as a research tool, 4) as a communication tool, 5) to find Open Educational Resources (OER), 6) to use ADA, assistive technology features, 7) to use social media and Web 2.0 pedagogical tools, and 8) to use as a workforce development tool.

The findings indicated that there were significant differences in professional development training scores by generational age, and by academic rank. There were significant findings in learning preference by teaching discipline and training by teaching disciplines. Last, there were significant differences in frequency scores by years of experience. These significant findings and differences in scores may be due to the skill of the professors to use smart mobile technologies, their digital literacy, and the skills they possess or lack to integrate into their teaching (Mac Callum et al., 2014). Melton (2016) and Torrence (2016) each specifically reported that although faculty wanted to use (smart and other) mobile devices, many lacked professional development training to use them. Additionally, when professors resist, adopt, or integrate mobile technology in their teaching curriculum, as some indicated in this study, two factors tend to influence the professor’s use and perception of that technology: perceived usefulness and the perceived ease of use (Mac Callum et al., 2014). For the present study, professors’ perceptions of ease of use and usefulness were gleaned by their answers to research questions relating to their attitudes towards using smart mobile devices, the willingness to use them, their frequency of use, self-rated competency, and willingness to attend best practice PD trainings. Some faculty members still lack self-efficacy in the usage of smart mobile devices and apps for their teaching discipline. The results reflect elements of technology adoption proposed in the Technology Acceptance Model (TAM) Hauptman (2015). Digital literacy, information and communication technology (ICT) anxiety and ICT teaching self-efficacy, as well as professors’ beliefs and attitudes influence the adoption of technology in their courses, all provide possible reasons for the significant findings indicated in this study (Chiu & Churchill, 2016). Previous studies (i.e. Macharia, 2011) found that age and gender are factors in technology use, however my study found no significant differences in technology use based on gender.

Consistent with previous studies (i.e. Grant & Gikas, 2011) the present study showed that professors’ attitude regarding social media are mixed. However, what changed is that more professors (n=41) perceived Web 2.0 tools for instruction such as social media positively than negatively (n=28), as they had indicated in previous studies cited in research by Grant and Gikas (2011). However, the some (n=21) remain uncertain. The present study indicates that professors regard smart mobile devices as distractions in the classroom, even though they agree that the devices enhance their teaching curriculum (for teaching and learning). Prior studies (i.e. Kopcha, 2012) indicated a rejection of smart mobile device use for instruction. The studies showed early adopting professors embraced mobile technology use for instruction, while others rejected or expressed reluctance or apprehension in using them (Al-Emram, Elsherif, & Shaalan, 2016;

Baran, 2014). The present study revealed that professors (n=54) felt smart mobile devices were a distraction in the classroom and some (n=8) were undecided about them being distractions. Most professors (n=63) felt that smart mobile devices enhance teaching and learning, while fewer (n=13) did not agree the devices enhance teaching and learning. Some (n=14) were undecided.

Consistent with previous studies and polls (i.e. Danford, 2015a,b,c; Novak, 2014; Pearson Harris Polls 2014 & 2015; Pew Research Center, 2018) most professors own a smart phone. However, more educators feel less competent or not competent at all in using them as teaching tools than competent or very competent using them. Almost all indicated higher competency ratings in using their smart mobile device as a communication tool than in any other category of usage (instruction, research, ADA features, workforce development, finding OER resources, or social media). The findings of the present study remain consistent with previous ones (i.e. Novak 2014) that many Tennessee professors were not using mobile devices in their curriculum, thus students were under-utilizing them in their instruction. When asked about their frequency of use of smart mobile devices as teaching tools and for apps in their teaching discipline, few professors answered “Always” (n= 2) or “Often” (n=5). The majority answered either “Occasionally,” “Almost Never,” or “Never.” Perhaps in recognizing their needs for additional skills in using smart mobile devices as instructional devices, professors indicated they were willing to attend best practice professional development training for using smart mobile devices and apps as teaching tools, enhancing learning for learners and for using them for workforce development tools.

In comparison, those who were willing to use smart mobile devices out-numbered those who did not. This observation differs from the past research (Novak, 2014). In fact, more professors now than in past studies on Tennessee professors indicated that see benefits in using smart mobile devices. The challenge that remain in both past and the current study is that some professors still find difficult to find in their discipline, and that they are expensive.

Recommendations for Practice

The following recommendations for practice are suggested. Professors reported that they are open to professional development training and some reported that they lack some skills to execute best practice use of smart mobile devices. More professional development training for mobile devices and best practices should be follow. Professional development that applies effective methods in using mobile devices and apps to improve self-efficacy and skills building is needed. Perhaps, with the ongoing COVID 19 pandemic the professional development training will need to be provided in an online format.

Recommendations for Further Research

The following recommendations for further research are suggested. The present research is on the use of smart mobile devices and recognizes that some faculty are open to professional development for best practices in using their smart mobile device, while others report not feeling competent in using them as teaching tools. An extended scope of empirical research into the efficacy of methods using smart mobile devices is needed, particularly focusing on scribing and outlining best practices for using smart mobile devices to improve faculty engagement with smart mobile devices. A study of Post COVID-19 use of smart mobile devices by faculty is also recommended. There may be some differences in smart mobile device use because COVID-19 has forced professors to teach online. This change occurred after the data collection for the present study. Research regarding smart mobile device use by faculty is recommended to include all community colleges in Tennessee; research regarding smart mobile device use by faculty in wider geographical areas in the U.S. is recommended. Other recommendations include qualitative research that includes interviews with faculty regarding their device use; and research on the relationship of online teaching experience and the use of smart mobile devices as a teaching tool is recommended.

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APPENDICES

Appendix A: Use of Smart Mobile Devices by Community College Faculty Survey

Thank you for agreeing to participate in this East Tennessee State University Doctoral study as part of my completion requirements for the Higher Education Leadership Ed.D degree program.

The purpose of this survey is to determine attitudes towards and feasibility of educators using mobile devices and educational applications (apps) for teaching. Your participation in this survey is voluntary and would be very much appreciated. Your responses will be kept confidential as well as anonymous.

For the purpose of this survey, the definition of a mobile device is a handheld device, handheld computer or pocket-sized computing device, typically having a display screen with touch input and/or a miniature keyboard, specifically a smart phone, iPad, Android or Windows tablet.

This survey contains 14 questions will take 10 minutes to complete. Should you have questions about this survey, please contact Denise Malloy at MalloyD@etsu.edu.

1. Please select your generational birth range
( ) Generation Y (Millennials) 1977 – 1995
( ) Generation X 1965 – 1976
( ) Baby Boomers 1946 – 1964

2. Please select your teaching rank
( ) Instructor ( ) Assistant Professor ( ) Associate Professor ( ) Full Professor ( ) Other (specify) _________________

3. Please indicate your sex.
( ) Female ( ) Male ( ) Prefer not to say ( ) Other Identify

4. Please select the area of your teaching discipline from the dropdown menu.
( ) Athletics/Sports ( ) Business ( ) Computer Science ( ) Education ( ) Engineering IT/Math
( ) Humanities (History, English, Philosophy, Languages, Literature, Art/Fine Arts
( ) Medical/Nursing/Allied Health ( ) Natural Sciences
( ) Social Sciences (Sociology, Psychology, Economics, Political Science
( ) Earth Science (geology, meteorology, oceanography, and astronomy)
( ) Workforce Training / Certifications / Continuing Ed (non-degree seeking)
( ) Other (specify) __________________

5. Please select range of number of years teaching
( ) 0-5 ( ) 6-11 ( ) 12-17 ( ) 18 or more

6. Please check all smart mobile devices that you use from the list below.

( ) Andriod Smartphone ( ) Android Tablet ( ) iPhone ( ) iPad ( ) Google Pixel Smartphone
( ) Windows Smartphone ( ) Windows Tablet ( ) Other (specify) _____________________

7. I prefer learning to use smart mobile devices by

	A	**VF**	**O**	**R**	**VR**	**N**
Self-exploration & discovery						
Family members						
Friends						
Co-worker (colleague)						
Formal Professional Development Training						
YouTube / Tutorial lesson						
Commercial store training where you purchased device						

Always | **V**ery **F**requently | **O**ccasionally | **R**arely | **V**ery **R**arely | **N**ever

8. I have been trained by my institution to use smart mobile devices..

	Extensive Training	Some Training	Very Limited Training	No Training
As a teaching tool				
As a learning tool				
As a collaboration tool				
As a communication tool				
As a workforce tool				
As a productivity tool				

For the purposes of this survey, an educational app is an application that is designed to provide downloadable educational content or activities to a mobile device (cell phone, tables, etc.,) for supporting teaching disciplines or students' programs of study.

9. Please indicate your frequency of use of your smart mobile device

	N	**AN**	**OS**	**AE**	**ET**
as a teaching tool, for lecture delivery, polls					
for apps for my teaching discipline					
for productivity (word processing, presentations, calendar, etc.)					
for communication & collaboration with students and colleagues					
to access and use our learning Management System					
for personal/non-teaching, i.e. games					

Never **|** **A**lmost **N**ever | **O**ccasionally-**S**ometimes | **A**lmost **E**very time | **E**very **T**ime

10. Please indicate your attitude towards using smart mobile devices

	SD	D	Sd	NAD	Sa	A	SA
Smart mobile devices and apps impede my teaching curriculum							
Smart mobile devices and apps do not enhance my pedagogy							
Web 2.0 tools such as social media are not useful pedagogical tools on smart mobile devices							

Strongly **D**isagree | **D**isagree | **S**omewhat **d**isagree | **N**either **a**gree nor **D**isagree | **S**omewhat **a**gree | **A**gree | **S**trongly **a**gree

11. Please indicate your willingness to attend professional development training in use of smart mobile devices for the following:

	SD	D	Sd	NAD	Sa	A	SA
"Best practices" for utilizing smart mobile devices and apps as teaching tools.							
Best practices" in-service training for utilizing smart mobile devices and apps to enhance learning							
Best practices" for utilizing smart mobile devices and apps as workforce tools							

Strongly **D**isagree | **D**isagree | **S**omewhat **d**isagree | **N**either **a**gree nor **D**isagree | **S**omewhat **a**gree | **A**gree | **S**trongly **a**gree

12. Please indicate your willingness to use smart mobile devices

	SD	D	Sd	NAD	Sa	A	SA
I want to use a smart mobile device in my teaching							
I see benefits in using smart mobile devices for educational purposes							
Cost of smart mobile devices to students is an issue							
I would like to find apps that align with my textbook & curriculum							
Smart mobile device can be useful in my discipline							

Strongly **D**isagree | **D**isagree | **S**omewhat **d**isagree | **N**either **a**gree nor **D**isagree | **S**omewhat **a**gree | **A**gree | **S**trongly **a**gree

13. Please rate your competence in using mobile devices for the following activities

	VC	C	SC	NC
As a teaching tool				
As a learning tool				
As a research tool				
As a communication tool				
To find Open Education Resources (OER)				
To use ADA, assistive technology features				
To use social media and Web 2.0 pedagogical tools				
To use as a workforce development tool				
Finding and using apps within my teaching discipline				

Very **C**ompetent | **C**ompetent | **S**omewhat **C**ompetent | **N**ot **C**ompetent

Appendix B: Survey Cover Sheet

Use of Smart Mobile Devices by Community College Faculty survey

Greetings Colleagues:
This survey instrument, Using Smart Mobile Devices for Teaching, is for a dissertation study on full-time faculty members' use of smart mobile devices for teaching. This study is in fulfillment of an Educational Leadership doctoral degree program at East Tennessee State University. It is pertinent to full-time faculty awareness and utilization of smart mobile devices and mobile apps as teaching tools for community colleges. You have been chosen to take the survey because you are full-time faculty. Your honest and accurate participation is vital, as the results of the study may aid in faculty professional development sessions or incentivize additional research on the topic. The survey will take approximately five minutes of your time. Please know your responses will be respectfully treated with the highest degree of confidentiality and anonymity.

Directions:
Please check the box below to indicate your informed consent to participate in the study and then click NEXT to go to the next page to begin the survey. Then please click SUBMIT at the end of the questionnaire after you have answered all the questions, leaving no questions unanswered. Should you wish to obtain survey results, or if you have questions about the survey, please contact me at dmalloy@southwest.tn.edu

Thank You
I appreciate your completing this survey! Please begin the survey on the next page.

( ) *Yes, I give my informed consent to participate in this study.
*Consent Box Must be Checked to Proceed

Appendix C: Email Invitation to Participate

Hello, my name is Denise Malloy.

I am a doctoral candidate at East Tennessee State University (ETSU) doing a research study on full-time faculty attitudes towards and utilization of mobile devices for teaching and curriculum development. I am looking for full-time faculty members, of all ranks, tenured, and non-tenured. My online survey takes three minutes (four if you include reading the letter of informed consent). Your participation is voluntary, anonymous, and necessary for the completion of my degree program. Your participation is greatly appreciated. You can access my survey using this link: https://forms.gle/4P5SosKj8Vt8zjto9. If you have any questions please contact me at **dmalloy@tnstate.edu or (901) 358-1384.** A copy of my letter of informed consent is attached to keep for your records.

Thank you in advance for your contribution to my scholarship.

Best Regards, Denise Malloy

Reminder Email Request to Participate

Hello, my name is Denise Malloy.

I am a doctoral candidate at East Tennessee State University (ETSU) doing a research study on full-time faculty attitudes towards and utilization of mobile devices for teaching and curriculum development. I am looking for full-time faculty members, of all ranks, tenured, and non-tenured. My online survey takes three minutes (four if you include reading the letter of informed consent). Your participation is voluntary, anonymous, and necessary for the completion of my degree program. Your participation is greatly appreciated. You can access my survey using this link: https://forms.gle/4P5SosKj8Vt8zjto9. If you have any questions please contact me at **dmalloy@tnstate.edu or (901) 358-1384.** A copy of my letter of informed consent is attached to keep for your records. If you have already completed the survey, please disregard this email.

Thank you in advance for your contribution to my scholarship.

Best Regards,
Denise Malloy

VITA

DENISE S. MALLOY

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	M.A. Sociology University of Memphis, Memphis, Tennessee, 1995
	B.A. Communications, Memphis State University, Memphis, Tennessee, 1992
Professional Experience:	Executive Director HBCU C2, Tennessee State University, National Center for SMART Technology Innovations, Nashville, TN 2019 – Present
	Professor, Sociology Southwest Tennessee Community College, Memphis, TN 1996 - 2019
Consultant & Trainer:	TN State University Graduate & Prof. Studies, Nashville, TN 2019 - Present
	SW TN Community College, Memphis, TN 2010-2019
	TN Board of Regents Ofc. Emerging Tech, Nashville, TN 2011-2017
	University of Memphis, Advanced Learning Center Memphis, TN 2006 -2010
Leadership:	Apple Community Education Initiative co-collaborator for HBCUs
	Apple Leadership and Learn Academy, Phoenix Arizona
	Hewlett Foundation Diversity, Equity & Inclusion Leadership Team
	TN Board of Regents Mobilization, Emerging Technology Executive Board Member
	TN Board of Regents Strategic Mobilization Planning Committee
	TN Board of Regents Faculty Mentor