TECHNOLOGY INTEGRATION SELF-EFFICACY REFRAMED THROUGH THE ISTE STANDARDS: AN INVESTIGATION AMONG URBAN K-12 TEACHERS

by

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A dissertation

submitted in partial fulfillment

of the requirements for the degree of

Doctor of Education in Educational Technology

Boise State University

May 2020

BOISE STATE UNIVERSITY GRADUATE COLLEGE

DEFENSE COMMITTEE AND FINAL READING APPROVALS

of the dissertation submitted by

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Dissertation Title: Technology Integration Self-efficacy Reframed Through the ISTE Standards: An Investigation Among Urban K-12 Teachers

Date of Final Oral Examination: 18 March 2020

The following individuals read and discussed the dissertation submitted by student Frank C. Gomez Jr., and they evaluated his presentation and response to questions during the final oral examination. They found that the student passed the final oral examination.

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DEDICATION

I dedicate this dissertation

to my mother, Delvorine Audinett.

No doubt her unconditional love,

tireless sacrifice, unrelenting support, and intercessory prayers

brought me to where I am today.

ACKNOWLEDGEMENTS

"Education is evolving due to the impact of the Internet. We cannot teach our students in the same manner in which we were taught. Change is necessary to engage students not in the curriculum we are responsible for teaching, but in school. Period."

—April Chamberlain

Boise State University (BSU) has been an ideal institution for me to pursue my research, academic, and teaching interests as I strive to not only be the best educator I can be, but also research ways of improving how others are being educated and impacted by the ubiquitous technology inside of schools. As a metropolitan research institution of higher learning, BSU challenges scholars to rethink educational practices, debunk educational neuromyths, demystify the gaudy exceptionalism of technology, and question how educational services are being delivered. In fact, it behooves me not to mention as Thomas Sowell once penned, "It takes considerable knowledge just to realize the extent of your own ignorance." By this metric, I feel confident in saying the faculty in the Department of Educational Technology at BSU has made me considerably a more knowledgeable person, more of a positive thinker, more of a reflective practitioner, more of an activist in deep thinking...and, by extension, a more resolved and well-rounded soul. Without further ado, I would like to acknowledge and thank several (but by no means all) of the people who aided me along this examined path and life journey.

First and foremost is my dissertation committee. To my research chair/advisor, Dr. Jesús Trespalacios, it was always comforting to know I could turn to you for feedback, advice, and support with my research. Thank you for believing in me from application to graduation. To my committee members, Dr. Yu-Chang Hsu and Dr. Dazhi Yang, thank you both for your astute feedback and support in the development of my dissertation. The sacrificial giving of your time to graciously serve on my dissertation committee is much appreciated. To the doctoral program co-coordinators, Dr. Ross Perkins and Dr. Patrick Lowenthal, as well as former co-coordinator, Dr. Lida Uribe-Flórez, thank you all for everything. Your course facilitation, support, and guidance have been priceless in getting me through the doctoral program in EdTech. Thank you for providing me with the support and direction I needed throughout my doctoral studies. Without this, I am certain I would have gotten off tracked, if not lost (many times!).

Unapologetically, I consider myself extremely fortunate to have had so much support from colleagues and others while pursuing my doctoral studies. Thank you to the principal of my employment and immediate supervisor, Mrs. Lynnette Lino, for your support and understanding of the arduous workload of a doctoral student as well as the patience in providing me the necessary space to experiment intermittently with digital tools in the name of technology integration. Also, without participants, this study would not have been possible, literally. My gratitude goes out to the teachers who voluntarily gave their time to complete the online surveys on multiple occasions as I pre- and piloted-tested my research instrument and, subsequently, conducted the survey data collection for this dissertation study. It is not an understatement to say that my doctoral study at BSU would not have gotten off the ground and thrive without the gracious assistance of Ms. Shannon Tabaldo, of the iDEAL Institute fame, who not only suggested the program to me but at multiple points provided support to further my research projects.

To my students, present, past, and those to come, you keep me young, intellectually curious, and optimistic. Thanks for trusting me as your lead learner.

Next, I am forever appreciative for the love, guidance, and support shown by my family and friends throughout my educational pursuits and life journey. To my mother, my first teacher and the source of the blueprint for the person that I am today, Ms. Delvorine Audinett, much appreciation for your unconditional love, sacrifice, support, and prayers. Thank you to my fellow educator *par excellence* and comrade, Dr. Matthias Vairez Jr., for your unwavering confidence in my capabilities. Your support and lifelong friendship have been second to none. Most certainly, I am grateful for my friend and biggest fan, Ms. Indira Chavarria, who was instrumental in multiple ways—from editorial assistance to moral support to words of encouragement and prayerful offerings. Thanks to my late dad, Mr. Frank Gomez Sr., for always encouraging me to be confident and embrace challenges as opportunities for growth; in a word, to be a resourceful problem solver—who knew my dissertation would explore the efficacy of this very topic (though in an instructional context)? A personal acknowledgment goes to my 'school sister' and friend, Ms. Selma Augustine, for her steadfast support and genuine friendship. Thank you for always looking out for me. Teaching for the last decade and three-eighths would not have been as much fun without you!

To my former undergraduate advisor, Dr. Paul Hoyt-O'Connor, who saw a spark of intellectual curiosity in my eyes when I did not see it fully, or saw mostly hazy self-doubt, in the mirror; thanks for stoking its flame through your mentorship and continued friendship. Next, to my fellow educators and colleagues at 'our special place' of employment, I appreciated your check-ins, votes of confidence and well wishes as I

endured the hardship of completing a doctoral program. No doubt, I have been so fortunate to work with so many awesome scholars and peers at Boise State University. Thank you to my doctoral cohort of 2016. I have enjoyed so much learning from and with you. Thank you for joining me on my crowning journey to deepen my own curiosities about learning, technology, evidence-based pedagogy, and research as a catalyst for solving educational issues. To read research literature deeply—and labor knee deep in this investigatory process—is to be challenged, and to emerge changed. May we continue to be 'salt and light' to those we serve and pillars of hope to those who cross our paths!

And finally, let me hasten to thank the Most High for the gifts bestowed upon me, and for the opportunities to be 'salt and light' to others! It is in reflective moments like these that Matthew 5:13-16 resonates: "You are the salt of the earth. ...You are the light of the world…let your light shine before others." And when it does, when you let the light, or lights, inside of you come on, as James Altucher reminds us, "everyone in the world can see a little better." Light is life and life is a felt feeling of connectivity—with the Most High and those around us including the digital world. Truly, with rapid technological advancement and our omnipresent and permanently connected screens and displays, this might just be the most exciting and promising time to be alive in human history! To paraphrase Walt Whitman (and echo the fictional John Keating), you are here—that 21st-century life exists, and technology, the most powerful programmatic viral play ever devised by humankind goes on and you, my friend, may contribute an algorithmic verse. What will you code, hack, tinker with, or post? *Carpe diem!*

ABSTRACT

Utilizing a descriptive research design and a theoretical framework based on self-efficacy theory (Bandura, 1997), this quantitative study examined self-efficacy as a factor on teachers' technology use and integration efforts in urban K-12 classroom settings of 327 Catholic school teachers in Southern California. To measure teachers' self-efficacy in using and integrating technology in the classroom, this study employed an online survey that included the Technology Integration Confidence Scale (TICS) version 3, an instrument developed by the researcher which is aligned to the ISTE (2017) Standards for Educators, and seven key demographic questions. Chief among these is the frequency of technology-oriented professional development (PD) training sessions teachers received.

This study's findings revealed that, on average, participating teachers had a fair level of confidence (i.e., they are fairly but not highly confident) in both using and integrating technology (M = 3.2, SD = .73). Furthermore, the research analysis confirmed that participating teachers' self-efficacy was a crucial factor in effectively using and integrating technology in their teaching practice based on the ISTE (2017) Standards for Educators. Accordingly, the current study established participating teachers' level of confidence in using and applying technology through continuous PD intervention as a key implication that influenced teachers' self-efficacy in leveraging technology for professional practice. Limitations and applicability of future studies are also addressed.

Keywords: Technology use, technology integration, ISTE Standards for educators, Technology Integration Confidence Scale, self-efficacy, TPACK, 21st-century teaching, professional development, Web 2.0 tools, urban education, Catholic school teachers.

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LIST OF ABBREVIATIONS

1:1	One-to-One
4 C’s	Creativity, Critical Thinking, Communication, and Collaboration
AECT	Association for Educational Communications and Technology
AR	Augmented Reality
CAI	Computer-Aided Instruction
EFA	Exploratory Factor Analysis
HMH	Houghton Mifflin Harcourt
HTML	Hypertext Markup Language
IRB	Institutional Review Board
ISTE	International Society for Technology in Education
K-12	Kindergarten through 12^{th} Grade
NETS-T	National Educational Technology Standards for Teachers
OECD	Organisation for Economic Cooperation and Development
PCK	Pedagogical Content Knowledge
PD	Professional Development
PLN	Personal Learning Network
RQ	Research Question
STEM	Science, Technology, Engineering, and Mathematics
TA	Technology Application
TGER	The Glossary of Education Reform

TICS	Technology Integration Confidence Scale
TIL	Technology-infused Learning
TLDC	Technology Literacy & Digital Citizenship
TPACK	Technological Pedagogical Content Knowledge
TPK	Technological Pedagogical Knowledge
TSA	Technology-supported Assessment
TSE	Technology Self-Efficacy
TU	Technology Usage
VR	Virtual Reality
WASC	Western Association of Schools and Colleges
WCEA	Western Catholic Education Association

CHAPTER ONE: INTRODUCTION

With the advent of the Social Web or "Web 2.0" (O'Reilly, 2005), the traditional model of unidirectional instruction has been increasingly set aside in preference to innovative approaches that utilize digital multimedia and technology integration (Brown, 2012; Clark & Mayer, 2016). Digital technology presents new possibilities for living, as well as learning inside the classroom (Clark & Mayer, 2016; Kay, 2006; Paus-Hasebrink, Wijnen, & Jadin, 2010). New media has had a growing impact on most aspects of human endeavor, including that of education where, over the last decade, the availability of technology has significantly increased in schools at all levels (Howard, 2013; Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). This digital technological revolution in schools, going back to the Computer-Aided Instruction (CAI) of the early 1980s (Kaousar, Choudhry, & Gujjar, 2008), started with personal computers, then desktop computers, networks, laptops, interactive whiteboards, and wireless overhead projectors to today's personalized and wearable smart devices with cutting edge virtual worlds in the form of virtual reality (VR) and augmented reality (AR) capabilities (Gerver, 2018). Digital devices, such as laptops, tablets, and smartphones, have opened up a plethora of possibilities that could facilitate effective teaching (Clark & Mayer, 2016; Sadaf, Newby, & Ertmer, 2016).

However, it must be pointed out that though technology usage is widespread, technology integration in education has not kept pace (Capo & Orellana, 2011; Deye, 2015; Gouseti, 2013; Warham et al., 2017). As the number of schools moving towards or adopting a one-to-one (1:1) teaching environment increases, teachers have greater access to technology; yet, teachers are not capitalizing on this opportunity to optimize and effectively integrate technology into curriculum (Slutsky, 2016). Teachers may be exposed to technological devices that inform, such as mobile devices, but that does not necessarily translate into technological knowledge needed to perform and instruct using technology as an application or extension to support learning (Clark & Mayer, 2016; Koehler & Mishra, 2009). The choice of instructional methods to drive learning performance and activities depends on a multitude of factors including student age, prior knowledge, content and conceptual understanding of subject matter, as well as teachers' knowledge and skills (Roehrig, Kruse, & Kern, 2007; Straub, 2009). As Ertmer and colleagues (2012) recognized, the selected methods of instruction depend on the teacher's exposure to or prior pedagogical training of 21st-century teaching and their repertoire of applicable or related technological skills (for example, whether they are familiar with the device or software application). Therefore, teaching with technology in an effective manner requires its own multifaceted skillset and technology self-efficacy (Ertmer & Ottenbreit-Leftwich, 2010).

According to Kent and Giles (2017), a credible indicator, or meaningful predictor, of a teacher's ability and willingness to engage learners through innovative 21st-century instruction is self-efficacy of technology integration. These authors are not alone in this regard. There is growing evidence suggesting teachers' own beliefs in their capacity to effectively integrate technology are a significant factor in determining actual technology use and implementation in the classroom (Albion, 1999; Bauer & Kenton, 2005, Ertmer & Ottenbreit-Leftwich, 2010; Holden & Rada, 2011). Given the changing context of teaching coupled with the robust research findings that technology integration for meaningful classroom use remains among the greatest challenges facing today's teachers (Cennamo, Ross, & Ertmer, 2010; Fioriello, 2011; Slutsky, 2016), there is a need to investigate the association between teachers' technology self-efficacy and their ability to effectively use and integrate technology in their teaching practice.

The Primacy of Technology Self-efficacy

Technology, contrary to popular perception and widespread belief, is not necessarily one thing but many things that can be woven into the classroom or instructional environment by a skilled teacher (of technological-pedagogical knowledge) to assist and enhance the teaching process (Lawless & Pellegrino, 2007). As Ross, Morrison, and Lowther (2010) recognized, "educational technology is not a homogeneous 'intervention' but a broad variety of modalities, tools, and strategies for learning" (p. 19). However, an emergent problem arises when teachers are not provided regular and relevant opportunities to learn new practices and skills to use and implement technology (An & Reigeluth, 2012; Warham et al., 2017), or receive support that does not fully take into consideration current research on human cognitive learning processes when using technology (Clark & Mayer, 2016). Proficient teaching occurs when teachers follow an approved curriculum by leveraging self-efficacy, relevant pedagogy, and available resources including technology in ways that best support student learning (Anderson & Maninger, 2007; Anderson, Groulx, & Maninger, 2011; Teo, 2009). Thus, creating an effective 21st-century learning environment for students requires administrators provide teachers with access to adequate professional development (PD) training sessions and conform available resources to a technology-rich curriculum aligned with standards. Research finds that teachers who receive such professional support increase their self-efficacy, giving them the confidence to increase their instructional competencies including the use and integration of technology (Brinkerhoff, 2006).

Teachers' technology integration self-efficacy could also be factored into the learning calculus since improving teaching and learning practices with technology is not about replacing traditional teaching but rather reflecting on what works and enhancing it (Gallagher, 2018). Effective instructional technology integration results from positive teacher-efficacy and is precipitated upon technological knowledge coupled with a willingness to innovate (Gallagher, 2018; Koehler & Mishra, 2009; Moore-Hayes, 2011). For example, Gallagher (2018) shared,

> Instead of assigning only five-paragraph essays...Teachers find that students are more invested in what they write [when] their final product will be in a medium they value: video. Once the essay is written, students use apps like Adobe Spark Video or iMovie to record their voice, add images, and edit them together to create a final product [that is authentic and] worthy of sharing not just with their teacher, but with their classmates [and possibly the world if posted online]. (para. 10)

Consequently, effective teaching occurs when the instructional methods selected are meaningful, relevant, and, as illustrated above, can extend learning in powerful and authentic ways (Banas & York, 2014; Brown, 2012).

As digital devices and online platforms rapidly evolve, teachers will continue to be thrust further into what was once thought of as realms of science-fiction (Clark & Mayer, 2016), such as the three-dimensional worlds made popular by gaming applications, gamification, VR and AR. These virtual worlds offer innovative online environments in which teachers could leverage them as tools for uniquely immersive educational experiences. The instructional potential of these 21st-century devices and platforms as facets for teaching are dependent upon the extent that teachers can successfully apply them in classroom settings (Donally, 2019). These devices and platforms may prove to be beneficial, for both teachers and students, if used in ways that are compatible with human cognitive learning processes and self-efficacy beliefs (Bandura, 1986, 1994, 1997; Clark & Mayer, 2016).

Teachers' Technology Self-efficacy and ISTE Standards

As described in the previous section, teachers' technology self-efficacy (TSE), which concerns the beliefs about their abilities to succeed at a specific task (Bandura, 1997), involves the relevant use and meaningful integration of technological tools to classroom settings. Subsequently, teachers' TSE can increase the effectiveness of the teaching process via technology-supported instruction (Holden & Rada, 2011). To advance this, the International Society for Technology in Education (ISTE, 2017) has developed new technology use and integration standards for educators to better engage student learning and to support teachers' technological and pedagogical competencies. These standards, which go beyond executing technological skills, specifically challenge teachers with integrating technology across the curriculum. The ISTE Standards are intended to serve as a framework for digital age learning, no matter where teachers are on the journey to effective educational technology integration (ISTE, 2018). Hence, the ISTE (2017) Standards for Educators are proffered as a road map to deepen teachers' practice, promote collaboration with peers, and challenge them to rethink traditional approaches as they prepare students to drive their own learning.

With the steady influence of technology on teachers' *modi operandi* in the 21st-century classroom (Kay, 2006), there is a need to investigate teachers' technology self-efficacy to effectively use and integrate technology in their teaching practice. Investigating teachers' TSE requires the examination of teachers' personal beliefs regarding their ability to use digital technology to perform a wide range of specific, yet related technology-supported instructional, tasks (Compeau & Higgins, 1995; Roblyer & Doering, 2010). Through the performance of a task, confidence (i.e., self-efficacy) leads to competence (i.e., expertise); therefore, when teachers think they can do a task, they do it and expertise eventually follows from gradual improvements and successful repetition via the 'confidence/competence loop' (Eikenberry, 2012). Moreover, experiential knowledge of pedagogical decision-making with the use of technology from practice increases teacher confidence in their ability to use technology effectively (Power, 2018).

Technology use and integration is driven by technological skills (abilities) and teacher's confidence (predicated upon a teacher's perception) in using and applying technology in the teaching process. As Bauer and Kenton (2005) confirmed, confidence and skill tend to intertwine for effective instruction with teachers' confidence, or self-efficacy, as one of the best predictors of teachers' technology use. Perceived self-efficacy then benefits both confidence and skill in supporting effective instruction and successful integration of technology within instruction (Albion, 1999; Bauer & Kenton, 2005, Ertmer & Ottenbreit-Leftwich, 2010; Holden & Rada, 2011; Wozney, Venkatesh, & Abrami, 2006). Accordingly, the purpose of this study is to examine self-efficacy as a factor in teachers' technology use and integration efforts in the K-12 classroom setting.

Statement of the Problem

According to Kallick and Zmuda (2017), "educators, overwhelmingly, agree that the 'one size fits all' model of teaching and learning is now behind us" (p. 53), and where it persists, it is commonly perceived as a pejorative applied to archaic educational practices (Willingham, 2018). Technology integration and implementation in schools through the blended learning approach (for example, incorporating online activities into the Station Rotation model) support this shift in learning and teaching (Tucker, 2017). Teaching that uses advances in technology allows teachers to free students from one-size-fits-all instructional mode and enable them to better explore more meaningful cross-curricular pathways (Rebora, 2017). Hence, this reveals the essential questions that go to the heart of the current study: What is the adequacy of teachers' technology self-efficacy to meaningfully use and integrate technology to positively impact student learning and achievement? How do we know if these teachers are confident in their current abilities to use and integrate technology in their classrooms? How do we know if teachers have the skill and motivation to use and integrate technology with understanding and fidelity?

These key questions also suggest that successful integration is in large measure determined by how the technology is deployed and executed in the classroom (Muir, Knezek, & Christensen, 2004; Rebora, 2017), which is frequently influenced by teachers' beliefs, social dynamics, and institutional culture as well as self-efficacy in using and integrating technology (Straub, 2009; Windschitl & Sahl, 2002). By utilizing an instrument (Technology Integration Confidence Scale (TICS) version 3) that was pre- and pilot-tested by the researcher, the current study evaluated fundamental components of teachers' technology efficacy. These interrelated components, namely, (a) technology usage, (b) technology application, (c) technology-infused learning, (d) technology literacy and digital citizenship, and (e) technology-supported assessment are intended to deepen educators' practice, promote collaboration with peers, and challenge educators to rethink traditional approaches (ISTE, 2017). Furthermore, this research instrument, validated by the researcher[1] and predicated upon Browne's (2011) TICS version 2, is aligned to the seven benchmarks of the current version of the ISTE (2017) Standards for Educators. ISTE, a leading global technology-education oriented organization, advocates through its frameworks for students, educators, administrators, coaches, and computer science educators to rethink education and create innovative learning environments for the digital age (ISTE, 2018). TICS, as aligned to the ISTE (2017) Standards for Educators, seeks to measure teachers' self-efficacy in using and integrating technology (students and teachers using technology during instruction) in the classroom.

As the preceding components implied, technology integration efforts further suggest that teachers are able to enact technology integration and pedagogical practices that are closely aligned with their espoused beliefs (Ertmer et al., 2012). As Ertmer and colleagues (2012) emphasize, a teachers' belief about technology integration is one of the strongest factors impacting teacher's actual implementation of technology integration in the classroom. Understanding this predictive factor, not in isolation but in relation to other associated variables such as technical knowledge and skills (Miles, 2013), time to integrate curriculum (Curts, Tanguma, & Peña, 2008), preparation and training (D. Watson, 2006), vicarious experience (Wang, Ertmer, & Newby, 2004), and a strong sense of computer self-efficacy (Teo, 2010) is thus key for technology use and integration as well as 21st-century teaching in the K-12 classroom. Consequently, the measurement of technology self-efficacy via self-reporting of the Technology Integration Confidence

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[1] See Chp. 3 for the survey instrument's psychometric properties and other statistical results confirming its reliability and validity.

Scale is a useful indicator of teachers' confidence to effectively use and integrate instructional technology (Browne, 2011).

Teachers' technology use and integration effort, regardless of the instructional level at the elementary, middle or high school, is a complex, inherently social, developmental process that is influenced by both teacher characteristics and teacher perceptions of school environments (Koehler & Mishra, 2009; Inan & Lowther, 2010; Straub, 2009). However, in light of the current push for innovative teaching, it is important to focus on teachers' technology self-efficacy which not only impacts teachers' skills but also their motivation to implement technology in daily lessons and engage in technology-infused practices. Accordingly, using a survey instrument based on the ISTE (2017) standards to measure self-efficacy, this quantitative study examined urban K-12 teachers' confidence to use and integrate technology in classroom practice (i.e., students and teachers using technology during instruction) to support and advance learning.

Purpose of the Study

The purpose of the current study was to examine self-efficacy as a factor in teachers' technology use and integration efforts, by leveraging Web 2.0 technologies as pedagogical tools, in the urban K-12 classrooms based on the ISTE (2017) Standards for Educators. As Muir, Knezek, and Christensen (2004) noted, successful integration is determined by how the technology is deployed in the classroom as well as the pedagogical model that undergirds the initiative. Classroom deployment of technology is influenced by contextual knowledge (i.e., teachers' beliefs, social dynamics, and institutional culture) as well as self-efficacy in using and integrating technology (Mishra, 2018; Straub, 2009; Windschitl & Sahl, 2002). As exemplified, teachers' technology self-efficacy is impacted by factors beyond their beliefs, which, as Bandura suggested (1994), results from their social and physical environments. Therefore, teacher efficacy as it relates to technology implementation is affected by factors such as school culture, teacher support, and available resources (Straub, 2009; Tschannen-Moran & Woolfolk Hoy, 2001).

Globally, schools in urban settings are larger, tend to benefit from better educational resources, and often enjoy greater autonomy in how they can allocate available resources (OECD, 2013). On the contrary, schools in urban settings in the United States, like those of Southern California, tend to be “heavily populated with culturally and racially diverse learners and has a heavy concentration of English language learners, a large number of poorer students, particularly students of color, high attrition of teachers, heavy institutional and systemic barriers, and meager resources” (Milner, 2006, p. 346). As a result, in urban classroom environments like those included in this study, teachers need to possess an eclectic array of skills and practices that are suitable to a diverse group of students (Lingam, 2010). Within this urban context of schooling, the current study investigated how confident participating Southern Californian urban teachers are in using and integrating technology in the K-12 classroom setting. In the process, the current study evaluated the components of teachers’ technology integration self-efficacy by utilizing a survey instrument (TICS version 3), which was pre- and pilot-tested by the researcher. The instrument examines self-efficacy, confidence, and beliefs of teachers. These constructs, following the self-efficacy framework of Bandura (1997), are used in this study in much the same way as Browne (2011) did in his TICS version 1 and 2, upon which the researcher modelled and developed TICS version 3. Hence, the instrument seeks to measure teachers' confidence to use and integrate technology, which is interpreted as a measure of teachers' self-efficacy and belief in their capacity to leverage technology to perform technological-pedagogical tasks.

Significance of the Study

The current study provided relevant insights and valuable knowledge relating to teacher confidence and competence for technology use and integration in urban K-12 schools. The findings from this quantitative study are intended to be used to better inform school leaders and those supporting the use of technology for effective teaching whether teachers have the skill and motivation to use and integrate technology with understanding and fidelity in the classroom. In the process, the present study sought to inform how professional development (PD) as an intervention can best be aligned with teachers' technology integration needs by facilitating PD in a more focused, practical, and targeted way based on their identified confidence levels to incorporate educational technology. Thus, using the TICS version 3 survey instrument aligned to the ISTE Standards for Educators (2017), the current study measured teachers' self-efficacy levels in carrying out technological-pedagogical tasks concerning technology integration. These tasks are intended to help teachers effectively instruct and empower student learners with skills needed in an increasingly technologically oriented, competitive global economy (Culp, Honey, Mandinach, & Bailey, 2003; Marmer, 2018).

The application of Web-based tools, particularly those used in K-12 education, in support of effective teaching has become much needed if educators are to meaningfully instruct and adequately prepare students for 21st-century life (Brown, 2012; P21, 2007). Subsequently, this research study, using the self-efficacy framework, evaluates if teachers' levels of self-efficacy to integrate various constructs of educational technology is a key reason for having good technology integration (Burden & Hopkins, 2016; Roblyer & Doering, 2010; Warham et al., 2017). Given that Web 2.0 usage is fragmented and lagging in the K-12 classroom setting (Capo & Orellana, 2011; Deye, 2015; Gouseti, 2013), there is a need for further investigation of K-12 teachers' level of confidence to use and integrate educational technology across the curriculum (Rodman, 2018).

As previous studies have acknowledged, if teachers' self-efficacy is a crucial factor in technology integration, then there is a fundamental need not only to assess it but also to understand the mechanisms that may raise teachers' self-efficacy toward technology integration (Anderson et al., 2011; Moore-Hayes, 2011). This research highlights the importance of the current study. What is the adequacy of teachers' technology self-efficacy to meaningfully use and integrate technology so as to positively affect student learning and achievement? Put another way, how do we know if urban K-12 teachers in Southern California are confident in their abilities to use and integrate technology in their classrooms? Accordingly, what PD needs exist for meaningful intervention measures? This current study can contribute to the body of knowledge in the fields of education and educational technology. Furthermore, this present study is intended to be of benefit to teachers (especially in urban K-12 schools), PD trainers, instructional designers and instructional coaches as well as school leaders and leaders of teacher preparation programs.

Theoretical Framework

Self-efficacy, as used in this study, is similar to the everyday understanding of 'confidence,' which is a personal belief about one's own ability to perform a given action or one's own capability to produce a given attainment or mastery (Bandura, 1997; Denzine, Cooney, & MacKenzie, 2005). For example, in terms of integrating technology in the classroom, self-efficacy is concerned with a teacher's perceived ability to incorporate digital tools, such as Web 2.0 technologies, into classroom lessons (action) as well as facilitate meaningful instruction using applicable digital tools (attainment). As illustrated in the previous section, a core task of teachers is instructional decision making, requiring the synthesis of multiple cognitive processes to facilitate innovative teaching in creative and effective ways. Teachers pull from pedagogical knowledge and technological experience to make instructional decisions. Self-efficacy, therefore, plays a critical role in a teacher's level of confidence to integrate technology (Beard, 2016). As Bandura (1997) suggested, a strong sense of self-efficacy is necessary to access skills and knowledge while at the same time remaining focused on the task, for example, integrating technology, in a complex environment such as today's urban K-12 classroom setting.

Successful integration of technology in the K-12 classroom is influenced by teachers' ability in making technological-pedagogical decisions of how, why (or why not), and when to employ technological tools to enhance teaching and student learning, which is predicated upon teachers' self-efficacy in using and integrating technology. Technology self-efficacy is concerned with a teacher's perceived ability to incorporate digital tools, such as Web 2.0 technologies and software applications, into classroom lessons and across the curriculum. As such, technology self-efficacy is preoccupied with the confidence level of an individual when using technology given that it is both task-specific and task-dependent (Albion, 1999; Bandura, 1997; Holden & Rada, 2011).

Hence, using self-efficacy theory and teacher's technology self-efficacy as the theoretical framework and the foundation for teacher's level of motivation, confidence, and actions, the current study examined urban K-12 teachers' confidence to integrate technology in classroom practice.

Research Questions

The purpose of this quantitative study, using the survey method as part of the descriptive research design methodology (Hale, 2018; Jackson, 2009), was to examine self-efficacy as a factor contributing toward teachers' technology use and integration efforts utilizing Web 2.0 technologies as pedagogical tools in the urban K-12 classroom setting. To collect the required data for the current study, an online survey was administered to a random sample of 381 urban K-12 Catholic school teachers from Southern California. Of these, 327 teachers responded fully (n = 327) to the survey[2] with self-reported confidence levels to carry out technology use and integration tasks within their classroom. Data collection and analysis evaluated urban K-12 teachers' level of confidence (i.e., self-efficacy) to operationalize and integrate technology (Research Questions 1 and 2, respectively) in accordance with the ISTE (2017) Standards for Educators. As a result, the present study explored the influence of technology self-efficacy on teachers' level of technology use and integration confidence in urban K-12 settings. Thus, to accomplish the purpose of the current study, the researcher investigated the following research questions (RQs):

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[2] The response rate for completion of the online survey, which is indeterminate (given the data collection process utilized as a result of the levels of gatekeeping that Catholic schools present to access teachers), is explained in Chp. 3.

- **Research Question 1 (RQ1):** What is participating Southern Californian urban Catholic school teachers' level of confidence in using technology?
- **Research Question 2 (RQ2):** What is participating Southern Californian urban Catholic school teachers' level of confidence to integrate technology in the teaching process using the ISTE Standards for Educators?

Assumptions, Delimitations, and Limitations

Whereas this current study offered many promising results, it was not without assumptions, delimitations, and limitations. First, there was an assumption in the research study that the teacher-participants' diverse experiences, environments, backgrounds, and grades taught are represented. Secondly, the researcher expected participants to respond to all survey questions to the best of their abilities so that the data collected was as accurate as possible. Participants who consented but did not complete the entire online survey were not included in the sample size for this study. Thirdly, it was assumed that the factors impacting instructional practices in urban K-12 schools are measurable and the responses by participants on the survey were influenced by the values and attitudes of the teachers at the time of the study. Such allowed for the researcher to use the collected data to positively impact teaching with technology, improve techno-pedagogical practice, and ultimately call for the support teachers need from school leadership to advance the efficacy of instructional and technological prowess.

Furthermore, delimitations of the study included only teachers who were employed where there were computer access and technological resources utilized for instructional purposes and as learning tools. Secondly, the study was opened only to urban K-12 teachers in Catholic schools. Thirdly, the study was restricted to teachers in the geographic location of Southern California. The second and third delimitations may affect the study's generalizability of urban teachers' confidence in leveraging technology.

Subsequently, the researcher recognizes as a limitation that other variables may have impacted teachers' technology usage and integration efforts for instructional purposes and student achievement. While diversity of experiences, environments, backgrounds, and grade levels taught by teachers were represented, the fact that the survey was administered electronically may have limited the sample pool to those who were most comfortable and/or savvy with technology, which could have potentially skewed or distorted the results toward technology usage and integration in Southern California Catholic schools. Also, since it was the call of principals as secondary gatekeepers to invite teachers to complete the online survey, the study was limited to teachers whose principals approved of their participation in the study. Lastly, a key limitation to the study was the disparity of the Southern California public, charter, and private school organizational structures, which may inadvertently limit the findings' generalizability as it relates to how confident teachers are in using and integrating technology in the classroom.

Definition of Terms

To avoid any discrepancy in understanding and misconceptions, the following terms are used in this study as defined and delineated below.

International Society for Technology in Education (ISTE): This is a leading global technology-education oriented organization which has created standards that serve as frameworks for students, educators, administrators, instructional coaches, and computer science educators to rethink education and create innovative learning environments for digital age learning (ISTE, 2018).

ISTE Standards for Educators: These standards, which were published in 2017 by ISTE serve as a framework for digital age learning, no matter where teachers are on the journey to effective educational technology integration (ISTE, 2018), are offered to teachers as road map to deepen their practice, promote collaboration with peers, and challenge them to rethink traditional approaches as they prepare students to drive their own learning (ISTE, 2017).

One-to-one (1:1) Teaching Environment: A technology-rich setting denoting one computer for every student where students use computing devices, such as wireless laptops or tablet computers, in order to learn (TGER, 2013). This term, however, implies more than the preceding since it is not just about technology adoption but rather a paradigm shift in instruction aimed at relevant and deep learning (InCare-K12, n.d.).

Professional Development (PD): In education, this term may refer to a wide variety of specialized training, formal education, or advanced professional learning intended to help administrators, teachers, and other educators improve their professional knowledge, competence, skill, and effectiveness (Great Schools Partnership, 2013). Ongoing and continuous PD opportunities imply that such training sessions are of higher quality (Great Schools Partnership, 2013).

Self-efficacy: Confidence, as it is commonly known, or self-efficacy is the belief in one’s capabilities to achieve a goal or an outcome. As such, this term refers to an individual’s belief in his or her capacity to execute behaviors necessary to produce specific performance attainments (Bandura, 1986, 1994, 1997). Thus, by extension, self-efficacy reflects confidence in the ability to exert control over one's own motivation, behavior, and social environment.

Technology Integration: This is the process of using technology and digital resources such as computers, mobile devices like smartphones and tablets, digital cameras, social media platforms and networks, software and online applications such as Web 2.0 tools, the Internet, etc., in daily classroom practices whereby teachers utilize content and technological-pedagogical expertise effectively for the benefit of student learning (Edutopia, 2007; Lambert, Gong, & Cuper, 2008).

Technology Integration Self-efficacy: This term, premised upon technology self-efficacy (TSE), refers to the belief about one's ability to succeed at a specific task involving the relevant use and meaningful integration of technological tools to classroom settings. Simply put, it is a belief that one can effectively use and apply technology for instructional purposes. It is thus a specific application of the broader and more general construct of self-efficacy, which—given its domain-specificity—is defined as the belief in one's ability to engage in specific actions that result in desired outcomes (Bandura, 1997).

Technological, Pedagogical and Content Knowledge (TPACK): This is a comprehensive term for a framework, built on Shulman's (1986) construct of pedagogical content knowledge (PCK), to include technology knowledge. TPACK involves a fluid and flexible, yet complex, interaction among three bodies of knowledge: Content, pedagogy, and technology. Understanding the dynamics of that interactivity and connection between content and technology, which seeks to inform effective teaching practices, is critical to effective teaching with technology (Mishra & Koehler, 2006; Koehler & Mishra, 2009).

Web 2.0: This is the name used to describe the second generation of the World Wide Web, whereby it moved from being a static entity displaying Hypertext Markup Language (HTML) pages to a more interactive and dynamic Web experience. Web 2.0 signaled a change in which the World Wide Web became an interactive experience between users and Web publishers (Techopedia, 2018). Web 2.0 sites and software applications, including cloud computing, provide users with information storage, creation, collaboration, communication, interactivity, and dissemination capabilities that were not possible in the prior online environment retroactively known as "Web 1.0".

Web 2.0 Tools: These are easy to use Websites or Web applications, commonly referred to as apps, designed to encourage creativity, teamwork, and higher-order thinking skills in the physical or online classroom. Adobe Spark, Edpuzzle, Google Sites, Kahoot!, Prezi, Seesaw, Socrative, VoiceThread, YouTube and Zoom are examples of Web 2.0 tools. Such Websites and digital applications strengthen the curriculum, allow teachers to engage students in their learning, enhance their essential skills, develop spatial intelligence, provide cognitive and metacognitive scaffoldings, reduce proficiency gaps, and permit users to dig deeper and design innovative solutions to problems (Smore, n.d.).

Organization of the Study

This dissertation consists of five chapters. Chapter 1 is the introduction of the study and includes background of the study, statement of the problem, purpose of the study, significance of the study, theoretical framework, research questions, assumptions, delimitations and limitations of the study, and definition of terms that are used in the study as well as the organization of the remainder of the current study.

Chapter 2 provides a comprehensive review of the literature related to the topic and the theoretical framework that guided the research. Chapter 3 describes the research methodology and consists of the research design, the population, instrumentation and the survey instrument developed to capture data, sample and sampling technique, the data collection, and types of analyses. Chapter 4 proffers the presentation of the findings, and Chapter 5 includes the discussion, recommendations for future studies, and conclusions.

CHAPTER TWO: REVIEW OF LITERATURE

Introduction

Digital technologies, like Web 2.0 tools, iPads, Chromebooks, and mobile devices, and new media, such as the Internet, smartphones, virtual worlds, and computer animation, are speedily changing both how students learn inside and outside of schools as well as how they communicate and interact with the world (Sadaf, Newby, & Ertmer, 2012, 2016). Advancements in digital and new technologies along with their corresponding affordances of productivity over the last decade have demanded new ways of integrating current and future technological innovations into the curriculum of K-12 education (Deye, 2015). Progressively, students are expected to harness the power of technology for continuous learning and leverage the benefits of collaboration for meaningful connected interaction. Increasingly, students are required to participate in active and deep learning, build metacognition and critical thinking, in addition to applying knowledge and skills to real-world examples rather than engage in rote memorization and absorbance of facts. In response to these demands supporting standardized testing and 21st-century learning, teachers today are asked to design personalized, customized, and differentiated learning experiences for students compared to the outdated traditional teacher-led approach of ‘one size fits all’ educational model (An & Reigeluth, 2012; Deye, 2015; Tomlinson, 2017).

Subsequently, understanding technology integration efforts, in light of the current emphasis on developing important skills such as the 4 C’s (critical thinking, communication, collaboration, and creativity) of 21st-century learning, suggest that teachers are able to enact technology integration and pedagogical practices closely aligned with their espoused beliefs (Ertmer et al., 2012). As Ertmer and colleagues (2012) affirmed, a teacher's belief about technology integration is one of the strongest factors associated with that teacher's actual implementation of technology in the K-12 classroom. Understanding this predictive factor, not in isolation but against the backdrop of other variables such as technical knowledge and skill (Miles, 2013), time to integrate curriculum (Curts et al., 2008), preparation and training (D. Watson, 2006), vicarious experience (Wang et al., 2004), and a strong sense of computer self-efficacy (Teo, 2010), is critical in understanding teachers' rationale to integrate and be innovative with technology in the K-12 classroom. Hence, the purpose of this literature review is to examine the impact of self-efficacy on teachers' technology use and integration efforts, utilizing Web 2.0 technologies as pedagogical tools, in the K-12 classroom setting.

Self-efficacy Theory and Technology Integration

Successful integration of technology in the K-12 classroom is influenced by many factors including addressing cognitive, emotional, and contextual concerns (Straub, 2009). That is, teachers' ability in making technological-pedagogical decisions of how, why (or why not), and when to use technological tools to enhance student learning. Thus, effective implementation is predicated upon teachers' self-efficacy and confidence in using and integrating technology. Self-efficacy is the 'confidence' in one's own ability to perform a given action or one's own capability to produce a given attainment (Bandura, 1997; Denzine et al., 2005). For example, in terms of integrating technology in the classroom, self-efficacy is defined as a teacher's ability to incorporate digital tools into classroom lessons (action) as well as facilitate collaborative and student-centered learning using applicable digital tools (attainment). As such, self-efficacy is determined by the confidence level of an individual when using technology (Bandura, 1997).

Moreover, self-efficacy, inherently, is task-specific and task-dependent (Albion, 1999; Bandura, 1997; Holden & Rada, 2011). For this reason, a person may exhibit high self-efficacy on one task and low self-efficacy on another. A case in point would be a teacher who demonstrates proficient technology usage of an iPad in her daily life but struggles to effectively and seamlessly integrate tablets and associated Web applications into her classroom lessons. Typically, in terms of integrating technology, these tasks are intended to deepen educators' practice, promote collaboration with peers, challenge educators to rethink traditional approaches and prepare students to drive their own learning (ISTE, 2017). Thus, using self-efficacy beliefs as the foundation for teacher's level of motivation, confidence, and actions, the current study examined self-efficacy as a factor on teachers' technology use and integration efforts in the urban K-12 classroom setting. Therefore, to investigate participants' confidence in technology use and integration, the researcher examined this against the backdrop of self-efficacy theory and teacher's technology self-efficacy (TSE) as the theoretical framework. Bandura's (1997) self-efficacy theory, predicated upon self-efficacy beliefs at its core, serves as the foundation from which teacher's technology self-efficacy, as defined in this study, is developed and advanced.

According to Bandura (1994), the notion of perceived self-efficacy is important given that "efficacious outlook fosters intrinsic interest and deep engrossment in activities" (p. 2), whether they are personal or professional. This importance is further underscored by Ertmer and Ottenbreit-Leftwich's (2010) assertion that self-efficacy may be more important than skills and knowledge, for example, among teachers who implement technology in their classrooms. Similarly, Holden and Rada (2011) concluded that self-efficacy can also have a strong influence on teachers' perceptions of interactive classroom technologies and implementation efforts. As such, the notion of perceived self-efficacy is best defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p. 2). In more succinct terms, as Holden and Rada (2011) put it, "self-efficacy is one's belief in his or her ability to execute a particular task" (p. 345), and such a belief, as proposed in Bandura's self-efficacy theory, is the most central mechanism of personal and professional agency.

Self-efficacy beliefs, then, have a tremendous impact on people as they influence how they feel, think, act, view the world around them, motivate themselves and behave (Bandura, 1994). Therefore, people with high levels of self-confidence, or high assurance in their capabilities and competencies, approach difficult tasks as challenges to be mastered rather than as threats to be avoided or tasks to be shunned (Bandura, 1994). As Bandura (1994) described these people,

> They set themselves challenging goals and maintain [a] strong commitment to them. They heighten and sustain their efforts in the face of failure. They quickly recover their sense of efficacy after failures or setbacks. They attribute failure to insufficient effort or deficient knowledge and skills which are acquirable. They approach threatening situations with assurance that they can exercise control over them. (p. 2)

Self-efficacy beliefs, evidentially, lead to an efficacy expectation, which is "the conviction that one can successfully execute the behavior required to produce the [desired or expected] outcomes" (Bandura, 1997, p. 193).

On the contrary, people with low levels of self-confidence, or those who doubt their capabilities, tend to shy away from difficult and challenging tasks they view as personal threats or professional obstacles to be avoided or evaded (Bandura, 1994). As Bandura (1994) described them,

> They have low aspirations and weak commitment to the goals they choose to pursue. When faced with difficult tasks, they dwell on their personal deficiencies, on the obstacles they will encounter, and all kinds of adverse outcomes rather than concentrate on how to perform successfully. They slacken their efforts and give up quickly in the face of difficulties. They are slow to recover their sense of efficacy following failure or setbacks. Because they view [unmet attainment or] insufficient performance as deficient aptitude it does not require much failure for them to lose faith in their capabilities. (p. 2)

Hence, from the standpoint of self-efficacy theory, self-efficacy beliefs (as illustrated in Figure 1) can be affected by enactive experience (successfully performing the behavior), vicarious experience (viewing other similar people successfully performing a behavior), verbal persuasion (coaching or encouragement efforts), as well as physiological and affective states such as stress (Bandura, 1994).

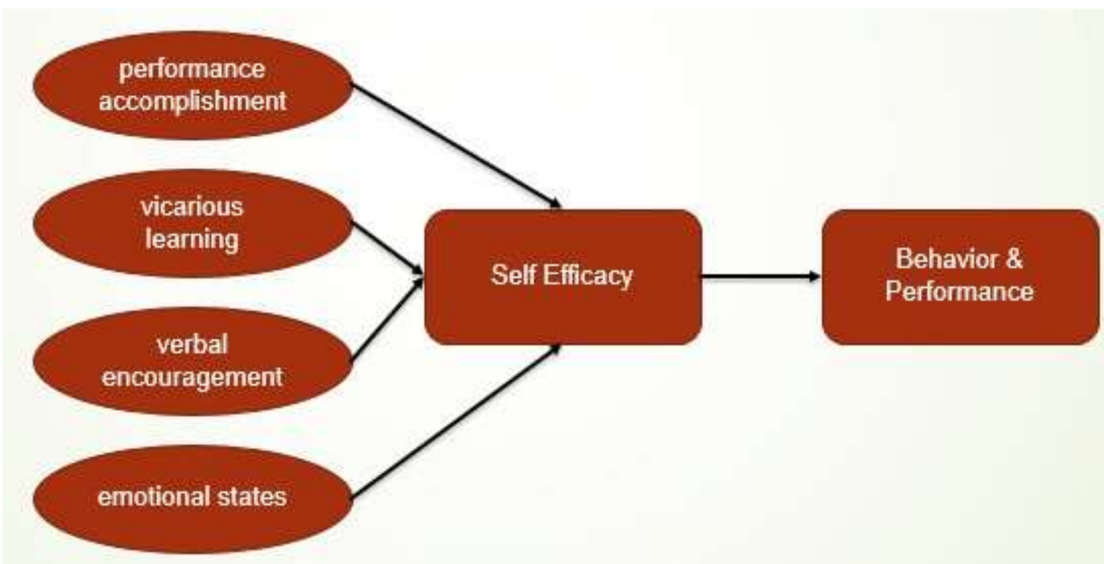

Figure 1. Components of Self-efficacy (Bandura, 1997)

This figure (reproduced with permission from Razzaq, Samiha, and Anshari (2018) via CC BY 4.0 license) illustrates the four main sources of self-efficacy beliefs, which is used as the central theoretical framework for the current study.

Bandura (1994), via his self-efficacy theory, identifies four influences on the development of self-efficacy. Whereas, two influences on personal self-efficacy, social persuasion and physiological responses, are of less relevance and applicability to technology integration; there are two most relevant to technology integration. The most effective or strongest is “mastery experiences” (p. 2) or personal success achieved from engagement in the relevant activity (action), followed by “vicarious experiences” (p. 3), that allows comparison with the attainments of others similar to oneself (attainment). Thus, Bandura (1994) affirmed that “successes build a robust belief in one’s personal efficacy” (p. 2). For example, teachers’ integration efforts, via Web 2.0 tools for teaching, is related to their belief in their ability to do so that reflects previous successes experienced. Accordingly, confidence (self-efficacy) leads to competence (expertise) in that when you think you can do a task, you do it and from successful repetition expertise eventually follows.

Similarly, Bandura (1994) suggested that observing people similar to ourselves succeed by sustained effort raises our beliefs that we, too, possess the capabilities to master or succeed in similar activities. Thus, seeing “competent models transmit knowledge and teach observers effective skills and strategies for managing environmental demands” (p. 3) are inspirational and confidence-building. Conversely, Ertmer and colleagues (2012) also observed that teachers’ attitudes and beliefs of other teachers were perceived to be among the most impactful factors on students’ uses of technology. This suggests that acquisition of better technology integration practices or more innovative instructional means through risk-taking or exposure from others serving as social models raises perceived self-efficacy. As such, when using or integrating technology, teachers’ practice stemming from active or vicarious experiences may lead to changes in their own beliefs about teaching. Consequently, these changes in beliefs should result in ‘good teaching’ that factors in the role of technology in developing 21st-century skills for the betterment of students’ lives and futures.

Challenges of Technology Integration

Digital technology such as like Web 2.0 tools, that are conducive to the demands of student-centered learning environments, can engage and support students to learn collaboratively and actively (Brown, 2012; Wilkins, 2009). Thus, one of technology’s main strengths lies in its ability to support students’ efforts to achieve rather than simply acting as a tool for delivering content (Tamim et al., 2011). Educational technology’s effectiveness, like Ross, Morrison, and Lowther (2010) realized, “depends on how well it helps teachers and students achieve the desired instructional goals” (p. 19). Yet, there are many barriers, obstacles, and hindrances that prevent teachers from using and integrating technology in their classrooms. Those barriers, obstacles, and hindrances often identified in the extant literature include lack of access to technology and insufficient planning time (Bhalla, 2012), lack of models and strategies for integrating technology (Ertmer, 1999), lack of technology skills (Ertmer, 1999), lack of teachers’ readiness (Inan & Lowther, 2010) and professional development programs that are too broad and not subject-specific enough (An & Reigeluth, 2012), lack of teacher self-efficacy (Teo, 2009), and lack of institutional support (Clausen, 2007).

Moreover, the implementation of social media tools (e.g., wikis) into lessons and educational experiences further offer the opportunity to strengthen students’ 21st-century competencies, allowing them not only to learn content but to acquire critical skills (e.g., creativity, collaboration, and digital literacy) possibly leading to future careers in science, technology, engineering, and mathematics (STEM) related fields (Minshew &Anderson, 2015; Paus-Hasebrink et al., 2010). However, as Paus-Hasebrink and colleagues (2010) cautioned, “new tools for collaborative learning also lead to great challenges for teachers and demand new didactical concepts” (p. 52) for facilitating socio-constructivist participatory learning. For example, according to Ifenthaler and Schweinbenz (2013), while a majority of teachers are open to incorporating tablets into daily lessons and feel they would enhance their instructional practice, others are not confident about using digital devices in their everyday instruction.

Therefore, even with increases in computer access and technology training, technology integration, i.e., teachers’ use of Web 2.0 technologies as learning tools and vehicles for effective and efficient instruction, still lags behind general social usage due to Web 2.0 tools’ “slow rate of adoption in education” (Capo & Orellana, 2011, p. 244). Technology, widely advanced as a tool to facilitate effective teaching and student-centered learning, is often not being used to support the kinds of instruction believed to be most powerful for 21st-century learning and STEM-related career fields (Ertmer & Ottenbreit-Leftwich, 2010). Simply put, technology is underutilized and/or ineffectively used in many classrooms even by those of younger tech-savvy teachers (Fioriello, 2011; Roblyer & Doering, 2010).

Harnessing the Power of Web 2.0 Tools

Technology is making life difficult for many teachers since it shifts the locus of expertise and control away from them (Collins & Halverson, 2009). Teachers are generally more comfortable utilizing technological usage for personal rather than professional purposes (Paus-Hasebrink et. al, 2010). Teachers engage with virtual learning networks, video sharing, online event scheduling, webinars, and social media, and are comfortable with wikis and social networking more so than with blogs, social bookmarking and audio/visual conferencing (Paus-Hasebrink et. al, 2010). Yet, teachers who engage in these online activities for personal and professional development usage may still be hesitant to fully implement technology into their classroom environment and harness the full potential for student learning and meaningful classroom applications (Paus-Hasebrink et al., 2010). As suggested by multiple research studies, a disconnect exists between teachers' and students' Web 2.0 technology usage (Capo & Orellana, 2011; Deye, 2015; Gouseti, 2013; Roblyer & Doering, 2010; Warham et al., 2017).

Nonetheless, even when teachers may feel very confident about using Web 2.0 technologies for personal and professional development use, they tend to be less confident in their abilities to integrate this same technology into their lessons or for educational experiences (Sadaf et al., 2012, 2016). For example, teachers with a greater understanding of how Web 2.0 technologies are used in a specific content domain tend to have more concern about how they could modify the integration of Web 2.0 tools to another setting. Even with these concerns, teachers would benefit from instructional risk-taking using Web 2.0 tools as a platform that motivates students and engages them more deeply in the learning process, resulting in more meaningful interactions and a greater understanding of the course content (Brown, 2012; Smith & Dobson, 2011). As suggested, technology integration, using Web 2.0 technologies, supports the demands of student-centered learning environments by teachers fostering a constructivist, student-centered view of teaching (An & Reigeluth, 2012; Brown, 2012; Wilkins, 2009).

Consequently, this results in developing a changed mindset and willingness to perform 21st-century constructivist tasks a new student-centered, technology-enhanced paradigm requires (An & Reigeluth, 2012).

However, as An and Reigeluth (2012) pointed out, possessing a “learner-centered philosophy does not necessarily lead to learner-centered practice” (p. 60). Though the opposite would be the normative expectation, many factors can contribute to inconsistency including lack of subject-specific technology integration ideas as well as *bona fide* opportunities to explore technologies in authentic teaching and learning contexts. A teacher’s technology self-efficacy (TSE) is impacted by factors other than her or his beliefs, that include the enactive contextual school culture. For example, teachers’ professional development is more effective and meaningful when it is deeply embedded in a school’s culture (Brinkerhoff, 2006; Doppelt et al., 2009). This was further substantiated by Windschitl and Sahl (2002), who found that the interplay of teacher beliefs, social dynamics, and institutional culture impact the ways teachers eventually integrated computers into classroom instruction. Further, as Gouseti (2013) observed, though digital technologies can transform classroom practices, many existing habits and ‘ways of doing’ things at schools simply remain in effect even within new contexts. This status quo, as Gouseti (2013) found from his study of implementing digital technologies for school collaboration, leads to a proliferation of the old ways of thinking often plaguing, if not hindering, the use and full implementation of digital technology in education.

Nonetheless, teachers, as well as administrators, instructional coaches, and even parents and policy-makers, need to guard against established ideas serving only to dilute the effectiveness of the technology-infused teaching process given minimal changes to the overall instructional design principles applied when technology is added to traditional lesson formats (Gouseti, 2013). Teachers need to be willing to embrace risks, re-consider ways of navigating existing school culture and refashion old instructional contexts to incorporate new technologically oriented pedagogical ones. Doing so will allow teachers to better promote collaborative, socio-constructivist “participatory learning framed by metacognitive awareness and critical acuity” (Luckin et al., 2009, p. 103). As Robb (2018), in a tweet, expressed:

> Risk-taking can break a [teacher’s] cycle of repetition [and promote diverse teaching styles, approaches, and strategies]. Permission to take risks is how we grow and become better. It will only happen if [the teaching] staff feel safe and observe [others] taking risks, missing the mark, but continuing to work hard until [they] reach [their] goal.

Hence, as teachers find creative ways through permissions and excuses to circumvent these constraints and overcome these barriers to technology integration in schools, they should become acutely aware that the collaborative aspects of Web 2.0 tools support deeper learning and levels of engagement for their students. Learning opportunities that harnessed the power of Web-based tools do so “through feedback, peer review and the development of a sense of audience and shared purpose” (Luckin et al., 2009, p. 101), that advances critical awareness, creativity, and metacognitive skills. Furthermore, Web 2.0 technologies may mitigate the gap between passively consuming content (i.e., traditional instruction) and producing and publishing (i.e., constructivist instruction with Web 2.0 as a learning tool). Constructivist instruction, therefore, incorporates active engagement, authentic communication, and deeper learning, which are hallmarks of 21st-century learning.

Developing Relevant Technology Skills

Despite the obstacles and challenges previously raised, Web 2.0 technologies as learning tools have emerged as a didactic approach with considerable potential to impact instructional and lesson design as well as the construction of knowledge supporting deeper learning. Hence, this type of 21st-century learning requires learning to "be infused with the context in which the learning is used in the real world" (The New Media Consortium, 2004, p. 5). The TPACK framework (see **Error! Reference source not found.**), a model describing the connection between content and technology, seeks to inform effective teaching practices (Mishra & Koehler, 2006; Koehler & Mishra, 2009). Web 2.0 tools, proffered to assist students' development of 21st-century skills along with college and career readiness, are intended to reduce gaps in student proficiencies. Subsequently, teachers are encouraged to make learning new digital tools a priority, even if time is a barrier, in order to enhance student learning outcomes (Hall, 2015). Proficient use of Web 2.0 tools, that encourage autonomy, process learning, and the initiative to enhance curiosity, is, thus, a relevant issue for many teachers due to the increasing focus on 21st-century skills in schools today. Therefore, a digital citizenship curriculum that prioritizes TPACK and implements Web 2.0 tools is, as Hall (2015) refers to, a must and a plus.

Teachers can utilize powerful Web-based application tools like Prezi, Slideshare, VoiceThread, Screencastify, Flipgrid, and Adobe Spark Video to implement technological curriculum innovations in their classrooms in alignment with 21st-century pedagogical practices and the ISTE standards. These Web 2.0 applications are well suited for literacy instruction and higher-order thinking as well as provide affordances for teachers to design learning opportunities beyond the textbook (Smith & Dobson, 2011). As Herro (2014) pointed out, "this coupling of content and Web 2.0 tools offered students engaging, collaborative, problem-solving opportunities, supported by socio-constructivist learning theory, which encouraged critical thinking" (p. 273). On the contrary, learning opportunities without Web 2.0 are further under-preparing students to compete in a global society that is highly driven by technology now and the foreseeable future (AECT, 2016). Therefore, a learner-centered approach, which does not rule out the use of new technological innovations but requires the adaptation of those innovations in ways that align technology integration self-efficacy to support good technology integration practice, would be beneficial.

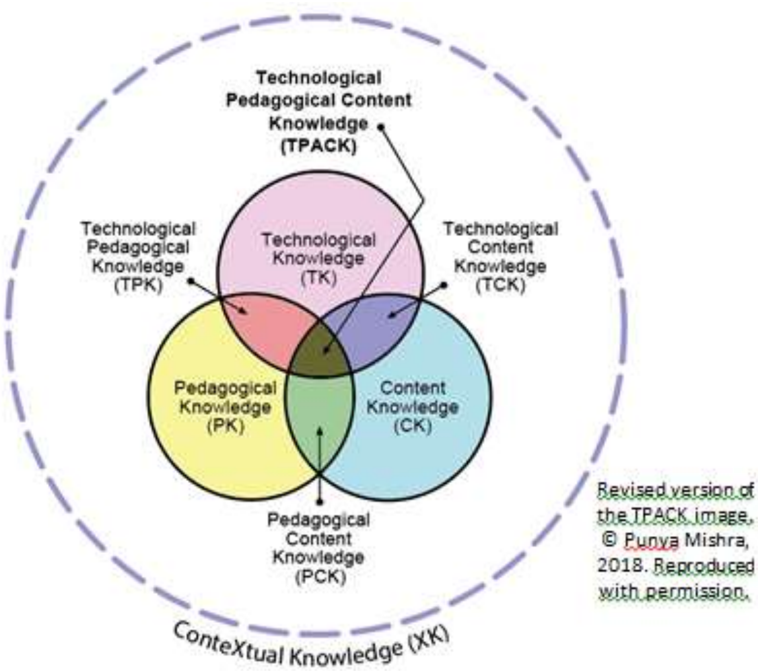

Figure 2. Components of the TPACK Model (Mishra & Koehler, 2006)
TPACK, mindful of teacher's organizational and situational constraints, illustrates the need to bring together content, pedagogy and technology knowledge required by teachers for technology integration.

Currently, schools are expected to focus their attention on educating students to develop 21st-century skills (Chapman, Masters, & Pedulla, 2010). Teachers are expected to foster critical thinking, deeper understanding, and technological skills through the implementation of learner-centered technology integration lessons predicated upon a corresponding learner-centered instructional philosophy. Yet, as Becker (2000) pointed out, teachers are much more constructivist in philosophy than in actual practice. Because of this incongruence between teachers' beliefs and practices, many teachers some 15 years after the advent of Web 2.0 as a digital platform still lag behind in their use of Web-based technologies as learning tools and vehicles for effective and efficient instruction (Capo & Orellana, 2011). Hence, to effectively teach with technology and bridge the technology integration gap (Lim, Zhao, Tondeur, Chai, & Tsai, 2013), it is suggested that teachers would benefit from continuous PD opportunities dedicated to technology literacy as well as technology applications for the classroom teaching them how to effectively integrate technology into their subject-specific lesson plans (Fioriello, 2011).

Furthermore, given the number of teachers who integrate technology for purposes other than instructional support remains below desired levels (Kidd, 2013), the applications of Web-based tools (particularly those used in K-12 education) are much heralded and needed to foster critical thinking and 21st-century skills. As Wang and colleagues (2004) derived, the disconnect between students' inside versus outside school technology experiences may be due to insufficient teacher training concerning technology integration strategies. The need for teachers at all levels, especially the more experienced instructors, to receive continuous PD training sessions of technologically oriented pedagogy cannot be underscored. When younger and less experienced teachers are compared to older and more experienced teachers, it is suggested that it is both the amount of screen time accumulated and training received that makes teachers more willing and eventually better at integrating technology (Hao & Lee, 2015; Kilic, 2015). Teacher education programs, thus, need to provide authentic teaching opportunities for pre-service teachers to develop relevant digital technology skills (Sadaf et al., 2012, 2016).

Nonetheless, K-12 teachers need to develop the corresponding confidence to apply the requisite technology integration tools needed to support effective 21st-century teaching, putting less weight on content knowledge and more emphasis on real-world applications and comprehension skills. As Thurston (2009) stated, “mathematics is not about numbers, equations, computations, or algorithms: it is about understanding” (p. 76). The focus, instead, is on critical thinking and creativity deemed among the essential skills needed for success in the future. Therefore, effective 21st-century instruction requires students to (a) act like a scientist, (b) think geographically, historically, and mathematically to solve complex problems, and (c) to work collaboratively. Teachers are also expected to increase engagement, enhance rigor, and promote digital literacy and citizenship through their teaching that can be fostered by integrating technology into classroom lessons and across the K-12 curriculum. Web-based application tools, (e.g., Prezi, Slideshare, Flipgrid, VoiceThread, Screencastify, and Adobe Spark Video) that seamlessly combine reading, writing, speaking, and listening, are well suited for literacy instruction and digital learning. These powerful Web 2.0 multimedia tools allow teachers to design learning opportunities that are interactive, collaborative, student-centered and, most importantly, extend beyond the textbook (Smith & Dobson, 2011).

Leveraging Teachers' Self-efficacy for Technology Integration

Teachers usage of technology is diverse (Ertmer et al., 2012), best categorized by Ertmer and colleagues (2012) as able to (a) supplement the required curriculum, (b) support the existing curriculum, and (c) facilitate an emerging curriculum. Regardless of the teacher's rationale for technology usage, successfully facilitating technology integration or adoption requires addressing cognitive, emotional, and contextual concerns (Straub, 2009). These are factored into the instructional design process as teachers need to adroitly make decisions of how, why, and when to tap into technological tools to enhance student learning. The trick, of course, to using technology as an educator inside the classroom is to know when technology can add value to, or when it detracts from, the learning experience of students and having the ability to employ it strategically (Brown, 2016).

To accomplish this, McCorkle (2017) suggests that teachers should refrain from having 'go-to apps' and focus not on the name of a particular tool, such as Google Doc, Flipgrid, Prezi, or VoiceThread, but rather on what they want students to do and accomplish. Furthermore, digital tools and software applications are ancillary, not primary, to teaching and the learning process; they merely support the craftsmanship and skill of the teacher (Joyner, 2019). Though ancillary, digital tools and Web applications can transform the quality of instruction by creating new possibilities for teaching and learning (Joyner, 2019; Minshew & Anderson, 2015). However, it is teachers, not tools, which drive learning (Joyner, 2019; Perkmen & Pamuk, 2011; Portnoy, 2018). Given that teachers are architects of learning experiences (Tucker, 2014), teachers need to set learning targets or goals and then determine creative ways to utilize technology effectively to enhance instruction and desired learning outcomes (Brown, 2016).

Consequently, technology is desirable when it adds value to the lesson. For example, in math, technology can help students gain a better conceptual understanding of mathematical notions by enabling them to see concepts that would otherwise be quite abstract. For science content, technology can help students achieve procedural understanding through the creation of schema to visualize a process. Digital technology, as the examples illustrated, makes learning visible; however, it is the teacher that unquestionably makes learning meaningful (Portnoy, 2018). As such, the strength of a digital tool in its instructional power and effectiveness is predicated on its use by a skillful educator who is willing to innovate (Portnoy, 2018). There is incredible potential for digital technology in and beyond the classroom, but it is vital to rethink technology adoption (Straub, 2009), and how learning is organized in order to reap the rewards (Mulgan, 2016, as cited in Paton, 2016). Technology should be seen as a tool that complements instruction, not as a learning outcome or the goal of teaching (Brown, 2016; McCorkle, 2017; Portnoy, 2018). As an instructional tool, digital technology has the potential to serve as an extension to the real belief—not just professional lip service—that even if it takes different paths to get there, all students can learn and succeed.

Challenges to Increase Technology Integration

In and of itself, teaching can be an arduous, sometimes overwhelming, task (Koehler & Mishra, 2009; Evers, Brouwers, & Tomic, 2002), and technology integration presents its own significant challenges to educators at each level of instruction (Johnson, Jacovina, Russell, & Soto, 2016). Subsequently, teachers need to possess a positive attitude, develop grit, and engage in risk-taking to meet the demands of 21st-century teaching (Heggart, 2015). Teachers need to be innovative in their instructional practice and "should not be afraid to introduce a new technology into their instruction" (Smith & Dobson, 2011, p. 325) since, as one pre-service teacher expressed, "Web 2.0 tools get the [students] engaged and involved in their learning, which allows them to gain more [and deeper] knowledge of the content" (Smith & Dobson, 2011, p. 323). It is, therefore, important for teachers at every level of instruction to utilize technology in the classroom to assist students in learning the subjects more profoundly and permanently (Wilson & Lowry, 2000). Yet, like the recurrent need for effective PD programs to support teacher techno-pedagogical self-efficacy and student-centered learning, integrating technology into teaching has been found to be among the greatest challenges facing today's teachers at all levels (Cennamo et al., 2010; Fioriello, 2011). Nonetheless, as Smith and Dobson (2011) illustrated, digital technology as a tool is quite powerful when it is strategically deployed to enhance collaboration, encourage creative discovery, or reinforce foundational knowledge.

Often, however, as Couros (2015) observed, the biggest barrier to instructional innovation and technology integration for teachers is their own way of thinking and their attitudes toward change. Teachers who fear change or doing something new frequently cite being afraid of embarrassing themselves, failing, or experiencing a loss of efficacy of the familiar (Knight, 2018). Couched in this fear is Spencer's (2016) finding that teachers' dominant emotions are optimism and fear. He writes, teachers are often paradoxically excited and scared about the use and promise of new technology (Spencer, 2016); they fear the unknown. Yet, as Couros (2015) states,

> …*change is an opportunity to do something amazing*, and…when we embrace new opportunities, even when they seem like obstacles, we can create something much better than what currently exists. Change is scary and we often stay with a "known bad" than take the chance on the possibility of a "great" new opportunity. Fear [predicated upon low self-efficacy] can stop us [from integrating technology] or make us reluctant [to innovate], but it doesn't have to defeat us [in our quest to enhance student learning, unless we let it]. (para. 2)

Teachers, thus, need to be challenged to not only think 'outside of the box,' but also to be innovative inside of the box (Couros, 2015). Doing so, however, requires teachers embrace the reality that technology integration is often messy and fraught with failure and 'not-yetness' (Kimbley, 2015; Ross & Collier, 2016). Further, as Ross and Collier (2016) argued, teaching with technology, or using digital practices, contributes to the fruitful mess that generally characterizes education.

As suggested, the main inhibitor to technology adoption by teachers is fear. Furthering that narrative, educators also fear that technology will be used by students for reasons other than those prescribed or negotiated in the emergent curriculum (Warham et al., 2017). And, more closely related to the current study, many teachers still fear some forms of technology, preventing them from making full use of digital resources in their teaching (Cox et al., 2003). In addition, Kilic (2015) found that teachers who are very experienced in using computers have higher technology self-efficacy and less computer anxiety than their colleagues. Anxiety adversely affects confidence, and without confidence, teachers revert to fear; and when they are fearful, they become tentative and engage in procrastination and inaction (Eikenberry, 2012). Their technology integration efforts become suboptimal. In fact, the cited case implies, like TPACK highlights, a technology integration self-efficacy gap in education (Fioriello, 2011; Lim et al., 2013). What TPACK, as the undergirding model to help shaping professional development based on teachers' needs, depicts as missing from the technology integration formula, and fails in-and-of-itself to deliver, is *how* to engage teachers in the pedagogical decision-making process for the use of technology (Power, 2018). So, how can this technology integration self-efficacy gap be closed? How can teachers build their confidence so they can effectively use digital tools for teaching and learning, and in the process narrow the technology integration self-efficacy gap in education?

Focusing on Good Technology Integration Practice

Many educators who shy away from technology in their classroom practice, however, do so not because they are 'unmotivated' to use technology or do not see technology as useful, it is often because they do not feel confident using technology (Spencer, 2016; Power, 2018). As Spencer (2016) suggested, such educators struggle with technology self-efficacy. Whereas, teachers may be highly motivated to use technology, they may fall short of implementation because they have a low sense of self-efficacy (Spencer, 2016). Others view themselves as low in their abilities to use technology and are unwilling to learn technology integration strategies (Spencer, 2016). As Tschannen-Moran and Woolfolk Hoy (2001) noted, a teacher's sense of self-efficacy can influence their "levels of planning and organization" and "willingness to experiment with new methods to meet the needs…of students" (p. 783). Hence, the real issue in technology integration may not necessarily be a loss of efficacy of the familiar but rather self-efficacy of something novel (Spencer, 2016; Power, 2018).

Researchers contend that technology-resistant teachers are not lacking in motivation so much as self-efficacy and Technical-Pedagogical Knowledge (Spencer, 2016; Power, 2018). It follows then, to increase teachers' confidence in their ability to use and integrate technology effectively, there needs to be an equal and corresponding increase in their understanding of pedagogical decision-making for the use of technology (Power, 2018). This is to say, successful professional development (PD) need to focus on assisting teachers with how to make pedagogical decisions first, model when technological tools are needed, and then demonstrate ways to find appropriate digital tools to effectively ‘get the job done’ (Power, 2018). Teachers, through training and experiential applications, ought to develop an understanding of when to be discriminatory about whether the use of digital technology will ‘assist or impede’ the learning process (Anderson, 2013). Moreover, as Kenny and colleagues (2010) pointed out, lack of PD training in the pedagogical considerations for the integration of a specific type of digital technology or app can have a negative impact upon teachers’ perceptions of self-efficacy.

Accordingly, professional development should not be preoccupied with what a particular technology can possibly do or how to use that technology *per se* but rather the focus should be on how to use that technology meaningfully by integrating it seamlessly into classroom lessons and activities to enhance student engagement, empowerment, and learning. To accomplish effective technology integration, Power (2018) suggested:

> …professional development efforts [should focus] on how to make decisions about when it’s appropriate to use technology tools, and how to frame our instructional design decisions. If teachers feel confident as to why they are using [digital] tools, and in the fact that it’s not so important that they be experts with all of the tools themselves (after all—our students can oftentimes provide us with on-the-spot tech support!), then their self-efficacy will go up. (para. 12)

Thus, strategic planning and scaffolding in training for teachers would provide opportunities for the technological improvements needed to gain mastery, or greater proficiency, in their use and integration of technology (Anderson, 2013; Mandinach & Cline, 1994).

Technology integration, within the scope of instructional proficiency, is a work in progress. All teachers, even experienced as well as tech-savvy ones, need to start where they are within their instructional practices, but should not stay there (Milner, 2010). As Milner (2010) further pointed out, in order to successfully teach students in diverse, urban schools, teachers need to give persistent attention to professional learning and development, as well as avoid complacency. Therefore, an emphasis on teachers' technology efficacy should be a key focus on teaching as a purposeful means to promote the success of all students. In fact, given that teacher efficacy is essential to the integration of technology (Franklin, 2007; Moore-Hayes, 2011), teachers' technology integration self-efficacy should remain among the top priorities in education and, through PD programs, it needs to be continuously addressed.

Embracing Continuous Professional Development

Schools, in their roles as professional learning communities, have the ability to assist teachers with building the skills and confidence to integrate technology within the frameworks of 21st-century pedagogical practices and appropriate technology standards such as the ISTE (2017) Standards for Educators. In addition, as ChanLin (2007) pointed out, for technology to become successfully integrated into teaching practice, teachers at all instructional levels should be exposed to "group interaction supported by technology" (p. 52). As part of school's institutional mechanism and cultural framework, an open atmosphere within a school community may inspire teachers to embrace risk, experiment, transform and employ innovative teaching approaches conducive to the demands of 21st-century learning (ChanLin, 2007). On the contrary, simply placing technology in the classroom or offering technical training does not guarantee that it will be used to support student-centered instruction (Cuban, Kirkpatrick, & Peck, 2001; So & Kim, 2009). As Kanaya, Light, and Culp (2005) found, schools that meet the immediate needs of teachers and provide them with opportunities to learn with and from each other, implement, and reflect on their practice are more likely to produce experienced users and integrators of educational technology. Not surprisingly, teacher's experience, qualifications, school technology support and access to technology are also factors influencing the confidence of a teacher using and integrating technology in a classroom setting (Liu, Ritzhaupt, Dawson, & Barron, 2017).

Nevertheless, regardless of these factors noted above, the effectiveness of technology integration in schools remain largely predicated on the teacher, especially in the revised and emergent role as facilitator and activator of learning (Fullan & Langworthy, 2014). Teachers need to receive adequate, ongoing training that equips them with innovative instructional methodologies to support optimal learning environments for all students. Stakeholders such as parents, institutions and policy-makers also have a role to play in supporting teachers to take pedagogical risks and confidently embrace technology to intentionally activate learning (Luckin et al., 2009). Educators who receive such professional support have also been found to gain self-efficacy, giving them the confidence to build their classroom competence or change their classroom practices and, in turn, have a positive influence on student learning (Brinkerhoff, 2006). Nonetheless, technology adoption is ultimately an intentional behavior reflecting the disposition and involvement of teachers in continual learning and technology integration (Sugar, Crawley, & Fine, 2004). It follows, as ChanLin (2007) surmised, "teachers who are willing to spend time in using computers are more likely to gain confidence in using computers" (p. 46) and digital technology, whether for personal or professional usage. In terms of technology integration, the former is a necessary foundation for the latter (Franklin, 2007). This further suggests that PD programs should focus, first, on increasing teachers' knowledge and skills, which with practice can help increase their confidence and reduce the fear associated with using technology (Ertmer & Ottenbreit-Leftwich, 2010; Willingham, 2002).

Subsequently, to be successful, any introduction of new technology into the classroom and emergent curriculum requires careful planning and regular time for PD training and practice (Warham et al., 2017). Through practice, feedback, and reflection, a teacher's development involves a very large element of learning 'on the job' by trial and improvement (Warham et al., 2017). Teaching is difficult and time-consuming (Evers et al., 2002; Koehler & Mishra, 2009), and proficiency even more so than mastery is developed over time. Thus, to be effective at teaching and seamlessly integrating technology requires regular PD training sessions and practice. As Marzano and Marzano (2015) pointed out, "effective teaching is not a simple matter of executing specific behaviors and strategies, because effective teaching is grounded in human relationships" (p. 125). Effective teaching is precipitated upon pedagogical capacity and the availability of time for teachers to gradually build relationships with their students. Given the latter, most educators (53 percent, according to Houghton Mifflin Harcourt's 2018 Educator Confidence Study) reportedly worry that a focus on using technology for learning comes at the expense of personal connections between students and teachers (HMH, 2018; Lynch, 2018). However, this fear is alleviated when teachers select and focus on 'purposeful technology' that extends their students' abilities (Lynch, 2018). Notably, research proports that technology works best when (a) teachers participated in adequate, sustainable training (for more than 14 hours and, optimally, as much as 49 hours) with sufficient practice (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007), and (b) it helps teachers spend more time building personal connections with their students (Lynch, 2018).

Nonetheless, after a period of time receiving training and engaging in practice, the best teachers settle into an equilibrium somewhere between being confident in what they are doing and a feeling that they could do it better if they further apply themselves (Warham et al., 2017). Consequently, Hall (2015), who investigated determinants of classroom technology integration including teacher's age, school budget, access to technology, years of teaching, lack of skills, lack of professional development training, and risk-taking, concluded that teachers should make learning new technology tools a priority, even if time is a barrier, in order to enhance student learning outcomes. Teachers, as Collins and Halverson (2009) asserted, must prioritize technology integration within the scope of pedagogical prowess and shift the emphasis from teaching to learning through meaningful practice. Thus, to meet the demands of 21st-century learning, teachers should not simply strive to be fountains of knowledge but rather seek to be architects of learning experiences (Tucker, 2014). Teachers, as architects of learning experiences, build lessons that challenge students to construct knowledge cooperatively and collaboratively as well as provide support and feedback throughout the learning process as needed (Tucker, 2014). Digital technology applications can facilitate this twin role of designing and supervising meaningful learning experiences. Together, technology access and availability, time, leadership, and, most importantly, teacher preparation and training are vital for incorporating technology effectively as well as transforming the quality of instruction within the classroom (Franklin, 2007; 2008).

Teacher's Technology Self-efficacy

Teacher's technology self-efficacy is a simple idea with significant implications. First, the concept of self-efficacy has proven its functionality and adaptability in many contexts, including the fields of education in general and educational technology, in particular, where there is a shift in emphasis from compliance to self-efficacy (Bandura, 1997). Such a shift in attitude and belief toward teaching and learning is pronouncedly indicative of teachers' expectations for 21st-century instructional professional practice, and of great paramountcy, since self-efficacy is strongly associated with performance (Ertmer & Ottenbreit-Leftwich, 2010), especially performance related to teaching tasks, professional expectations, and other evolving responsibilities. As an indicator, self-efficacy has a strong positive association to both performance and also future behavior. Self-efficacy, therefore, seems to be "a future-oriented belief about the level of competence a person expects he or she will display in a given situation" (Tschannen-Moran & Woolfolk Hoy, 2001, p. 787).

Though many of the extant literature on technology self-efficacy focused on pre-service teachers, the findings are applicable to this study on urban K-12 teachers' confidence levels to integrate technology. For instance, Sprague and Katradis (2015), who investigated pre-service elementary teachers' perceptions of technology and their abilities to integrate technology in their teaching using TICS version 2 as one of the research instruments, found a "disconnect" (p. 114) between pre-service teachers' espoused beliefs (e.g., blog postings) and their self-efficacy to integrate technology as scored by the TICS version 2 survey. Further, using a different instrument measuring this construct, Pan and Franklin (2011), found that the implementation of Web 2.0 tools was also impacted by teacher self-efficacy. Similarly, Anderson and Maninger (2007), in their exploration of the factors best predicting pre-service teachers' intentions to use a variety of software, found value beliefs and self-efficacy to be significant predictors of technology integration. Sadaf and colleagues (2016) also reported that self-efficacy and ease of using Web 2.0 tools were among the most important factors influencing pre-service teachers' use of Web 2.0 in the classroom.

Accordingly, self-efficacy emphasizes the "critical role of cognition in people's capability to construct reality, self-regulate, encode information and direct behavior" (Pajares, 2002, p. 1), such as the willingness to take risk with innovative instructional practices including integrating technology into classroom lessons. Theoretically, a teacher's efficacy beliefs will then transfer to the extent that he or she perceives similarity in the task resources and constraints from one teaching situation to another (Bandura, 1997). However, given an individual's anticipated level of performance, Bandura (1986) argued that 'outcome expectancy' is a judgment of the likely consequences of a specific action, if performed at the expected level of competence. A teacher's efficacy belief, therefore, is a judgment of his or her capabilities to bring about desired outcomes of performance or required task (Bandura, 1997). Teacher's technology self-efficacy, and teacher self-efficacy in general, is thus not only concerned with teachers' professional tasks and behavioral performance as it relates to technology integration but also students' achievement, motivation, and their own sense of efficacy to learn and engage in meaningful activities including those that incorporate digital technology.

As discussed earlier, sources of self-efficacy may be personal and reside within people or may result from their social and physical environments (Bandura, 1994). For example, self-efficacy beliefs influence teachers' persistence, enthusiasm, commitment and instructional behavior when things do not go smoothly as well as impacting their resilience in the face of challenges and setbacks (Tschannen-Moran & Woolfolk Hoy, 2001). The utility of the self-efficacy concept lies in its operative qualities and deeper understandings of how efficacy can be addressed by the four main sources of influence defined in Bandura's self-efficacy theory, and a clear focus on performance task and context specificity (Bandura, 1994). As such, teachers, who are enthusiastic about the promise of digital technology, should see Web-based technology not as a product or a binary choice but instead as part of the process (AECT, 2016; Cuban, 2016), one that is capable of supporting deeper learning when paired with relevant instructional and learning strategies, critical thinking, and real-world curriculum relevancy (HMH, 2018; Sprague & Katradis, 2015).

Consequently, today's educators need to embrace technology within the scope of pedagogical prowess and purview of student learning. Specifically, the application of Web-based tools, particularly those used in K-12 education, in support of student-centered teaching and learning is much needed if educators are to adequately prepare students for 21st-century life. Technology usage is widespread; yet, technology integration in education has not kept pace (Capo & Orellana, 2011; Deye, 2015; Roblyer & Doering, 2010; Warham et al., 2017). As lifelong learners and promoters of a growth mindset, it is incumbent upon K-12 classroom teachers to avoid engaging in risk-aversion and resistance to technology integration. On the contrary, teachers are asked to embrace risks and re-consider ways to incorporate technologically oriented pedagogical practices in the lessons they facilitate. Minshew and Anderson (2015), who investigated technology self-efficacy in middle school, found that digital technology when paired with student-centered instructional strategies offered teachers the ability to transform the quality of instruction. However, limited or low level of confidence adversely affected the way lessons are designed and facilitated (Cox et al., 2003). Teachers are, thus, expected to set as a high priority the development of technological literacy and technological-pedagogical knowledge if they are to integrate technology confidently and effectively (i.e., purposefully and meaningfully) into students' learning experiences (Capo & Orellana, 2011; Tucker, 2014).

Technology Integration Confidence Scale

Technology Integration Confidence Scale (TICS), whose first two versions were developed by Browne (2011), is intended as a self-efficacy scale aligned with the standards for teachers/educators developed by the International Society for Technology in Education (ISTE). ISTE is a leading global technology-education oriented organization which has created standards that serve as frameworks for students, educators, administrators, coaches, and computer science educators to rethink education and create innovative learning environments for digital age learning (ISTE, 2018). Likewise, the Technology Integration Confidence Scale, as aligned to ISTE, seeks to measure teachers' self-efficacy in integrating (i.e., using and applying) technology in the classroom.

Notably, TICS version 3 developed by the researcher to be utilized as the chief research instrument for this study furthers the progression of Browne's (2011) TICS version 2, which was a self-efficacy scale aligned to the first generation of ISTE's (2000)

National Educational Technology Standards for Teachers (NETS-T). In comparison to TICS version 3, Browne's (2011) TICS version 2 more narrowly measures teachers' confidence in executing technological skills as that was the alignment focus of NETS-T (ISTE, 2000). Thus, unlike Browne's (2011) TICS version 2, TICS version 3 emphasizes the tasks of effective technology use and integration (i.e., students and teachers using and applying technology during instruction). TICS version 3, with its five components, is aligned with the seven benchmarks of the third and current generation of ISTE (2017) Standards for Educators. These seven benchmarks or subscales are briefly explicated below in Table 1.

Table 1 Explanation of the Benchmarks of ISTE Standards for Educators

Benchmarks	Explanations
Learner	This category of questions measures educators' comfort level to "continually improve their practice by learning from and with others and exploring proven and promising practices that leverage technology to improve student learning" (ISTE, 2017).
Leader	This category of questions measures educators' comfort level to "seek out opportunities for leadership to support student empowerment and success and to improve teaching and learning" (ISTE, 2017).
Citizen	This category of questions measures educators' comfort level to "inspire students to positively contribute to and responsibly participate in the digital world" (ISTE, 2017).
Collaborator	This category of questions measures educators' comfort level to "dedicate time to collaborate with both colleagues and students to improve practice, discover and share resources and ideas, and solve problems" (ISTE, 2017).
Designer	This category of questions measures educators' comfort level to "design authentic, learner-driven activities and environments that recognize and accommodate learner variability" (ISTE, 2017).
Facilitator	This category of questions measures educators' comfort level to "facilitate learning with technology to support student achievement of the ISTE Standards for Students" (ISTE, 2017).
Analyst	This category of questions measures educators' comfort level to "understand and use data to drive their instruction and support students in achieving their learning goals" (ISTE, 2017).

TICS Version 3 Components (Subscales) Defined

Unlike Browne's (2011) TICS version 2, TICS version 3 in accordance with theoretical and statistical measures does not correspond on a one-to-one basis to the seven subscales of the ISTE (2017) Standards for Educators but rather is aligned to its overarching construct of integrating instructional technology. TICS version 3, with its five components, consists of 25 items. These items, intended to measure teachers' technology self-efficacy, are aligned to the benchmarks of the third and current generation of ISTE (2017) Standards for Educators. Below are the explicated components of the instrument[3]:

Technology Usage (C1)

The Technology Usage subscale examines teachers' confidence to use and model technological devices and digital tools to support student learning. Teachers are asked to facilitate effective lessons with the support of technological devices. Those who are able to do this will be able to confidently deal with the logistics of operating technological devices and utilize them to present information and facilitate learning. They will also be able to show students how to use them by modeling, through illustration, or step-by-step instruction of how to use the devices, thereby, supporting student learning.

Technology Application (C2)

The subscale of Technology Application deals with teachers' confidence to integrate technological devices into lessons and provide application opportunities of digital tools for students to use and benefit from as part of instructional practice. Teachers are asked to facilitate effective technology-supported lessons that include meaningful and real-world applications. Teachers who are able to do this will be able to confidently and seamlessly utilize technological devices and digital tools/Web applications in lessons, for both instructional and learning application purposes, without unnecessary figuring it out on the fly. Additionally, teachers will be able to provide extended and other learning application opportunities to further and meaningfully enhance student learning.

[3] These explicated technology usage and application components were taken directly from the TICS version 3 survey instrument developed by the researcher.

Technology-infused Learning (C3)

The subscale of Technology-infused Learning addresses teachers' confidence to embrace student-centered learning through effective use of technology in the classroom as part of their instructional practice. Teachers are asked to facilitate constructivist student-centered learning experiences rather than the traditional approach of 'one size fits all.' Technological devices and digital tools/Web applications support this shift away from traditional instruction toward collaborative and cooperative facilitation of student-centered learning. Teachers who are able to do this will be able to confidently integrate technology to personalize, customize, and differentiate learning experiences for students.

Technology Literacy & Digital Citizenship (C4)

The subscale of Technology Literacy and Digital Citizenship explores teachers' confidence to effectively use technology to communicate information to enhance the learning process and to recognize the skills and concepts students should know to use technology appropriately. Before students can adequately learn with technology, they must know and understand the language of technology and the digital world. Specifically, students must have a grasp of appropriate behavior for online and computer-enhanced learning environments as well as the nuanced netiquette of digital behavior that contributes to good digital citizenship. Teachers who are able to do this will be able to confidently model and convey appropriate digital interaction and behavior for students as well as instruct the skills and concepts needed to appropriately and effectively navigate technology usage that support student learning.

Technology-supported Assessment (C5)

The subscale of Technology-supported Assessment evaluates teachers' confidence to create an environment in which appropriate technology is integrated to provide meaningful assessment and feedback. Teachers are asked to support student learning through timely and relevant feedback. Formative assessments allow teachers to check for accuracy and correct misconceptions in learning. Teachers who are able to do this will be able to confidently use technology to provide just in time feedback to assist students while they are engaged in the process of their learning experiences. In short, these five components reflect, or implicate, teachers' readiness and preparedness to integrate technology.

Conclusion

The use of digital technology in today's urban classrooms continues to gain steady and increased importance (HMH, 2018; Kay, 2006). Concomitantly, a teacher's positive self-efficacy, as it relates to technology, has emerged, and continues to gain greater prominence, as essential for effective instructional technology integration (Anderson et al., 2011; Moore-Hayes, 2011). As ChanLin (2007) stated, "teachers who are willing to spend time in using computers are more likely to gain confidence in using computers" (p. 46) and digital technology, which in turn can transform the quality of instruction and ultimately have a positive influence on student learning (Brinkerhoff, 2006). Evidently, as illustrated in this literature review, the term and concept of self-efficacy are both widely used in educational technology with varying degrees of rigor and success. As noted, success is dependent upon a teacher's belief about technology integration, which is one of the strongest factors impacting that teacher's actual implementation of technology integration in the classroom (Ertmer et al., 2012). However, teachers' technology integration efforts can be influenced through relevant modeling and vicarious experiential means such as observing communities of practice, assisting in preparing teachers to integrate technology in more student-centered ways. While the most impactful influence supporting the effective use of technology as stated by 76% of educators in a recent study was through informal/collaborative discussions with colleagues (HMH, 2018), other significant sources included self-guided research, and social media/online communities to support personal learning networks (PLNs).

Consequently, according to Ertmer (2005), it is "not necessary to change teachers' beliefs before introducing them to various technology applications" (p. 36). On the contrary, technology PD training sessions would be more effective by introducing teachers to the types of technology uses and applications that can support their most immediate technological and pedagogical needs at their current points of professional proficiency (Ertmer, 2005; Ismail & Muthusamy, 2011; Jones, 2018; Tomlinson, 2018). However, given that these newly acquired skills are unlikely to be used by many teachers unless they "fit with teachers' existing pedagogical beliefs" (Ertmer, 2005, p. 37), it is imperative that educators, stakeholders, and major actors in education "increase their understanding of and ability to address teacher beliefs, as part of their efforts to increase teachers' technology skills and uses" (Ertmer, 2005, p. 37). Part of that adaptation by teachers to implement technology in meaningful ways must stem from the principle of putting students' needs first rather than operating from a comfort zone of familiar instructional methodologies.

Facilitating meaningful and engaging learning opportunities through the lens of a learner-centered approach requires continuous pedagogical-technological PD training sessions of what works best (according to research-based theory and evidence-based practices) on the part of teachers. It can be argued that continuous PD programs are needed because being “a professional teacher is a continuous process which never stops throughout a teacher’s career” (Ismail & Muthusamy, 2011, p. 97). Teacher self-efficacy, in turn, must be continuously addressed and teachers empowered to meet the challenges in the classroom and the fast-paced technological changes impacting society and education. Research supports successful PD programs, targeting specific skills and knowledge gaps, are those that provide support to educators for an average of 49 hours over the course of six months to a year (Yoon et al., 2007). Hence, against the backdrop of a constructivist and growth mindset approach to their practice, 21st-century instructional professionals should be guided by an “accurate understanding of how learning works” (Clark & Mayer, 2016, p. 39), the tenets of self-efficacy theory (Bandura, 1986, 1994, 1997), and TPACK in facilitating technology-enhanced, learner-centered classroom environments (Mishra & Koehler, 2006; Koehler & Mishra, 2009).

The subsequent chapter, Chapter 3, describes the requisite research methodology used to conduct the current study. This chapter also consists of a description of the research design, the target population, the instrument utilized to capture data, sample and sampling technique, the data collection process and types of analyses employed.

CHAPTER THREE: METHODOLOGY

The primary goal of this quantitative study was to examine self-efficacy as a factor in teachers' technology use and integration efforts utilizing Web 2.0 technologies as pedagogical tools in the K-12 classroom setting based on the International Society for Technology in Education (2017) Standards for Educators. Put another way, the current study sought to evaluate the components of teachers' technology integration self-efficacy by utilizing the Technology Integration Confidence Scale (TICS) version 3 survey instrument to measure the confidence of teachers to perform enactive tasks of effective technology use and integration. These tasks, namely, (a) technology usage, (b) technology application, (c) technology-infused learning, (d) technology literacy and digital citizenship, and (e) technology-supported assessment, are intended to deepen educators' practice, promote collaboration with colleagues, challenge educators to rethink traditional approaches to instruction, and prepare students to drive their own learning. The survey instrument was aligned to the seven benchmarks of the current third iteration of the ISTE (2017) Standards for Educators and predicated upon Browne's (2011) TICS version 2.

Utilizing an online survey consisting of seven demographic items along with the survey instrument with 25 Likert-type items, participants reported their confidence to carry out specific tasks of technology use and integration. Accordingly, the research questions (RQs) for this quantitative study are as follows:

- **Research Question 1 (RQ1):** What is participating Southern Californian urban Catholic school teachers' level of confidence in using technology?
- **Research Question 2 (RQ2):** What is participating Southern Californian urban Catholic school teachers' level of confidence to integrate technology in the teaching process using the ISTE Standards for Educators?

This chapter provides a detailed description of the methodology applied in this study and outlines the development of the survey instrument and pilot study, instrumentation, setting, target population, sample, sampling procedure, data-gathering procedures, the method of analysis, research questions, ethical concerns, and a summary.

Survey Instrument Development and Pretesting

For this study, a survey instrument, predicated upon Browne's (2011) TICS version 2, was developed. In 2006 and 2007, Browne (2011) created TICS versions 1 and 2 in alignment with the first iteration of ISTE's (2000) National Educational Technology Standards for Teachers (NETS-T). ISTE (2008) updated and released its second generation of NETS-T; and in reaction, Browne made an unfulfilled declaration to produce a third version of the TICS. With the publication of the third and current version of ISTE (2017) Standards for Educators, Browne's (2011) TICS version 2 had become outdated and less applicable to current 21st-century technological and pedagogical practices. Hence, the rationale for this study was to develop the TICS version 3 survey instrument and create a current and timely instrument measuring teachers' self-efficacy to use and integrate instructional technology.

Construction of the TICS version 3 survey instrument commenced by generating items grounded in alignment with the ISTE (2017) Standards for Educators. These statements described expected specific tasks of technology integration such as teachers' self-efficacy or confidence level in using technology in the classroom (see Table 2). The items were then examined for ambiguity, wording, and content overlap. To ensure content validity, the items were subjected to the scrutiny and evaluation of an educational technology professor, a director of technology, a coordinator of technology, a lecturer of education, and a statistician. As a result of this initial work with the instrument, a 34-item survey that corresponded to the seven subscales of the ISTE (2017) Standards for Educators emerged for further evaluation and modification. To gather more systematic data on the instrument, the 34-item version of the TICS version 3 was then administered as a pretest through an online survey to 118 urban K-12 teachers in multiple Southern California Catholic school settings. There was a total of 97 usable completed surveys (n = 97) whose data were utilized for the initial analysis.

The pretesting field study suggested a need to revisit the instrument and connect theory with statistics. For example, the ISTE (2017) Standards for Educators have seven standards; however, the statistics generated from the pretesting field analysis found only four constructs emerged. Consequently, the researcher reexamined the overarching constructs of the ISTE (2017) standards for educators and the corresponding 34-item pretested survey to include the multiple standards in fewer constructs. Given that one of the suggested constructs, Component 1, had 14 items, the decision was made, based on the psychometric analysis of the instrument and theoretical consideration, to split this component into two and reduce the number of components from seven to five rather than four as suggested by the analysis. Also, as a result of this initial field test of the instrument, nine statements were omitted due to reliability and validity concerns based on the psychometrics and experts' feedback, leaving 25 items (see Table 2) to be included in the final pretested form of the instrument. Using a scale where 0 means Not confident at all, 1 means Slightly confident, 2 means Somewhat confident, 3 means Fairly confident, 4 means Quite confident, and 5 meaning Completely confident, the mean score of the TICS components represents a global measure of teachers' self-efficacy to implement that task or skill of technology integration. Thus, the TICS version 3 survey instrument was developed to be used in the current study to measure technology integration confidence rather than to assess whether teacher-participants met the seven benchmarks of the ISTE (2017) Standards for Educators.

Table 2 TICS v.3 Survey Questions

	The Technology Integration Confidence Scale (Version 3)
C1	**Technology Usage**
	How confident are you…
1.	In using technology to stay current with research to support student learning outcomes?
2.	In facilitating and supporting student learning opportunities with technology?
3.	In modeling, for colleagues, the identification, exploration, evaluation, curation, and adoption of new digital resources and tools for learning?
4.	In using collaborative tools to expand students' authentic, real-world learning experiences by engaging virtually with experts, teams, and students, locally and globally?
5.	In collaborating and co-learning with students to discover and use new digital resources as well as diagnose and troubleshoot technology issues?
6.	With actively participating in virtual and blended learning communities to support your CPD?
7.	In designing authentic learning activities that align with content area standards and using digital tools and resources to maximize active, deep learning?
C2	**Technology Application**
	How confident are you in…
8.	Exploring and applying instructional design principles to create innovative digital learning environments that engage and support learning?
9.	Using technology to create, adapt, and personalize learning experiences that foster independent learning and accommodate learner differences and needs?

10. Creating learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems?

11. Managing the use of technology and student learning strategies in digital platforms, virtual environments, hands-on makerspaces or in the field?

12. Providing alternative ways for students to demonstrate competency and reflect on their learning using technology?

C3	**Technology-infused Learning**
	How confident are you in…

13. Learning about, testing or adding into regular practice a variety of proven, promising, and emerging learning strategies along with technology to support and enhance student learning?

14. Using technology to support student needs through increased personalization and differentiation?

15. Using technology to support student learning and enhance student engagement through virtual collaboration?

16. Using technology to support the demands of the student-centered pedagogy for project-based learning?

17. Using technology to support STEAM as an access point to guide student inquiry, dialogue, and critical thinking?

C4	**Technology Literacy & Digital Citizenship**
	How confident are you in…

18. Teaching students to think critically, be safe, and responsible in the digital world?

19. Establishing a learning culture that promotes curiosity, critical examination of online resources, digital literacy, and media fluency for learners?

20.	Mentoring students to use digital tools in safe, legal, and ethical ways including the protection of intellectual rights and property?
21.	Modeling and promoting management of personal data and digital identity as well as protect student data privacy?
C5	**Technology-supported Assessment**
	How confident are you in…
22.	Facilitating data-driven instruction and guiding learning based on competency-based assessment and new data analysis tools?
23.	Using digital tools to provide immediate feedback to students?
24.	Dedicating planning time to collaborate with colleagues to create authentic learning experiences that leverage technology?
25.	Using technology to design and implement a variety of formative and summative assessments that accommodate learner needs, provide timely feedback to students, and inform instruction?

The realignment with fewer components to balance the number of items per component more evenly was suggested by the statistical model (see Table 3). More importantly, the inclusion of fewer components better clarified the role that technology plays in education to that of Technology Usage and Application as well as other supportive concerns like Technology Literacy and Digital Citizenship. The seven aspects of the ISTE standards only generally include these and have a greater focus on the wider role of educators in 21st-century education, for whom technology is expected to play a central role. In comparison, the realigned TICS version 3 with its five components and 25 items examined technology usage and explored technology integration in a more pronounced way.

Table 3 TICS v.3 Categorical Items per Component (C) as Re-aligned

	The ISTE Standards for Educators	**C1**	**C2**	**C3**	**C4**	**C5**	# of TICS Items (in new TICS v3)
1.	Learner	1 6		13 14 15 16 17		22 23	9
2.	Leader	2 3					2
3.	Citizen				18 19 20 21		4
4.	Collaborator	4 5				24	3
5.	Designer	7	8 9				3
6.	Facilitator		10 11				2
7.	Analyst		12			25	2

TICS version 3 survey instrument, whose components were realigned after the initial pretesting, makes sense both theoretically and statistically as determined by psychometrics. The tasks included in the realigned TICS version 3 are intended to deepen educators' practice, promote collaboration with peers, challenge educators to rethink traditional approaches and prepare students to drive their own learning. Accordingly, TICS version 3, as aligned to the ISTE (2017) Standards for Educators, sought to measure teachers' self-efficacy level in conducting technological-pedagogical tasks concerning technology integration in order to help students become empowered learners. A Cronbach's alpha coefficient of .985 for the 34-item pretested survey shows high reliability of the TICS version 3. From these initial data and analysis, it was determined that the TICS version 3 instrument was a valid and reliable measure of teachers' technology self-efficacy. However, further evaluation and confirmation via a pilot test of the 25-item instrument was still needed. Thus, a pilot study was carried out to statistically confirm the items to be included in the TICS version 3 survey instrument.

Pilot Testing the Instrument and Measures

The pilot study sought to statistically confirm the items to be included in the TICS version 3 survey instrument against the backdrop of the theoretical framework of self-efficacy. This study involved self-reported data via an online survey from teacher respondents using a simple random sample. One hundred and eleven teachers responded, of which 43 had missing/incomplete data thereby resulting in 68 respondents who completed the survey (n = 68). These participants were teachers employed in Southern California, who had access to utilize and integrate technology in the classroom environment as an instructional and/or learning tool. Accordingly, this validation study indicated the existence of five components: Technology Usage (TU), Technology Application (TA), Technology-infused Learning (TIL), Technology Literacy & Digital Citizenship (TLDC), and Technology-supported Assessment (TSA). As such, the TICS version 3 is a standardized 25-item forced-choice, multidimensional measure of five fundamental aspects of technology integration to analyze teachers' self-efficacy to use and integrate technology.

The subscale of Technology Usage examines teachers' self-efficacy to use and model technological devices and digital tools to support student learning. The subscale of Technology Application focuses on teachers' self-efficacy to integrate technological devices into lessons and provide application opportunities of digital tools for students use and benefit as part of instructional practice. The subscale of Technology-infused Learning addresses teachers' self-efficacy to embrace student-centered learning through effective use of technology in the classroom as part of their instructional practice. The subscale of Technology Literacy and Digital Citizenship explores teachers' self-efficacy to effectively use technology to communicate information to enhance the learning process and to recognize the skills and concepts students should know to use technology appropriately. The subscale of Technology-supported Assessment evaluates teachers' self-efficacy to create an environment in which appropriate technology is integrated to provide meaningful assessment and feedback. These five components, as defined in Table 4, reflect or implicate teachers' readiness and preparedness to integrate technology in the classroom. Therefore, the five components of TICS version 3 highlight the importance of the association between teachers' self-efficacy and their potential integration of current and future technology in the K-12 classroom setting.

Table 4 TICS v.3 Components, Definitions, # of Items, & Sample Questions

The Technology Integration Confidence Scale (Version 3)

Component	Definition	# of Items	Sample Question
Technology Usage (C1)	Teachers' confidence to use and model technological devices and digital tools to support student learning.	7	How confident are you in using tech to stay current with research to support student learning outcomes?
Technology Application (C2)	Teachers' confidence to integrate technological devices into lessons and provide application opportunities of digital tools for students use and benefit as part of instructional practice.	5	How confident are you in exploring and applying instructional design principles to create innovative digital learning environments that engage and support learning?
Technology-infused Learning (C3)	Teachers' confidence to embrace student-centered learning through effective use of technology in the classroom as part of their instructional practice.	5	How confident are you in using tech to support student needs through increased personalization and differentiation?
Technology Literacy & Digital Citizenship (C4)	Teachers' confidence to effectively use technology to communicate information to enhance the learning process and to recognize the skills and concepts students should know to use technology appropriately.	4	How confident are you in teaching students to think critically, be safe, and responsible in the digital world?
Technology-supported Assessment (C5)	Teachers' confidence to create an environment in which appropriate tech is integrated to provide meaningful assessment and feedback.	4	How confident are you in using digital tools to provide immediate feedback to students?

According to Allen and Seaman (2007), for a Likert scale and Likert-type scale survey to be valid and reliable it is required to have at least five response categories but having more than seven tend to adversely affect the scale's reliability. Research further suggests that an even number of categories, such as a 6-point Likert-type scale, eliminate the 'neutral' option in a 'forced choice' survey scale, like that of TICS version 3, and require participants to be intentional about their responses (Allen & Seaman, 2007). Thus, TICS version 3 items use a consistent and familiar response pattern, comprising of a 6-point Likert-type scale response (where 0 means Not confident at all to 5 meaning Completely confident), to affirm or reject the statements of confidence as it relates to an aspect of technology integration. Examples of items are included in Table 4.

Responses to the survey are scored to yield measures on each of the five fundamental components of technology integration. The mean score of the components represents a global measure of teachers' self-efficacy to implement that aspect or skill of technology integration. Substantial preliminary evidence as to the validity of the TICS version 3 was calculated. Based on the 68 responses, the overall Cronbach's Alpha reliability coefficient for the TICS version 3 is 0.977 (see Table 5), which is very good (the threshold is >= 0.8; >=0.75 is marginally acceptable). For the subtests, reliability coefficients ranged from .916 to .933 for the TU subscale, .905 to .921 for TA subscale, .852 to .913 for the TIL subscale, .890 to .922 for the TLDC subscale, and .846 to .882 for the TSA subscale.

Table 5 Instrument Overall Reliability

Reliability Statistics

Cronbach's Alpha	N of Items
.977	25

An exploratory factor analysis (EFA) was also performed to investigate the factor structure underlying responses to the 25-item TICS version 3. The EFA confirmed that 65.35% of respondents' total variance toward the target construct are explained by the instrument. This result is considered adequate, as ideally at least 50% of the variance should be explained (Hatcher, 2013; Lomax & Hahs- Vaughn, 2012). Hence, using the statistical techniques of item analysis and instrument validation, the analyses confirmed the instrument's psychometric properties for reliability and validity, thereby, affirming its usage for future studies as a short, direct, reliable measure for the K-12 school level for research and evaluation.

Instrumentation

An online survey that included the 25-item TICS version 3 instrument and seven demographic items (e.g., age, gender, race/ethnicity, educational attainment, years of experience, level of teaching, and the number of continuous PD hours received) was utilized to collect the data for this study. The purpose of collecting the demographic items was to provide data regarding the research participants and the sample's representativeness of the target population for generalization purposes. For example, as it relates to teachers' technology integration confidence levels, the demographic data may allow the researcher to determine, among other things, if participants' age and/or years of experience and/or number of continuous PD hours received are aids or hindrances to teachers' technology integration attributable to more training in technology during teacher training and/or continuous PD.

This third iteration of the TICS survey instrument was intended to measure a teacher's self-efficacy to integrate technology in the classroom. Hence, TICS version 3 furthered the progression of Browne's (2011) TICS version 2, which was a rigorously developed self-efficacy scale aligned to the second (2007) generation of ISTE's National Educational Technology Standards for Teachers (NETS-T). Browne's (2011) TICS version 2 more narrowly measures teachers' confidence in executing technological skills as that was the alignment focus of NETS-T. Unlike Browne's (2011) TICS version 2, TICS version 3 examined the tasks of effective technology integration (i.e., students and teachers using technology during instruction). TICS version 3 has five components or categorical tasks (see Table 6 below), aligned to the seven benchmarks (viz., Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst) of the third and current generation of ISTE (2017) Standards for Educators, as outlined in Table 1 earlier.

Table 6 TICS v.3 Items per Components

	Components	TICS Items (in TICS v3)	Alignment to ISTE Standards for Educators
1.	Technology Usage (C1)	1-7	Learner (#1, 6) Leader (#2, 3) Collaborator (#4, 5) Designer (#7)
2.	Technology Application (C2)	8-12	Designer (#8, 9) Facilitator (#10, 11) Analyst (#12)
3.	Technology-infused Learning (C3)	13-17	Learner (#13-17)
4.	Technology Literacy & Digital Citizenship (C4)	18-21	Citizen (#18-21)
5.	Technology-supported Learning & Teaching (C5)	22-25	Learner (#22, 23) Collaborator (#24) Analyst (#25)

Selection of Participants

Setting

The setting for the current study was multiple urban Catholic K-12 school environments in Southern California. Catholic schools, united in their belief of Catholicism and their hierarchical religious structure, are accredited by their regional accreditation organizations. In California, Catholic schools are accredited by the Western Association of Schools and Colleges (WASC) and the Western Catholic Education Association (WCEA). Though guided by a central school district office, the day-to-day management is parochial and site-based. These schools' diversity and makeup generally are reflective of the local community. As a result, Catholic schools vary in terms of size, population, technology availability as well as technology services provided for teachers and students. The faculty at these schools are generally diverse in terms of ethnicity, socioeconomic status, and district geography. Additionally, many teachers are non-Catholics, but all teachers are required to possess at least a bachelor's degree, and increasingly to have their California teaching credential, to be employed.

Target Population and Sample

The target population for this study consisted of approximately 2,500 teachers in a large, diverse Southern California Catholic school district with 215 elementary schools and 40 high schools. Given the study's estimated target population, the researcher sought to utilize a minimum returned sample size of at least 334 teachers, as calculated online by Raosoft (2004). According to Bartlett, Kotrlik, and Higgins (2001), this is an acceptable minimum sample size, since it reflects a 95% confidence level and a 5% margin of error, to investigate teachers' self-efficacy of technology integration (i.e., their self-efficacy or confidence level in using and integrating technology in the classroom). However, the actual minimum returned sample size of 327 teachers (n = 327)[4], resulting in a 5.05% margin of error with a 95% confidence level (Raosoft, 2004), was in compliance with Israel's (2003) suggestion that a good size sample, ex., 200-500, is needed for performing more rigorous evaluations and analyses.

Additionally, the participants in this study were urban K-12 teachers in multiple Catholic school settings from Southern California, who had access to utilize and integrate

[4] Given that the online survey was sent to principals who, as secondary gatekeepers, opted to forward the invitation and survey link to teachers on staff, the response rate for completion of the survey is indeterminate. However, as stated elsewhere, the online survey has an acceptable 5.05% margin of error with a 95% confidence level (Bartlett et al., 2001; Raosoft, 2004).

technology in the classroom environment as an instructional and/or learning tool. Accordingly, these teachers were employed in schools with computer access and over time received continuous PD training sessions on technology integration. For this study, access to technology was defined as the program infrastructure that participating teachers instructing students had availability to them such as the Internet and Wi-Fi, Chromebooks, iPads, and desktop computers in the classroom, media center, computer lab and/or interactive smart boards installed or stationed in the classroom.

Data Collection

To collect the requisite data for the current study, an online survey was administered to a random sample of teachers. The researcher contacted and solicited the assistance of Catholic elementary and high school principals in Southern California by emailing them a brief notice explaining the scope and purpose of the study as well as expressly encouraging teachers on staff to participate in the study. The principal, in turn, emailed teachers an invitation to participate in the study.

Upon receiving the teachers' responses to the email, a letter of invitation and participant consent (see Appendix B) was sent to each teacher along with the link to the online survey. Teacher-participants had the option, before commencing the survey, to proceed with completing or declining the invitation to participate and terminate the survey. The data collection period, which was extended beyond the anticipated 4-6 weeks to accommodate a minimum sample size necessary for a 5% margin of error with a 95% confidence level, ultimately lasted for the duration of 15 weeks. During this period, the researcher addressed any procedural questions or study-related concerns that participants expressed. Reminders concerning the survey completion request were sent to participants via principals in response to weekly email promptings by the researcher. After the data collection period closed, the responses were collected from the online survey tool (Qualtrics) and were used to develop the data set in IBM SPSS version 23.

Data Analyses

For the current quantitative investigation, the researcher utilized a descriptive research design to conduct the study. A quantitative design in research, according to Creswell (2003), is a useful tool to support or refute “alternate knowledge claims” (p. 153). In particular, descriptive research examines the situation, as it exists in its current state, identifying attributes of a specific phenomenon (e.g., teachers’ TSE) based on an observational basis, such as the survey research method (Hale, 2018; Williams, 2007). Using a survey instrument employing Likert-type scales, this study sought to evaluate teachers’ level of self-efficacy to operationalize and integrate technology in the urban K-12 classroom setting.

It is empirically sound to employ Likert-type scales since a Likert response format, despite Jamieson’s (2004) best argument to the contrary, produces empirically interval data (Allen & Seaman, 2007; Carifio & Perla, 2008; Norman, 2010). Jamieson (2004) argued that ‘Likert scales’ are ordinal in character (i.e., produce rank order data) and, therefore, must be analyzed using non-parametric statistics. However, Carifio and Perla (2008) refuted this claim by pointing out that even if the *F-test* is used to analyze ordinal data it still produces unbiased results since the *F-test* is extremely robust to violations of its assumptions. Thus, according to Carifio and Perla (2008), it is:

> …perfectly appropriate to summarise the ratings generated from Likert scales using means and standard deviations, and it is perfectly appropriate to use parametric techniques like Analysis of Variance to analyse Likert scales. It is also perfectly appropriate to calculate Pearson correlation coefficients using the

> summative ratings from Likert scales and to use these correlations as the basis for various multivariate analytical techniques, such as multiple regression, factor analysis and meta-analysis, to obtain more powerful and nuanced analyses of the data and research hypotheses being investigated. (p. 1150)

As implied, to investigate participants' confidence in technology integration via the five subscales or components of TICS version 3, the current study used Likert-type items as part of its survey instrument. The researcher employed a simple scoring method to convert the Likert-type scales categorical responses ('Not confident at all' to 'Completely confident') to an equal-interval numeric scale ranging from zero to five. Thereafter, using the Statistical Package IBM SPSS version 23, the researcher conducted various statistical analyses in order to answer the research questions. The analyses utilized descriptive statistics, including relevant measures of central tendency and dispersion, which were computed for Technology Integration Confidence level scores.

However, because TICS version 3 measures the construct of technology use and integration, it must be split to be meaningfully investigated and interpreted. The rationale for doing so pivots on the fact that knowing how to use computers for one's personal use is not synonymous with knowing how to teach with technology (Franklin, 2007). As Franklin (2007) pointed out, knowing the content is not the same as knowing how to teach content. Likewise, a parallel exists with technology (Franklin, 2007), meaning that knowing how to use technology is not the same as knowing how to teach with technology. The former is a necessary foundation for the latter and was addressed by RQ1 while the latter was explored by RQ2. Taken together, both meaningfully addressed the construct of technology use and integration.

Specifically, to answer RQ1, descriptive statistics, such as mean, median, standard deviation, and variance, were computed from TICS version 3 Components 1 and

3, i.e., Technology Usage and Technology-infused Learning. Categorical responses (i.e., ‘Not confident at all’ to ‘Completely confident’) from the Likert-type items of the survey instrument were converted to an equal-interval numeric scale ranging from zero to five. Descriptive statistics were used to indicate teachers’ level of self-efficacy for the TICS version 3 subscales of Technology Usage and Technology-infused Learning, which in tandem measured teachers’ technology usage (i.e., operationalize and model software and hardware). Data visualization techniques were utilized to highlight patterns of teachers’ level of self-efficacy for technology usage.

Like RQ1, to answer RQ2, descriptive statistics were computed (from TICS version 3 Components 2, 4 and 5, i.e., Technology Application, Technology Literacy and Digital Citizenship, and Technology-supported Assessment) after converting the Likert-type scales categorical responses of the survey instrument. Descriptive statistics were used to indicate teachers’ level of self-efficacy for the TICS version 3 subscales since these components together measure teachers’ technology application (i.e., integrating technological devices and digital tools into lessons to enhance student engagement and learning). Data visualization techniques were utilized to highlight patterns of teachers’ level of self-efficacy for technology application.

Consequently, to accomplish the purpose of the current study, the researcher explored the following two research questions (RQ1 & RQ2).

- **Research Question 1 (RQ1):** What is participating Southern Californian urban Catholic school teachers’ level of confidence in <u>using</u> technology?

- **Research Question 2 (RQ2):** What is participating Southern Californian urban Catholic school teachers' level of confidence to integrate technology in the teaching process using the ISTE Standards for Educators?

Ethical Considerations

The study commenced after procuring approval from the Institutional Review Board (IRB) at Boise State University. Consent to conduct the study was obtained via a letter addressed to the assistant superintendent for Catholic elementary and high schools as well as through email correspondence forwarded to school principals, who acted as secondary gatekeepers. Since Catholic schools operate by site-based management, principals had the prerogative to forward the invitation and survey link tor teachers on staff to participate in the study. Participation in the study by teachers was entirely voluntary and did not entail any foreseeable risks. The data collected from teachers via the online survey was utilized and analyzed in a non-identifiable way assuring that the responses remained confidential. All personally identified data were kept secure with access only given to the researcher.

Summary

The purpose of this quantitative research, utilizing a random sample and a descriptive research design, was to evaluate teachers' level of self-efficacy to operationalize and integrate technology in the urban K-12 classroom in multiple Catholic school settings from Southern California. By utilizing the Technology Integration Confidence Scale version 3 survey instrument that was pre- and pilot-tested by the researcher, the current study evaluates the fundamental components of teachers' technology efficacy. These interrelated components, intended to deepen educators' practice, promote collaboration with peers, challenge educators to rethink traditional approaches and prepare students to drive their own learning (ISTE, 2017), were defined as (a) technology usage, (b) technology application, (c) technology-infused learning, (d) technology literacy and digital citizenship, and (e) technology-supported assessment. Taking these five components into account as a conglomerate, TICS version 3 inherently measured the construct of technology use and integration.

However, to independently assess teachers' level of self-efficacy for the constructs of technology use and technology integration *per se*, TICS version 3 subscales (also referred to as components) had to be subdivided. Components 1 and 3, i.e., Technology Usage and Technology-infused Learning, which in tandem measured teachers' technology usage (i.e., operationalize and model software and hardware), and Components 2, 4 and 5, i.e., Technology Application, Technology Literacy and Digital Citizenship, and Technology-supported Assessment, which in concert measured teachers' technology application (i.e., integrating technological devices and digital tools into lessons to enhance student engagement and learning) were grouped and analyzed. Taken together, findings show that both subcategories meaningfully addressed the construct of technology use and integration.

This chapter detailed the research method and design for the current quantitative investigation and described the purpose of the study, research questions, research method, research design, the target population, a sampling of the population, sampling procedures, and data-gathering procedures. The study, utilizing a random sample of teacher-participants, was conducted in Southern California. Consent for the study was obtained through a letter addressed to teacher participants. Data analyzed were non-identifiable assuring teachers that their responses remained confidential. Descriptive statistics were computed to answer the research questions. The next chapter, Chapter 4, presents the findings.

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF DATA

Based on the methods discussed in chapter three, this chapter contains the results of the analyses of the data. First, the results from the descriptive analysis describing the sample are presented. Next, the results from the analysis of the data addressing the two research questions that examine urban K-12 teachers' technology self-efficacy (TSE) to effectively use and integrate technology in their teaching practice based on the ISTE (2017) Standards for Educators are presented.

Demographic Data Analysis

A total of 381 teachers consented and responded to the online survey. However, 54 teachers did not complete the entire survey. Therefore, after addressing missing data on each item by means of listwise deletion, the resulting sample size for the current study was three hundred and twenty-seven (n = 327). Since the population of teachers in the school district was estimated to be 2,500, with a sample size of 327, this resulted in a 5.05% margin of error with a 95% confidence level (Raosoft, 2004). This is considered an acceptable sample size and margin of error for social science research (Bartlett et al., 2001).

To describe the sample of Southern Californian urban K-12 teachers who participated in the current study, descriptive statistics such as frequencies, measures of central tendency and dispersion were computed using IBM SPSS 23 statistical software. The results are presented in Tables 7-13, which describe the various elements of the sample. The frequencies and percentages of participating K-12 teachers by gender are presented in

Table 7. The majority of teachers who participated in the study were females (77.1%), while two teachers selected “other” (0.6%) as their gender. This distribution of teachers in the sample by gender is representative of the gender distribution in the population of the school district where the majority of teachers are females.

Table 7 Distribution by Gender

	Frequency	Percent
Male	73	22.3
Female	252	77.1
Other	2	0.6
Total	327	100.0

The frequencies and percentages of participating K-12 teachers by race are presented in Table 8. Of the eight categories of race/ethnicity on the online survey, the largest group of teachers self-identified as Hispanic/Latino (40.4%) followed by White (38.5%). Also, some teachers self-identified as Asian (7.0%) and mixed race (6.1%). Only 7.9% of the teachers self-identified as one of the remaining four categories of race (Black/African American, Other, American Indian/Alaska Native, and Hawaiian/Other Pacific Islander).

Table 8 Distribution by Race

	Frequency	Percent
American Indian/Alaska Native	3	0.9
Asian	23	7.0
Black/African American	16	4.9
Hawaiian/Other Pacific Islander	2	0.6
Hispanic/Latino	132	40.4
White	126	38.5
Mixed Race	20	6.1
Other	5	1.5
Total	327	100.0

The frequencies and percentages of participating K-12 teachers by the six categories of age are presented in Table 9. The majority of teachers in the sample were between the age of 26 to 45 years old (57.2%). Further, 37.6% of the teachers were older than 45 years and only 5.2% of the teachers were younger than 26 years.

Table 9 Distribution by Age

	Frequency	Percent
25 or younger	17	5.2
26-35	96	29.4
36-45	91	27.8
46-55	64	19.6
56 or older	59	18.0
Total	327	100.0

The frequencies and percentages of participating K-12 teachers by teaching level are presented in

Table 10. The largest groups of teachers who participated in the current study were elementary (46.2%) and middle school teachers (36.7%). This distribution of teachers in the sample by teaching level is representative of the distribution in the population of the school district where the majority of teachers are at the elementary and middle school levels.

Table 10 Distribution by Teaching Level

	Frequency	Percent
Elementary (TK-5)	151	46.2
Middle School (6-8)	120	36.7
High School (9-12)	56	17.1
Total	327	100.0

The frequencies and percentages of participating K-12 teachers by the highest level of educational attainment are presented in

Table 11. The majority of teachers, who participated in the current study, reported that their highest educational attainment was a master's (59%). This was followed by 34.9% of participating teachers reporting that they had earned a bachelor's degree as their highest educational attainment. Notably, a few of the teachers' highest educational attainment was a doctorate degree (4%).

Table 11 Distribution by Highest Level of Education

	Frequency	Percent
Bachelor	114	34.9
Master's	193	59.0
Educational Specialist	7	2.1
Doctorate	13	4.0
Total	327	100.0

The descriptive statistics for participating K-12 teachers' years of teaching experience are presented in Table 12. The years of teaching experience of the teachers in the sample ranged from 1 to 42 years. The mean years of teaching experience was 13.4 (*SD* = 9.5). The median years of teaching experience was 12 years, with a mode of 3 years.

Table 12 Descriptive Statistics for Years of Teaching Experience

	Statistics
Mean	13.4
Median	12.0
Mode	3
Std. Deviation	9.5
Minimum	1
Maximum	42

One of the demographic items on the online survey asked teachers to indicate how frequently they participated in technology-oriented professional development (PD) training sessions. The results from participating teachers' responses to this item are presented in Table 13. As shown, the largest group of teachers (25.1%) reported that they participated in one technology-oriented PD training session per year. Further, 18.3% and 16.8% of the teachers indicated that they participated in technology-oriented PD training sessions twice and four times per year, respectively. Also, 14.7% of the teachers reported that they participated in technology-oriented PD training sessions monthly. Furthermore, 14.4% of the teachers reported that they did not participate in any technology-oriented PD training session in the last year.

Table 13 Distribution by Frequency of Tech-oriented PD

	Frequency	Percent
None in the last year	47	14.4
Annually	82	25.1
Twice per year	60	18.3
4 times per year	55	16.8
6 times per year	35	10.7
Monthly	48	14.7
Total	327	100.0

Data Analysis and Research Findings

For the current quantitative investigation, the researcher utilized a descriptive research design to conduct the study that evaluated teachers' level of self-efficacy to operationalize and integrate technology in the urban K-12 classroom setting. Hence, to accomplish the purpose of the current study, the researcher explored the following two research questions (RQ1 & RQ2).

- **Research Question 1 (RQ1):** What is participating Southern Californian urban Catholic school teachers' level of confidence in using technology?
- **Research Question 2 (RQ2):** What is participating Southern Californian urban Catholic school teachers' level of confidence to integrate technology in the teaching process using the ISTE Standards for Educators?

Furthermore, the Technology Integration Confidence Scale (TICS) version 3 survey instrument was used in this study to validly examine technology self-efficacy. The extreme scores/means of technology usage/integration confidence are 0 and 5, representing 'not confident' and 'completely confident,' respectively. For optimal technology integration self-efficaciousness, scores/means of technology usage/integration confidence of 4 or above are required. Other intermediate levels of confidence are listed in Table 14.

Table 14 TICS v.3 Scale with Levels of Confidence

TICS Scale	Score Equivalent	Interval	Level of Confidence
0	Not confident at all		
1	Slightly confident	<3.00	Very Low/Somewhat Confident
2	Somewhat confident		
3	Fairly confident	3-3.99	Modestly/Fairly Confident
4	Quite confident		
5	Completely confident	>3.99	Highly/Very Confident

The data collected addressing the purpose of the current study via the TICS version 3 survey along with the seven demographic items are analyzed and presented below.

Results Related to Research Question 1

The first goal of the current research was to investigate participating Southern Californian urban K-12 teachers' level of confidence in using technology. To address this goal, via answering Research Question 1, the means and standard deviations of the indexed scores for the subscales Technology Usage (C1), Technology-infused Learning (C3), and the overall Technology Usage (C1 and C3) were computed. Additionally, data visualization displayed using box plots were developed to better graphically display and determine teachers' level of confidence in using technology. The results from Table 15 indicate that, on average, participating teachers' level of confidence in using technology were 3.2 (*SD* = .78) for Technology Usage, 3.2 (*SD* = .78) for Technology-infused Learning, and 3.2 (*SD* = .73) for overall Technology Usage on a scale from 0 to 5, where 0 means not confident at all and 5 means completely confident. These mean scores between 3 and 4 out of a possible score of 5 for using technology by teachers indicate fair levels of confidence.

Table 15 Descriptive Statistics for Confidence in Using Technology

	Tech Usage	Tech-infused Learning	Overall Tech Usage
Mean	3.2	3.2	3.2
SD	.78	.78	.73

Further, examining the box plots in Figure 3, 50% of the participating Southern Californian urban K-12 teachers indicated a level of confidence in using technology that was between 3.33 and 4 out of a possible score of 5 for overall Technology Usage, considered a score representing teachers who would be fairly confident in using technology in the classroom setting. The remaining 50% of the teachers surveyed reported a level of confidence in using technology that was less than 3.33 out of a possible score of 5 for overall Technology Usage. Teachers with such a score would mostly be less than fairly confident in using technology in the classroom setting. Also, the box plots illustrate that none of the surveyed teachers self-identified as being highly confident in using technology in the classroom setting. The conclusion is that, on average, these participating Southern Californian urban K-12 teachers had a fair level of confidence in using technology (*M* = 3.2, *SD* = .73).

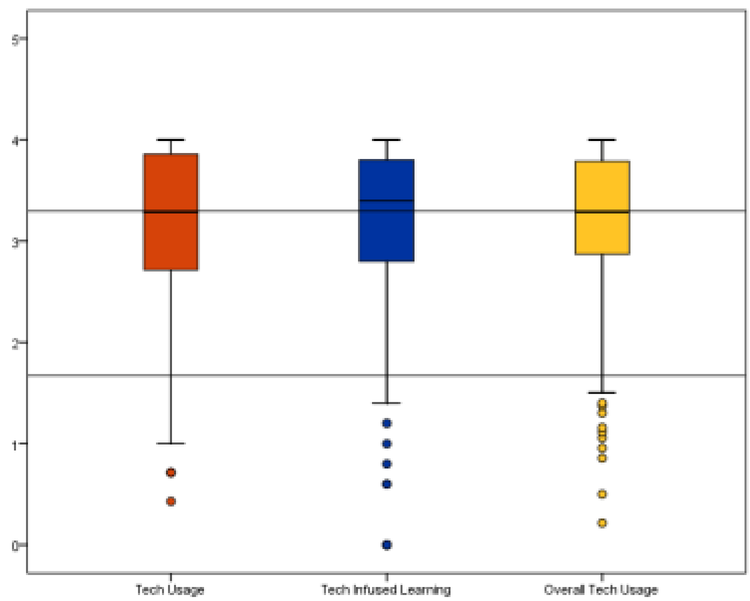

Figure 3. Box Plots of Confidence in Using Technology

Results Related to Research Question 2

The second goal of the current research was to investigate Southern Californian urban K-12 teachers' level of confidence integrating technology in the teaching process using the ISTE (2017) Standards for Educators. To address this goal, via answering Research Question 2, the means and standard deviations of the indexed scores for the subscales Technology Application (C2), Technology Literacy and Digital Citizenship (C4), Technology-supported Assessment (C5) and the overall Technology Application (C2, C4, and C5) were computed. As before, data visualization technique employed using box plots were developed to better visualize and determine teachers' level of confidence to integrate technology in the teaching process using the ISTE (2017) Standards for Educators. The results shown in Table 16 indicate that, on average, participating Southern Californian urban K-12 teachers' level of confidence to integrate technology in the teaching process using the ISTE (2017) Standards for Educators was 3.0 (*SD* = .89) for Technology Application, 3.5 (*SD* = .68) for Technology Literacy and Digital Citizenship, 3.1 (*SD* = .88) for Technology-supported Assessment, and 3.2 (*SD* = .73) for overall Technology Application on a scale from 0 to 5, where 0 means not confident at all and 5 means completely confident. These mean scores between 3 and 4 out of a possible score of 5 for integrating technology by teachers indicate fair levels of confidence.

Table 16 Descriptive Statistics for Confidence in Integrating Technology

	Tech Application	Tech Literacy & Digital Citizenship	Tech-supported Assessment	Overall Tech Application
Mean	3.0	3.5	3.1	3.2
SD	.89	.68	.88	.73

Further, examination of the box plots illustrated in Figure 4 shows that less than 50% of participating teachers indicated a level of confidence to integrate technology that was between 3.33 and 4 out of a possible score of 5 for the subscales of Technology Application and Technology-supported Assessment. However, that also means more than 50% of the participating Southern Californian urban K-12 teachers reported a higher level of confidence for integrating technology that was between 3.33 and 4 out of a possible score of 5 for the subscales of Technology Literacy and Digital Citizenship and overall Technology Application. Teachers with such a score would be fairly confident in integrating technology in the classroom setting. Also, the box plots illustrate that none of the surveyed teachers self-identified as being highly confident in integrating technology in the teaching process using the ISTE (2017) Standards for Educators. Therefore, the conclusion is, on average, participating Southern Californian urban K-12 teachers had a fair level of confidence to integrate technology in the teaching process using the ISTE (2017) Standards for Educators (*M* = 3.2, *SD* = .73).

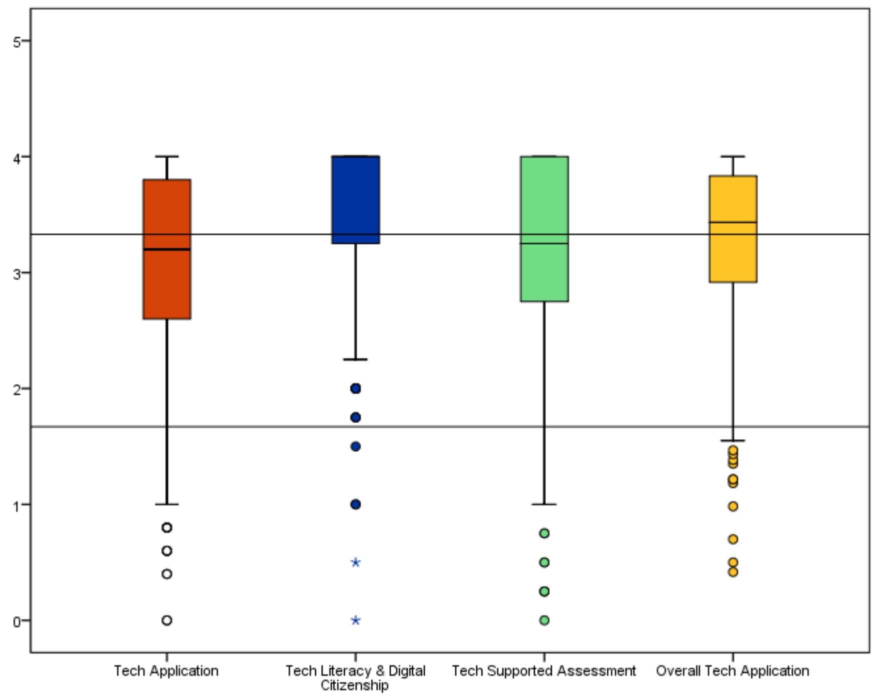

Figure 4. Box Plot of Confidence in Integrating Technology

<u>Other Noted Results</u>

Participating Southern Californian urban K-12 teachers reported the subscale of Technology Literacy and Digital Citizenship as their most self-efficacious area for technology integration is a finding in need of further clarification. At first glance, this finding seems counterintuitive since experientially the subscale of Technology Literacy and Digital Citizenship tends to be infrequently addressed and minimally included as part of teachers' technology-oriented PD training sessions (Hollandsworth, Dowdy, & Donovan, 2011; Lindsey, 2015). However, after reviewing the survey items that comprise this subscale, teachers may feel self-assured to teach appropriate prosocial behaviors and critical evaluations of sources as well as the promotion of the moral code to respect the property of others and confidentiality applied to an online environment (see Appendix A, C4#18-21). Perhaps, in light of the preceding, this subscale is the teachers' most confident aspect of their technology-oriented teaching practice since, as an element of technological knowledge, it is presumably less rigorous than performing a techno-pedagogical skill. Being akin to a proactive guideline, albeit an evolving one, for cyber activities, online etiquette, and critical perspectives vis-à-vis digital society (Roquet, 2019), Technology Literacy and Digital Citizenship might be perceived by teachers as a lesser demanding subscale. Also, this subscale perceivably constitutes easier or less daunting tasks to successfully execute since incorporating a digital citizenship component into any technology-enhanced lesson is reportedly a simple matter (Krueger, 2020).

Next, to examine the outliers found in the boxplots (see Figures 3 and 4), the raw scores for overall Technology Usage and overall Technology Application were converted to z-scores. Participants with z-scores greater than 3 or less than -3 are considered outliers (Dienes, 2011; Frost, 2019; Shiffler, 1988). The outliers for overall Technology Usage were four participants who had z-scores less than -3 (see Figure 5). Three of the four outliers were white females older than 55 years. The other was a Hispanic/Latino male between the age of 36-45 years. Two outliers possessed a Bachelor's degree whereas the other two had a Master's degree. Two outliers received no technology-oriented professional development (PD) training in the last year while the other two participated in only two PD training sessions. Two outliers were high school teachers, one was a middle school teacher, and one was an elementary teacher. Their teaching experiences were 3, 18, 22, and 27 years. The younger, less experienced Hispanic/Latino female teacher participated in six PD training sessions in the last year.

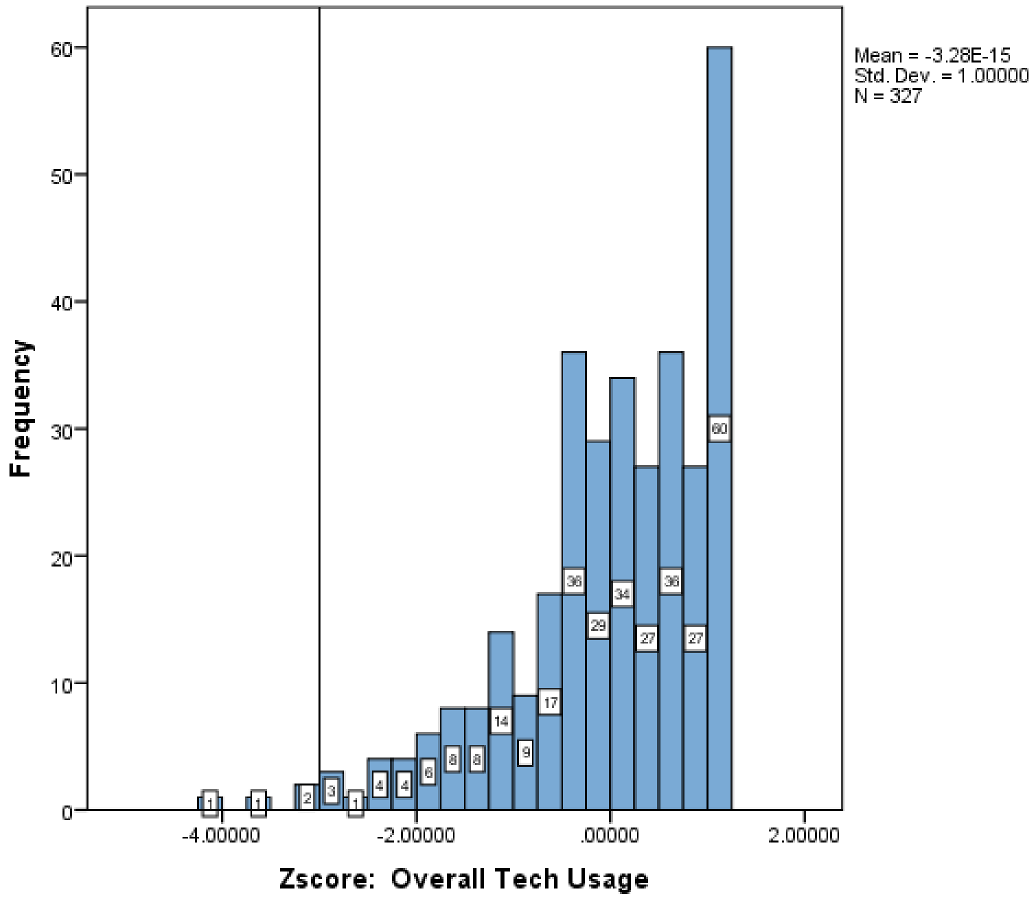

Figure 5. **Histogram of Z-scores for Overall Technology Usage**

The outliers for overall Technology Application also included four participants who had z-score less than -3 (see Figure 6). However, only one of the participants was an outlier for both overall Technology Usage and overall Technology Application, meaning this teacher has very low self-efficacy to use technology in the classroom setting and integrate technology into teaching practice as stipulated by the ISTE (2017) Standards for Educators. Specifically, this outlier was a white male high school teacher who is older than 55 years. He possessed a Master's degree with 27 years of teaching experience and did not attend any PD training sessions within the last year. The other three outliers for overall Technology Application were females, taught at the elementary school level, and participated in no technology-oriented professional development PD training in the last year. Two outliers were white and two were Hispanic/Latino. Two outliers possessed a Bachelor's degree while the other two had a Master's degree. Two outliers were older than 55 years, one was between the age of 26 and 35, and the other was between the age of 46 and 55 years. Their teaching experiences were 4, 24, 27, and 31 years.

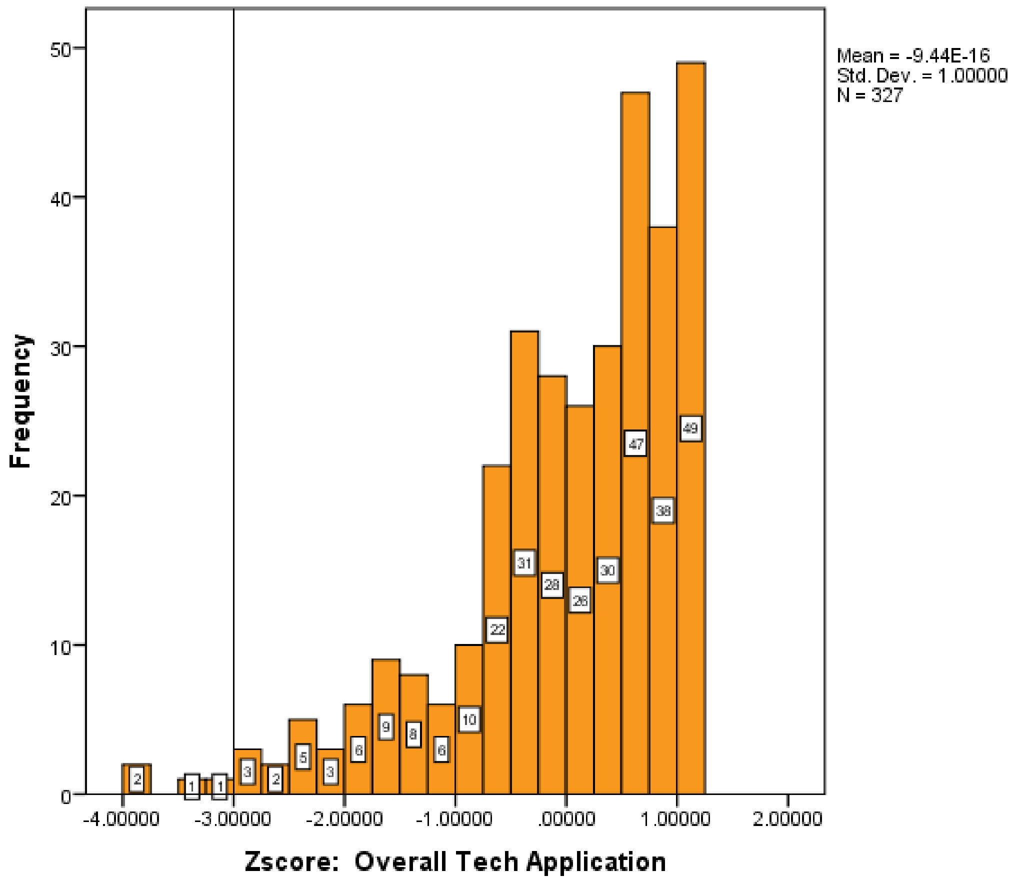

Figure 6. Histogram of Z-scores for Overall Technology Application

Subsequently, more experienced teachers who participated in no or, at most, two PD training sessions within the last year were the most outstanding descriptive profile features among the outliers for both overall Technology Usage and overall Technology Application. Participation in PD training appears to be a factor that affects teachers' self-efficacy as it relates to technology usage in the urban K-12 classroom setting and the integration of technology in their teaching practice, and as such, may serve as an intervention measure to increase teachers' technology self-efficacy.

Summary

The purpose of the current study was to investigate urban K-12 teachers' level of technology self-efficacy to effectively use and integrate technology in their teaching practice in multiple Catholic school settings from Southern California. The means and standard deviations of the indexed scores, as well as data visualization using box plots, were computed and developed to determine and graphically display teachers' level of confidence in using and integrating technology.

For the first research goal (RQ1), exploring technology usage, the data analysis revealed that 50% of the participating Southern Californian urban K-12 teachers indicated a level of confidence in using technology that was between 3.33 and 4 out of a possible score of 5, considered a score representing teachers who would be fairly confident in using technology in the classroom setting. However, that also means the remaining 50% of the participating teachers reported a level of confidence in using technology that was less than 3.33 out of a possible score of 5, suggesting that these teachers were mostly less than fairly confident in using technology in the classroom setting. Also, none of the participating teachers reported being highly confident in using technology in the classroom setting. Thus, the conclusion of this particular study is, on average, participating Southern Californian urban teachers had a fair level of confidence in using technology. These descriptive findings of technology usage, for example, sets the stage for a future predictive study to examine the relationship between levels of self-efficacy and frequency of technology uses in the K-12 classroom as a means to verify if that relationship has any impact on teaching practice and ultimately student achievement.

For the second research goal (RQ2), investigating technology integration, data analysis indicated that less than 50% of the teachers surveyed had a level of confidence for integrating technology that was between 3.33 and 4 out of a possible score of 5 for the subscales of Technology Application (C2) and Technology-supported Assessment (C4), considered a score representing teachers who would be fairly confident in using technology in the classroom setting. However, more than 50% of the teachers surveyed indicated a higher level of confidence in integrating technology that was between 3.33 and 4 out of a possible score of 5 for the subscale of Technology Literacy and Digital Citizenship (C5) and overall Technology Application. Teachers with such scores are fairly confident in integrating technology in the classroom setting. Also, none of the surveyed teachers reported being highly confident in integrating technology in the teaching process using the ISTE (2017) Standards for Educators. The conclusion is, on average, participating Southern Californian urban K-12 teachers reported a fair level of confidence in integrating technology in the teaching process using the ISTE (2017) Standards for Educators. As before, this study’s descriptive findings concerning technology integration serve as foundation for further predictive and improvement research to explore factors, like those of the demographic items, that lead to prediction of frequency for teachers’ technology use and integration efforts as well as intervention ways to improve teaching practice, student achievement, and possibly close the achievement gap.

This penultimate chapter, Chapter Four, reported the findings based on the analysis of the data. Chapter Five, the concluding chapter, provides a summary of the study, discussion of research findings and interpretations, implications for professional practice, limitations, conclusions, and recommendations for future studies.

CHAPTER FIVE: SUMMARY, DISCUSSION, AND CONCLUSION

Digital technology use in today's classroom continues to gain steady and greater importance concordantly with increases in computer access and technology training (HMH, 2018; Kay, 2006). However, it must be noted that a teacher's high computer self-efficacy level, often exhibited through their technology usage know-how, does not guarantee that she or he will be able to thoughtfully and effectively integrate technology in the class environment (Kilic, 2015; Paus-Hasebrink et al., 2010). There are two connected but distinct skills involved with technology-enhanced teaching in classroom settings: (1) how to use technology and (2) how to integrate technology (Paus-Hasebrink et al., 2010; Sadaf et al., 2012, 2016; So & Kim, 2009). The latter presupposes the former since the latter is impacted by factors such as fear and anxiety associated with computer usage (Kilic, 2015). As such, the benefits gained from these emerging technologies and promising new media will depend, to a large degree, on the extent they can be leveraged for effective teaching (Clark & Mayer, 2016). Instructing with technology allows teachers to use advances in technology to increase teaching effectiveness as well as explore more meaningful curricular pathways (Rebora, 2017).

Accordingly, it is teachers, not digital tools, that drive instruction (Joyner, 2019; Perkmen & Pamuk, 2011; Portnoy, 2018). The instructional potential of these 21st-century digital devices, software applications, and online platforms as facets for teaching are dependent upon the extent that they are able to be applied and leveraged in ways that are compatible with human cognition as well as teachers' pedagogical beliefs and technology self-efficacy (Clark and Mayer, 2011; Straub, 2009; Windschitl & Sahl, 2002). For this reason, the current study utilized self-efficacy theory (Bandura, 1997) as the conceptual framework for investigating teachers' technology efficacy and validly examined technology self-efficacy via the Technology Integration Confidence Scale (TICS) version 3 survey instrument.

Moreover, teachers' beliefs serve as cognitive filters screening their experiences and thus shaping and reshaping their thoughts and actions (Hoy, Hoy, & Davis, 2009). Among the many beliefs that teachers might hold, few are as powerful as their self-efficacy for teaching (Gregoire, 2003; Hoy et al., 2009). The latter is of such high significance that in the complex process of navigating classroom life it can trump other beliefs including a teacher's personal philosophy of education, pedagogical principles, and at times research-based instruction (Hoy et al., 2009). As Gregoire (2003) suggested, even when teachers acknowledge that a given method may be more effective than another, their efficacy beliefs for enacting that new method will ultimately drive their implementation decisions. Thus, successful integration is, in large measure, determined by how technology is deployed and executed in the classroom (Muir et al., 2004; Rebora, 2017). Implementation, therefore, is influenced by teachers' beliefs, social dynamics, and institutional culture as well as self-efficacy and confidence in using and integrating technology (Straub, 2009; Windschitl & Sahl, 2002).

The research literature has been consistent that teachers are indispensable to student achievement since they are the most important factor for learning in the classroom (Darling-Hammond, 2000; Hattie, 2003a; Hattie, 2003b; Kane, Rockoff, & Staiger, 2008; U.S. Department of Education, 2010). Indeed, it is not the software application itself but how the software application is employed that is associated with, for example, the student's skill level (Joyner, 2019; Perkmen & Pamuk, 2011). Consequently, when used and integrated properly, digital tools can enhance and fundamentally transform the effectiveness of classroom instruction. Given the steady influence of technology on teachers' *modi operandi* in the 21^{st}-century classroom, there is an undeniable need to investigate the K-12 teachers' technology self-efficacy to effectively and seamlessly use and integrate technology in their teaching practice.

This final chapter, Chapter Five, provides summary information, interpretations of findings, implications of the research for professional practice, limitations, recommendations for future research studies, and the overall conclusions of this study.

Summary of Study

This quantitative study, employing a descriptive research design, examined self-efficacy as a factor of teachers' technology use and integration efforts utilizing Web 2.0 technologies as pedagogical tools in the K-12 classroom setting. Accordingly, this study evaluated the components of teachers' technology integration self-efficacy by examining results from the researcher-validated TICS version 3 survey instrument, that is aligned to the seven benchmarks of the current ISTE (2017) Standards for Educators. Specifically, the study measured the self-efficacy of teachers to perform tasks of effective technology use and integration. Hence, to provide answers and analyses, the current research study explored the following research questions (RQ1 & RQ2):

- **Research Question 1 (RQ1):** What is participating Southern Californian urban Catholic school teachers' level of confidence in <u>using</u> technology?

- **Research Question 2 (RQ2):** What is participating Southern Californian urban Catholic school teachers' level of confidence to integrate technology in the teaching process using the ISTE Standards for Educators?

To collect the required data for the current study, an online survey was administered to urban K-12 teachers from a large, diverse Southern California Catholic school district. The researcher contacted and solicited the assistance of Catholic elementary and high school principals in Southern California by emailing them a brief notice explaining the scope and purpose of the study as well as expressly inviting them to encourage teachers on staff to participate in the study. The principal, in turn, emailed teachers an invitation to participate in the study. There were 381 teacher-participants who accepted the invitation to participate in the study, of which 327 teachers completed the entire survey. The data collection period lasted for a protracted duration of 15 weeks, which was necessary to strive for the target sample of 334 participants desired for a 5% margin of error with a 95% confidence interval.

The sample size of 327 participants (n = 327) resulted in a 5.05% margin of error with a 95% confidence level (Raosoft, 2004); that, according to Bartlett and colleagues (2001), is an acceptable minimum sample size. Therefore, the current study's findings met the statistical threshold to examine teachers' level of confidence in using and applying technology, and K-12 teachers' self-efficacy as a crucial factor to effectively use and integrate technology in their teaching practice based on the ISTE (2017) Standards for Educators at multiple Southern Californian Catholic school settings. Accordingly, the study offers recommendations to better understand the mechanisms that may increase urban K-12 teachers' self-efficacy toward technology use and integration.

Summary of Findings and Interpretation of Results

Utilizing a descriptive research design, the current quantitative research explored urban K-12 teachers' technology self-efficacy to effectively use and integrate technology in their teaching practice in multiple Catholic school settings in Southern California. The means and standard deviations of the indexed scores for the subscales of the TICS version 3, namely, Technology Usage (C1), Technology Application (C2), Technology Infused Learning (C3), Technology Literacy and Digital Citizenship (C4), and Technology-supported Assessment (C5), as well as overall Technology Usage (C1 and C3) and overall Technology Application (C2, C4, and C5), were computed to determine teachers' level of confidence in using and applying technology, respectively. Overall, the results found that participating Southern Californian urban K-12 teachers felt fairly but not highly confident in both their technology usage and integration efforts.

Specifically, the study's findings revealed that, though their scores ranged in the fair level of confidence, this group of surveyed teachers reported most self-efficacious with the subscale of Technology Literacy and Digital Citizenship and least effectual on the subscales of Technology Application and Technology-supported Assessment. That is, the study's findings affirmed that urban teachers' greatest areas for growth to enhance technology integration self-efficacy are Technology Application and Technology-supported Assessment. Similarly, the data analysis revealed that none of the teachers felt highly confident in using technology. Overall, 50% of the surveyed teachers were fairly confident in using technology while the other half reported feeling less than fairly confident in their technology usage.

Though none of the teachers reported a high level of confidence (scores above 4 on a 0-5 scale) in integrating technology, the results of the analysis concerned the subscale of Technology Literacy and Digital Citizenship and overall Technology Application revealed that more than half of the teachers indicated a fair level of confidence in integrating technology in the teaching process using the ISTE (2017) Standards for Educators. Given that scores above 4 (on a scale of 0 to 5) on the TICS version 3 suggest optimal levels of confidence to use and integrate technology, the findings from this study found sub-optimal levels of technology self-efficacy (TSE), which are counterproductive to effective technology usage and meaningful technology integration. Since teachers who maintain a high degree of technology self-efficacy are more likely to use and apply new technologies during their instruction (DeSantis, 2012; Holden & Rada, 2011), the results of the current study indicate that teachers possessed less-than-ideal levels of confidence to support classroom realities for proficient pedagogical use and integration of technology.

In addition, there were four outliers each for overall Technology Usage and overall Technology Application. However, only one of the participants was an outlier for both overall Technology Usage and overall Technology Application. Further analysis revealed that more experienced teachers who participated in no or, at most, two PD training sessions within the last year were the most outstanding descriptive profile features among the outliers for both overall Technology Usage and overall Technology Application. Participation in PD training appears to be a factor that affects teachers' self-efficacy as it relates to technology usage in the urban K-12 classroom setting and the integration of technology in their teaching practice, and as such, may serve as an intervention measure to increase teachers' technology self-efficacy.

Lastly, another relevant finding indicated that about an equal number of teachers received only monthly professional development (PD) training sessions and no technology-oriented PD in the last year. A larger number of teachers, about a quarter, participates in just a single technology-oriented PD training session per year. Further, nearly half of the teachers are participating in technology-oriented PD at least twice and as much as six times per year. However, only about one in six and close to one in nine of the surveyed teachers indicated that they participated in technology-oriented PD quarterly and bimonthly, respectively. The study's findings thus found that a high number of teachers in this study are participating in a low quantity (number of sessions and hours of sessions) of technology-oriented PD training per year.

Discussion of Findings

As illustrated throughout this paper, countless studies have shown that there is a difference between using and integrating technology in the classroom (Ifenthaler & Schweinbenz, 2013; Paus-Hasebrink et al., 2010; Sadaf et al., 2012, 2016; So & Kim, 2009). Whereas, teachers, today, have greater access to technology, they are not optimizing this opportunity to meaningfully use and effectively integrate technology (Slutsky, 2016). For this reason, the current study advances the research on teachers' level of self-efficacy to use and integrate technology in the Southern Californian urban K-12 classroom setting. The important findings of this research are discussed below.

Teachers' Level of Confidence in Using Technology

According to the Framework of the Partnership for 21st Century Learning (2007) and ISTE (2017) Standards for Educators, it is recommended that the focus for teachers should be on how to use technology meaningfully to integrate it seamlessly into classroom lessons and activities as a means to enhance instruction for student engagement, empowerment, and learning. However, as the current study revealed, the participating Southern Californian urban K-12 teachers had a fair level of confidence on average in using technology and none of the participating teachers reported high or complete confidence in performing technology usage tasks. Results indicated that teachers' level of confidence in using technology was mixed. That is, teachers are unable to perform some technology usage tasks and subskills well, viz., Technology Usage and Technology-infused Learning. Not having high or higher levels of confidence to perform these subskills is expected to limit the scope and frequency of instructional technology integration given that current and future technology integration is associated with technology usage (Tweed, 2013).

Since teachers reported having a fair level of confidence in performing tasks in the areas of Technology Usage and Technology-infused Learning coupled with a growing need for teachers to use and infuse technology into classroom lessons and instructional activities to aid student learning performance (Deye, 2015; HMH, 2018; Kay, 2006), there is a corresponding need for professional and teacher-led intervention measures to increase teachers' self-efficacy in Technology Usage. As Bandura (1997) explained, an effective strategy to improve, or develop, a strong sense of self-efficacy is through mastery experiences from performing tasks successfully. As implied, competence (i.e., expertise) is predicated upon confidence (i.e., self-efficacy) as expertise eventually occurs from gradual improvements and successful repetition via the ‘confidence/competence loop’ (Eikenberry, 2012). Moreover, research shows that experiential knowledge of pedagogical decision-making for the use of technology from actual in-class practice increases teachers’ self-efficacy in their ability to use technology effectively (Power, 2018). Therefore, effective teaching with technology requires multiple opportunities for practice as well as reflections on the deep structure of teaching after enactive contextual experiences (Bandura, 1997; Mishra, 2018; Willingham, 2002).

Teachers’ Level of Confidence to Integrate Technology

Technology integration, within the scope of instructional growth and proficiency, is a work in progress (Milner, 2010). Vicarious experience, allowing comparison with the attainments of others similar to those tasks we individually desire to perform, is a suitable strategy though less effective than mastery experience to successfully execute technology integration tasks (Bandura, 1997). For example, teachers’ integration efforts influenced by teacher modeling via a competent colleague or from professional development coaching are related to their belief concerning their ability to do similar or like technology integration tasks effectively. Thus, confidence (i.e., self-efficacy) leads to competence (i.e., expertise)—when you see someone perform a task you think you can do, you do it and from successful repetition expertise eventually follows. Professional development opportunities can have profound influence on teachers’ technology integration and classroom practice (Brinkerhoff, 2006; Doppelt et al., 2009). Suggesting that acquisition of better teaching practices or more innovative instruction or exposure from others serving as social models raises teacher’s perceived self-efficacy. As such, using or integrating technology, teachers' practice stemming from active or vicarious experiences may lead to changes in their own beliefs about teaching. Hence, as Holden and Rada (2011) concluded, self-efficacy can also have a strong influence on teachers' perceptions of interactive classroom technologies and implementation efforts.

Nonetheless, as Paus-Hasebrink and colleagues (2010) cautioned, "new tools for collaborative learning also lead to great challenges for teachers and demand new didactical concepts" (p. 52) for facilitating meaningful classroom technology application and timely technology-supported assessment. Integrating technology into teaching is challenging for many of today's teachers at all levels (Cennamo et al., 2010; Fioriello, 2011). As the current study revealed, less than 50% of participating teachers indicated a level of confidence to integrate technology that was considered in the confident range of fair for the subscales of Technology Application and Technology-supported Assessment. As Gouseti (2013) observed, though digital technologies can transform classroom practices, many existing habits and 'ways of doing' things at schools simply remain in effect in new contexts. Such teaching practice leads to a proliferation of 'the status quo works' mindset that often plagues, if not hinders, the use and full implementation of digital technology in education (Gouseti, 2013). To mitigate the latter, teachers are encouraged to embrace risks, re-consider ways of navigating existing school culture and refashion old instructional contexts to incorporate new technologically oriented pedagogical ones (Gouseti, 2013; Luckin et al., 2009; Robb, 2018).

In the current classroom setting, teachers are encouraged to utilize new digital tools to enhance student learning outcomes including deeper student learning (Hall, 2015). A digital citizenship curriculum, one that prioritizes learning opportunities beyond the textbook (Smith & Dobson, 2011), has become a must and a plus (Hall, 2015). As this current study pointed out, more than 50% of the surveyed teachers reported a level of confidence for integrating technology that was fair for the subscales of Technology Literacy and Digital Citizenship as well as the overall Technology Application. Accordingly, as Ifenthaler and Schweinbenz (2013) suggested, a majority of teachers are open to incorporating digital technology into daily lessons and feel they would enhance their instructional practice, but others are not self-efficacious about integrating digital devices in their everyday instruction. This finding is also reflectively in alignment with the current study's analysis that, on average, teachers have a fair level of confidence to integrate technology in the teaching process using the ISTE (2017) Standards for Educators. Therefore, the number of teachers who integrate technology beyond resources for instructional support remains below desired levels (Kidd, 2013). Yet, as Smith and Dobson (2011) stated, digital technology as a tool is quite powerful when it is deployed strategically to enhance collaboration, encourage creative discovery, or reinforce foundational knowledge.

Digital technology, as Prensky (2009) suggests, not only has the power to make us smarter but, more importantly, wiser. This is especially so if the technology is leveraged to enhance our capabilities. This is even more true for teachers if they are to effectively use and seamlessly integrate technology into their teaching practice. On average, to reiterate the current study's findings, teachers have a fair level of confidence in both using and integrating technology. These findings are similar to those from Houghton Mifflin Harcourt national surveys for 2016, 2017, and 2018, which confirmed that only 58% of teachers reported being extremely or very confident in their ability to use educational technology in instructionally effective ways. According to those national surveys, on average, 36% of the teachers over the three-year period reported that they are somewhat confident while 6% declared that they are not very confident in their ability to use educational technology in instructionally effective ways (HMH, 2018). These results, aligned with prior research on teacher self-efficacy scores and technology use in classrooms (DeSantis, 2013; Ertmer & Ottenbreit Leftwich, 2010; Evers et al., 2002; Liu et al., 2017; Tweed, 2013), further reveal there is room for meaningful improvement of integrating technology as part of teachers' classroom practice. Accordingly, elevating teachers' technology self-efficacy and preparing them to effectively integrate technology into their classrooms via multiple-track sustained PD programs to facilitate meaningful professional learning is vitally important in today's urban classroom and the world of educational practice (Beard, 2016).

Implications for Professional Practice

Over time with purposeful support and classroom practice, a teacher gains experience and self-efficacy. This is important since teachers who possess high self-efficacy are better able to adapt to evolving technology, making them best prepared to integrate technology into their classrooms (Ertmer & Ottenbreit-Leftwich, 2010; Gilakjani, 2013; Mishra and Koehler, 2006; Tweed, 2013). Accordingly, a teacher's experience with technology significantly influences his or her classroom technology integration (Liu et al., 2017). Additionally, how frequently a teacher uses technology alongside with his or her confidence and comfort using and applying technology further mediates classroom technology integration (Liu et al., 2017). For this reason, the current study advances two interesting implications for practice on technology use and technology integration, which hinge on a steady amount of continuous professional development.

Prensky's (2009) term of 'digital wisdom' might be apropos since, in his informed view, digital wisdom encompasses a duality: (a) wisdom arising from the use of digital technologies (i.e., technology usage), and (b) wisdom in using digital technologies (i.e., technology application/integration). As the current study suggests, both of these elements, or forms of digital wisdom, may have implications for teachers' technology integration self-efficacy needed for the development of teachers' abilities to confidently use and effectively integrate technology into their classroom practices. The present study, predicated upon this two-fold concept of digital wisdom, provides affordances for two implications intended to leverage technology integration confidence to support proficient technology-oriented classroom practice for urban teachers. Namely, the study's findings suggest, if they are to improve their self-efficacy to use and integrate technology in the classroom, teachers (a) develop and leverage their technology integration self-efficacy, and (b) participate in continuous technology-oriented PD training. Raising teachers' levels of technology integration self-efficacy is a crucial piece of the quality assurance puzzle to facilitate 21st-century teaching, as discussed below.

Developing Teachers' Self-efficacy for Technology Integration

Digital devices—such as laptops, tablets, and smartphones—proffer a plenitude of possibilities for the facilitation of effective teaching (Clark & Mayer, 2016). The benefits gained from these 21st-century technologies and promising new media will depend on the extent that they can be leveraged by teachers for better and effective teaching with technology (Willingham, 2018). No doubt, technology usage is widespread; yet, technology integration in education has not kept pace (Capo & Orellana, 2011; Deye, 2015; Gouseti, 2013; Warham et al., 2017). As stated earlier, only 58% of the 1,281 teachers who participated in a recent Houghton Mifflin Harcourt (2018) national survey reported that they are extremely or very confident in their ability to use educational technology in instructional effective ways. To bridge this technology integration confidence gap, as the findings implied, teachers need PD opportunities, or teacher coaching within the context of collaborative professional communities (Kraft, Blazar, & Hogan, 2017; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009), that would actively engage and teach them to effectively integrate technology into their lessons.

The goal of teachers' professional development is to produce teachers who possess high self-efficacy. Meeting this expectation enhances teachers' adaptability to evolving technology, making them better prepared to integrate technology into their classrooms (Beard, 2016). However, a joint national research project—conducted on behalf of Scholastic and the Bill & Melinda Gates Foundation that surveyed 20,157 public school PreK-12 teachers—found that close to one in five teachers (19%) reported the most significant challenge teachers faced was not enough PD to ensure growth as a teacher (Bill & Melinda Gates Foundation, 2014). This is further corroborated by the current study's data analysis, which revealed close to two in five teachers received just one or no technology-oriented PD training sessions in the last year and as much as three in five teachers reported participating only twice annually.

Often, as Yoon and colleagues (2007) referenced them, "single-shot, one-day workshops" (p. 1) tend to make teachers' PD training "intellectually superficial, disconnected from deep issues of curriculum and learning, fragmented, and noncumulative" (Ball & Cohen, 1999, p. 3-4). Attributably, these infrequent (often one-time) technology-oriented PD training sessions may have contributed to teachers, on average, only having a fair level of self-efficacy to use and integrate technology in their teaching practice. Teachers, as Yoon and colleagues (2007) recommended in their meta-analysis, need to receive adequate, ongoing training that targets specific skills and knowledge gaps. Specifically, they recommend more than 14 hours of PD training, but most advantageously an average of 49 hours over the course of six months to a year, to be equipped with innovative instructional methods that support effective teaching. Educators who receive such professional support also gain self-efficacy, giving them the confidence to change their classroom practices and teach with technology (Brinkerhoff, 2006; DeSantis, 2013).

Furthermore, teachers who use and integrate technology well embrace a philosophy that fosters the generation of technology self-efficacy and TPACK, which in turn guides them to adopt new tools to enhance their instruction (DeSantis, 2013; Hixon & Buckenmeyer, 2009). Put another way, to increase teachers' confidence in their ability to use and integrate technology effectively, teachers need to have sound pedagogical understanding for the use and application of technology. That is, they need to know when, why and how to use technology within their teaching practice. If not, technology in education will continue to be paradoxically characterized as 'oversold and underused' due to its high level of access but low classroom use (Cuban, 2016; Cuban et al., 2001; Ertmer, 2005). As Clark and Mayer (2016) pointed out, "The reason for the disappointing history of educational technology may be that instructors expected learners to adapt to the technology and therefore did not design learning environments that were consistent with how people learn" (p. 32), again calling into question the pedagogical preparation and capability of the instructor.

Participate in Continuous Technology-oriented PD Training

Professional development (PD) is a critical avenue to intervene and ensure high-quality instructional practices including pedagogical use and application of technology (Didion, Toste, & Filderman, 2020). That is, the purpose and focus of technology-oriented PD programs should be on developing teachers to have high, or elevated levels of, self-efficacy so they can be confident users and integrators of technology. However, in a national survey of 1,281 teachers conducted by Houghton Mifflin Harcourt (2018), close to three in ten (29%) and close to one in four (24%) teachers reported lack of effective PD to help teachers implement curriculum and a lack of PD to help effectively integrate technology into instruction, respectively, as areas where educators are very concerned. Evidently, customized classroom supports and customized professional development for teachers are relatively rare (Bill & Melinda Gates Foundation, 2014). Thus, as the current study's findings revealed, there is certainly room for K-12 teachers to improve their technology integration competency, especially in the areas of Technology Application and aspects of Technology-supported Assessments, both of which are integral to technology integration in the classroom.

Essentially, facilitating meaningful and engaging learning through the lens of 21st-century teaching requires continuous and relevant professional development training sessions of what works best (according to research-based theory and evidence-based practices) on the part of teachers. However, as the study's findings indicated, nearly three in five teachers participated in only two or less technology-oriented PD training sessions in the last year and as much as three-quarters of them did not receive the adequate amount of technology-oriented PD training sessions needed per year. This high number of teachers receiving a low quantity of PD training sessions is a concern since technology integration works best for student outcomes when teachers participate in adequate, sustainable, collaborative training with sufficient practice and implementation (Cordingley, 2015; Yoon et al., 2007; Wei et al., 2009).

Although the number of contact hours optimally needed to elicit teacher change remains open and to some extent inconclusive (Blank & Alas, 2009), research offers a general range of hours for most effective PD. Yoon and colleagues (2007), after their meta-analytic review, posited that interventions with 5-14 contact hours of PD showed no statistically significant effects on teaching and student learning outcomes. Consequently, research suggests that the most effective PD is more than 14 contact hours (Yoon et al., 2007) and distributed over time from 20 contact hours (Desimone, 2009), to over 30 hours (Guskey & Yoon, 2009), to 49 hours (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). These findings correlate with 49 average contact hours found by Yoon and colleagues (2007) in their meta-analysis to be most effective for teachers who participated in PD to boost their students' achievement the most (by about 21 percentile points). Though the number of hours teachers spent in PD, often referred to as intensity (Kennedy, 2016), varies, it appears that more than 14 contact hours and preferably as much as 49 hours spread over time are needed, as Yoon and colleagues (2007) assert and Darling-Hammond and others (2009) confirmed, for PD programs that are intense enough to elicit change at both the teacher- and student-level.

Furthermore, good technology-oriented PD sessions are those that help increase teachers' use and application of computers and the Internet (G. Watson, 2006). Research indicates that the level of a teacher's technology self-efficacy impacts student achievement and self-efficacy (G. Watson, 2006). Moreover, raising the quality of teaching is considered a necessity of the times given the dynamic development of technology (Bicaj & Treska, 2014). However, teaching quality will have limited impact unless linked to an effective approach to PD (Gore et al., 2017), and, as research affirmed, needs to be collaborative (Cordingley, 2015; Wei et al., 2009), coherent, based on content matter, focused on instructional practice (Borko, 2004; Wei et al., 2009), and sustained over time (Yoon et al., 2007; Wei et al., 2009). These characteristics regarding effective PD are necessary since not all PD is created equal (Lindsay, Widman, & Garcia, 2019). For example, the single-shot, one-day forms of professional development prevalent in schools are shown to be ineffective in improving teacher efficacy and effectiveness (Darling-Hammond, 2012). On the contrary, sustained, scaffolded, and collaborative PD sessions have demonstrated success in assisting teachers in developing technology self-efficacy and supporting their ability to integrate new technology tools in their instruction (DeSantis, 2013).

Ongoing professional development for teachers then is a key intervention mechanism for improving classroom instruction and student achievement (Bicaj & Treska, 2014). As Yoo (2016) posited, teachers' PD efforts have a positive effect on teacher efficacy, which in turn improves instruction and raises student achievement (Yoon et al., 2007). Specifically, in a meta-analysis conducted by Yoon and colleagues (2007), the length of PD was identified as a key predictor of increased student learning gains. Thus, an essential way for PD designers to ensure positive pedagogical changes among teachers is to maintain focused programs on specific topics sustained over many months by distributing the workshops (DeSantis, 2012; Doppelt et al., 2009). The PD program format that Christensen (2002) studied, where in-service teachers participated in two days of needs-based technology integration training with a follow-up day of training every six weeks throughout the academic year, might be an appropriate model to emulate if technology-oriented PD training sessions are to positively affect teacher efficacy, TSE, classroom instruction and student achievement.

Notably, in the same aforementioned joint national research project, only 2 in 15 teachers (13%) stated that professional learning/development opportunities have been customized to meet teachers' needs (Bill & Melinda Gates Foundation, 2014). PD training sessions should be further designed in response to available data concerning teachers' needs—and where such data are lacking, they should be planned with the deliberate intent to continuously advance teachers' competencies and TSE within the scope of 21st-century teaching and the ISTE (2017) Standards for Educators. Current data suggest that the focal areas are Technology Application and Technology-supported Assessments, both of which are integral to effective and meaningful technology integration. The extent to which teachers are able to raise their level of technology integration self-efficacy will be the degree to which they can better meet students' learning needs. Teacher effectiveness, though varied, is fundamental to reducing persistent achievement gaps and enhancing student learning. Hence, to level the playing field, 21st-century instructional professionals should be supported by high-quality continuous PD training sessions, fostering the generation of technology self-efficacy guided broadly by the TPACK framework for effective instruction (DeSantis, 2013; Koehler & Mishra, 2009; Mishra & Koehler, 2006). If not, teachers will continue to display, on average, only fair levels of confidence in both using and integrating technology in the urban K-12 classroom settings.

Consequently, educational leadership needs to refocus schooling towards teachers and their teaching (Hattie, 2003a) or, at the least, reframe it in the vision of the ISTE standards (or some other relevant framework) and their school's mission. However, the researcher of the current study emphasized, and cannot underscore enough, that the results and implications derived from the current study are just a few key pixels of the big picture of 21st-century teaching. These findings and interpretative suggestions are thus not meant to dictate how school leaders, district managers, and instructional coaches should act but rather be used as a research-supported gauge to guide their informed views and assist them in their decision making to support teachers' professional development as a means of intervention to mediate and positively impact the quality of teaching in general, and technology-oriented teaching in particular. The goal is to encourage teachers in possessing high self-efficacy, positioning them for adaptability to evolving technology, making them better users and integrators of technology in the K-12 classroom.

Limitations of the Study

While this current study offered many promising results, it was not without limitations. First, the researcher only used the completed online surveys where participants responded to all questions so that the data collected was as accurate as possible. Using listwise deletion, this reduced the sample size by 14.2% (or 54 consented teacher respondents), which ultimately resulted in being 7 participants shy of the desired sample size of 334 teachers needed for an even 5% margin of error with a 95% confidence level. However, the current sample size (n = 327) was virtually not impacted mathematically speaking, allowing the researcher to leverage the statistical power of the data to offer recommendations that can positively impact teaching, improve techno-pedagogical practice, and ultimately recommend the support teachers need from school leadership to advance the efficacy of instructional and technological prowess. Secondly, since principals served as secondary gatekeepers, the study was limited to teachers who received their approval to participate in the study. Thirdly, the study was restricted to the geographic location of Southern California and was opened only to urban K-12 teachers in Catholic schools. This may serve to limit the generalizability of the current study.

Similarly, while diversity of experiences, environments, backgrounds, and grades taught by teachers were represented, the fact that the survey was administered electronically may have limited the sample pool to those who were most comfortable and/or savvy with technology, which could have potentially skewed the results toward technology usage and integration in schools. Subsequently, the researcher recognized as a limitation that other variables may have impacted teachers' technology usage and integration efforts for instructional purposes. Lastly, a key limitation to the study was the disparity of the Southern California public, charter, and private school organizational structures, that may inadvertently limit the generalizability of the findings as it relates to how confident teachers are in using and integrating technology in the classroom.

Recommendations for Future Studies

The context of this quantitative study was an urban K-12 Catholic classroom setting of Southern California. Due to the potential limitations of the Catholic/private school structure discussed above, further research should be conducted related to urban K-12 teachers' self-efficacy to use and integrate technology into their classroom practice from Southern California in other contexts such as public, charter, and even other types of private schools. Carrying out this study at other urban K-12 school settings would allow for comparison and further corroboration of findings. Additionally, it would be valuable to replicate this study at rural school systems and districts to compare and evaluate the urban-rural divide in teachers' continued preparation and professional development as it relates to their self-efficacy as an associated and meaningful factor on technology use and integration efforts. Likewise, it would be valuable to replicate this study in a variety of geographic areas of the United States, and even internationally, for comparison across geographic regions and national boundaries.

Furthermore, future research could utilize a mixed-method approach and include observations of urban K-12 teachers' actual enactive experiences using and integrating technology in their classrooms to further confirm the results of the current study, which used teachers' self-assessment and self-reporting of techno-pedagogical competencies. Additionally, the current study in the present school district could be extended through the collection of the survey data to continue tracking teachers' technology integration self-efficacy and improve the quality of teaching, or carry out annually or over a protracted period of time to perform longitudinal analyses with the same scope and purpose. More importantly, future studies could go beyond the current study, which has established the confidence levels of urban K-12 teachers, to explore ways to increase teachers' confidence to use and integrate technology, and determine what are the factors that influence teachers' levels of confidence to use and integrate technology.

Additionally, as an outgrowth of the current research, future studies can explore the areas of Technology Application and aspects of Technology-supported Assessments, both of which are integral to technology integration and implicated as deficient among urban K-12 teachers in Southern California given their fair level of technology integration confidence. These two concerns regarding pedagogical use and application of technology should serve as topical parameters or targets for teaching excellence, which is to say as Hattie (2003b) states “goal posts” (p. 1) in need of PD intervention. Similarly, other studies can examine and differentiate the statistical significance and predictive power of demographic factors, such as teachers’ age, grade taught/level of instruction, educational attainment, and frequency (or number of hours) of PD training sessions received, as well as how cognitive and non-cognitive factors, respectively, affect or impact teachers’ confidence in using and integrating technology. Such future studies would shed further light on the larger picture regarding the array of factors that influence teachers’ self-efficacy in using and integrating technology to improve 21st-century teaching practice.

Conclusion

In the 21st-century, teachers are asked to innovate and risk take, to possess an adaptable mindset and be growth-oriented in their practice (Heggart, 2015). In a word, they are asked to be flexible in their teaching to meet the changing needs of students and the times. Given that Southern Californian urban K-12 teachers in a parochial setting have, on average, a fair level of confidence in using and integrating technology, teachers may need to develop flexible knowledge-bases to truly achieve teaching expertise. Teaching with technology starts at the skill-level first by addressing task-specific problems and then through contextual application and enactive practice, which imbue confidence and advance self-efficacy, evolves into flexible knowledge as expertise is developed (Bandura, 1997; Mishra, 2018; Willingham, 2002). Supporting teachers as they shift their pedagogical practices to leverage technology tools is not a one-stop experience providing them with a single-shot, one-day workshop on a specific technology concern or pedagogical problem. Teachers need ongoing distributed PD training sessions to provide *de facto* coaching and reinforcement of confidence to help them develop their technology integration competency and pedagogical content expertise (Bandura, 1997; Mishra & Koehler, 2006; Koehler & Mishra, 2009; Sadaf et al., 2016).

Moreover, techno-pedagogical skills are developed as teachers' contextual experience increases (Mishra, 2018), and their self-efficacy improves accordingly (Bandura, 1997). Like that of Ertmer and colleagues (2012), the findings of the current study show that teachers need further support and opportunities to develop higher levels of techno-pedagogical self-efficacy and expertise as part of their teaching repertoire. As teachers work with the experiential knowledge they possess from actual enactive contextual experiences of teaching or inflexible knowledge obtaining from ongoing PD training sessions, their repertoire of techno-pedagogical knowledge and skills will become larger and increasingly more flexible (Bandura, 1997; Mishra, 2018; Willingham, 2002). Flexible knowledge gives rise to higher self-efficacy, allowing teachers to integrate technology into their classrooms (Ertmer & Ottenbreit-Leftwich, 2010; Gilakjani, 2013; Mishra and Koehler, 2006; Tweed, 2013). Thus, there is a need for PD intervention within the context of elevating technology integration self-efficacy by refocusing attention on teachers and the quality of their teachings (Hattie, 2003a). In summary, through PD intervention, flexible knowledge acquisition, and a willingness to take instructional risks with technology integration, teachers will be better positioned and able to raise their levels of technology integration self-efficacy to facilitate 21st-century teaching.

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APPENDIX A

The Technology Integration Confidence Scale (Version 3)

Instructions: For this survey, you will be asked to rate how confident you are at completing certain technology integration tasks on the following scale:

0 - Not confident at all
1 - Slightly confident
2 - Somewhat confident
3 - Fairly confident
4 - Quite confident
5 - Completely confident

This survey, which provides a snapshot of your confidence vis-à-vis your readiness to facilitate learning and teaching with technology, routinely takes less than 10 minutes to complete.

Technology Usage (C1)

1. Staying abreast with the developments and latest trends or insights is a professional expectation in all professional fields. Teachers, who endorse 21^{st}-century principles, are expected to stay current through practices like setting search engine email alerts for specific topics, following thought leaders or key organizations on social media or RSS feeds, attending presentations or webinars, and subscribing to edtech research journals or other media sources. ***How confident are you in using technology to stay current with research to support student learning outcomes?***

2. Classrooms are places filled with diverse learners. Educators are expected to plan and facilitate learning that accommodates differing access levels and individual needs, for example, providing homework alternatives for students who do not have Internet access at home or scaffolding student learning to challenge and support individual students where they are. ***How confident are you in facilitating and supporting student learning opportunities with technology?***

3. Educators are expected to find and experiment with new digital tools to enhance learning, being open to calculated risk-taking and productive failure for continuous learning, reflect on improvements of tools for future use, and incorporate select tools and strategies into regular practice. ***How confident are you in modeling for colleagues the identification, exploration, evaluation, curation, and adoption of new digital resources and tools for learning?***

4. Cloud-based technologies include shareable documents (such as Google Docs, Google Sheets, Google Slides, etc.) and calendars, social media, video- and audio-conferencing software, and email. Authentic, real-world learning experiences are easily facilitated using cloud-based technologies whether it is solving real-world local or global problems or addressing career/workforce related projects and skill-building. ***How confident are you in using collaborative tools to expand students' authentic, real-world learning experiences by engaging virtually with experts, teams, and students, locally and globally?***

5. In schools where lead learners thrive that can be any person and is often the students. In such a culture, the teacher-student relationship is reconfigured to encourage modeling and facilitating of student learning. Educators and students collaborate and learn together to improve practice and solve technological problems (for example, restarting a device, transferring work from one device to another or troubleshooting when audio/video won't play, etc.). Evidently, being a lead learner is a mindset whereby an educator sees oneself simultaneously as a facilitator and a learner alongside the students. ***How confident are you in collaborating and co-learning with students to discover and use new digital resources as well as diagnose and troubleshoot technology issues?***

6. Being a professional educator means engaging in lifelong learning through continuous professional development (CPD). You are expected to participate in local and global learning networks, which include virtual and blended learning communities such as social media groups or chats, virtual professional learning networks (PLNs), conference, meet-ups, and edcamps and school-based professional learning communities (PLCs). ***How confident are you with actively participating in virtual and blended learning communities to support your CPD?***

7. Technology is well suited to the demands of authentic and active, deep learning. Educators are asked to leverage digital tools and resources so students can gain mastery of content area knowledge while gaining vital competencies, including problem-solving, critical thinking, effective communication, and collaboration. ***How confident are you in designing authentic learning activities that align with content area standards and using digital tools and resources to maximize active, deep learning?***

Technology Application (C2)

8. Educators are expected to create innovative digital learning environments that engage and support learning. They are challenged to maximize learning by designing effective instruction in a variety of learning environments and rethinking physical space to enhance new models of classroom learning such as blended learning, online learning and various device models such as 1:1 tablets or laptops. ***How confident are you in exploring and applying instructional design principles to create innovative digital learning environments that engage and support learning?***

9. Technology's efficiencies and functionality can be capitalized and leveraged to foster personalize learning experiences. Students' individual learning needs can be met by technology, for example, through scaled tests, adaptability tools, software that can capture where students are struggling, tools that facilitate student reflection, project planning, and collaborative work. ***How confident are you in using technology to create, adapt, and personalize learning experiences that foster independent learning and accommodate learner differences and needs?***

10. Educators are expected to teach students how to engage a problem through a series of ordered steps—such as design process (for example, human-centered design process, project-based learning, engineering design processes or scientific method) and computational thinking (which includes logically organizing data, automating solutions

through algorithmic thinking, using computer and other tools to solve problems, or representing data through abstractions such as models and simulations)—in order to develop solutions to a wide variety of problems. ***How confident are you in creating learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems?***

11. Educators are asked to make use of technology and student learning strategies. They do so in order to keep students supported, on task and learning in a variety of face-to-face (F2F), digital or hybrid environments. ***How confident are you in managing the use of technology and student learning strategies in digital platforms, virtual environments, hands-on makerspaces or in the field?***

12. Educators are expected to provide students with alternative ways (such as a final project or presentation, an e-portfolio system or a self-paced assessment) to demonstrate competency and metacognitive opportunities using digital tools to reflect on their own learning (i.e., successes, areas for improvement, goal setting or future adjustments). ***How confident are you in providing alternative ways for students to demonstrate competency and reflect on their learning using technology?***

Technology-infused Learning (C3)

13. Teachers today are asked to utilize research-based strategies to guide their instruction. You are expecting your principal to engage in a walk-through observation for one of your lessons and provide feedback as it relates to your incorporation of proven, promising, and emerging learning strategies with technology. ***How confident are you in learning about, testing or adding into regular practice a variety of proven, promising, and emerging learning strategies along with technology to support and enhance student learning?***

14. You have a diversity of students in your class in terms of students who are considered to be accelerated, on level, and struggling learners. Your principal expects you to meet the needs of all learners. ***How confident are you in using technology to support student needs through increased personalization and differentiation?***

15. One of the Four Cs of 21st-century learning is collaboration. To enhance the student experience and collaboration in the learning process, you attended a professional development (PD) workshop where it was recommended that it is beneficial for learners to engage in virtual collaboration, either in real time or asynchronously. ***How confident are you in using technology to support student learning and enhance student engagement through virtual collaboration?***

16. The time has come for project-based Learning (PBL). Given the desire for an effective and enjoyable way to learn and develop deeper learning competencies, your school has decided to adopt PBL as part of its curricular approach to student-centered learning. ***How confident are you in using technology to support the demands of the student-centered pedagogy for project-based learning?***

17. The STEM (Science, Technology, Engineering, and Mathematics) to STEAM (Science, Technology, Engineering, the Arts and Mathematics) movement is surging forward as a positive mode of action to truly meet the needs of a 21st-century learner and economy. Your school has decided to join the movement as it desires students who take thoughtful risks, engage in experiential learning, persist in problem-solving, embrace collaboration, and work through the creative process. ***How confident are you in using technology to support STEAM as an access point to guide student inquiry, dialogue, and critical thinking?***

<u>Technology Literacy & Digital Citizenship (C4)</u>

18. Digital citizenship helps to create a positive school culture that supports safe and responsible technology use. Students are expected to make positive, socially responsible contributions, for example, engage productively with others online, share creative or intellectual work that is original, protected, and documented, not engaging in trolling or cyberbullying, and being respectful of others' perspectives and experiences. ***How confident are you in teaching students to think critically, be safe, and responsible in the digital world?***

19. Digital literacy is generally described as the set of skills and knowledge needed to fully participate in a technologically-based society. The more digitally literate teachers are the greater the likelihood that they will employ the requisite skills in the classroom, which in turn is expected to foster a strong sense of digital citizenship and media fluency in students. However, the importance and scope of digital literacy must extend beyond these to include a critical examination of online resources, for example, evaluating the accuracy of source data, identifying bias and relevance to learning goals, learning to spot confirmation bias, and varying search terms to find alternative perspectives. ***How confident are you in establishing a learning culture that promotes curiosity, critical examination of online resources, digital literacy, and media fluency for learners?***

20. Cyberethics is a code of acceptable online behavior for moral, legal and social practices. Students need to learn about interactions that keep them out of harm's way (such as how much and what kind of information you release online), are mindful of the law (for example, abiding by copyright and fair use, not using another's identity or hacking network protection), and follow the moral code (by being mindful when sharing creative and intellectual work, avoiding plagiarism and supporting positive digital identity). By practicing cyberethics, one can have safer and enjoyable Internet experiences. ***How confident are you in mentoring students to use digital tools in safe, legal, and ethical ways including the protection of intellectual rights and property?***

21. Digital identity, which comprised of characteristics, or data attributes, such as username and password, is an online or networked identity adopted or claimed in cyberspace by an individual, organization or electronic device. Teachers are expected to create effective passwords, share personal data conscientiously, possess an awareness of depictions by others, understand and comply with organizations' policies and data management policies, protect students' personal or academic information, and share student work, pictures or identifying information with permissions from students and/or

parents/guardians. In terms of digital identity management, key areas of concern are security and privacy. ***How confident are you in modeling and promoting management of personal data and digital identity as well as protect student data privacy?***

Technology-supported Assessment (C5)

22. Educational decisions and pedagogical choices have increasingly become data-driven. Educators and teachers alike must collect and analyze assessment data, and determine appropriate competency assessment tools (such as those afforded by Renaissance Learning) to remediate skill or knowledge gaps. ***How confident are you in facilitating data-driven instruction and guiding learning based on competency-based assessment and new data analysis tools?***

23. Teaching is an interactive and corrective process. Students benefit most from immediate and constructive feedback that address misconceptions. Digital tools, apps, and platforms can help teachers with formative assessment to elicit evidence of student learning. Technology affords teachers the opportunity to assign activities to students and receive the results in real time, which in turn allow teachers to provide immediate feedback to students. ***How confident are you in using digital tools to provide immediate feedback to students?***

24. Collaboration among colleagues supports imaginative teaching informed by new technologies, deliberate lesson/course design, reflective teaching practices, and meaningful assessment of student learning. Educators are expected to block off time to collaborate with colleagues to improve practice, share resources and ideas, and solve problems. ***How confident are you in dedicating planning time to collaborate with colleagues to create authentic learning experiences that leverage technology?***

25. Educators are asked to meet and accommodate the needs of learners. Digital tools and apps provide real-time measures of knowledge and understanding of student learning. Formative and summative assessment data allows educators to adjust current instruction or iterate on future lessons, be it class-wide or for individual student instruction. ***How confident are you in using technology to design and implement a variety of formative and summative assessments that accommodate learner needs, provide timely feedback to students, and inform instruction?***

APPENDIX B

Letter of Invitation to Participate in Study & Consent

Dear participant,

As a doctoral candidate at Boise State University (BSU), I am conducting a study for my dissertation to understand teachers' technology self-efficacy and their levels of confidence to integrate technology in the instructional process. As a participant, your responses will be completely anonymous, and your name will not be associated with any research findings. Your participation is entirely voluntary and does not entail any foreseeable risks. You may choose not to participate or complete/submit the online survey without adversely affecting your relationship with the investigator, the school district, your place of employment, or BSU.

There is no compensation for participating. However, by participating in this study, you will (a) reflect on and receive additional knowledge relevant to your instructional practice, and (b) contribute to scholarly research as your input is extremely valuable for the preparation of future and current teachers at K-12 schools in Southern California. This survey routinely takes less than 10 minutes to complete. By clicking the survey link below and submitting your survey, you hereby consent to participate in this study. Thanks in advance for your consideration and/or participation. If you have any questions regarding the study, please contact the principal researcher, faculty advisor, and/or the Office of Research Compliance at BSU below.

Sincerely,

Frank C. Gomez Jr.
Principal Researcher (Doctoral Candidate)
frankgomez@u.boisestate.edu

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Online Survey Link: https://rebrand.ly/ticsv3survey

APPENDIX C

Demographic Information Items

1. What level of instruction do you teach at?
    a) Elementary (TK-5)
    b) Middle School (6-8)
    c) High School (9-12)

2. What is your highest level of education completed?
    a) Bachelor
    b) Master's
    c) Educational Specialist
    d) Doctorate

3. Which category below includes your age?
    a) 25 or younger
    b) 26-35
    c) 36-45
    d) 46-55
    e) 56 or older

4. What is your gender?
    a) Male
    b) Female
    c) Other (specify): _________________

5. What is your ethnicity?
    a) American Indian or Alaska Native
    b) Asian
    c) Black or African American
    d) Hawaiian or Other Pacific Islander
    e) Hispanic or Latino
    f) White
    g) Mixed Race
    h) Other (specify): _________________

6. How many years have you been teaching? (Please enter number, ex. 5.)

    ____

7. How often do you participate in technology-oriented PD training?
    a) monthly
    b) 6 times per year
    c) 4 times per year
    d) twice per year
    e) annually
    f) None in the last year

APPENDIX D

Instrument Permission

Permission to Develop TICS

Hi Dr. Browne,

My name is Frank Gomez and I am a Doctoral Candidate at Boise State University. I'm working on my dissertation study and find that the fundamentals embedded in the Technology Integration Confidence Scale (TICS) may be useful in exploring technology integration self-efficacy among urban teachers in Southern California. If I am able to use the scale you have developed, update and create a new version of the TICS (version 3) align to the current ISTE Standards for Educators (2017) to further my research that would be greatly appreciated. Do I have your consent to freely use, modify, adapt, and publish a TICS version 3 predicated on the work and research you started with TICS versions 1 and 2?

I appreciate your time and consideration regarding this matter.

With gratitude,

Frank Gomez
Doctoral Candidate,
Department of Educational Technology
Boise State University
frankgomez@u.boisestate.edu

Re: Permission to Develop TICS

Jeremy Browne jeremy_browne@byu.edu Friday, May 31, 2019, 2:19 PM
To: Frank Gomez frankgomez@u.boisestate.edu

Frank,

Thanks for contacting me about the TICS. That project is, unfortunately, abandoned. It has seen no development since 2011. The TICS webpage lists all the information that is available.

Since the instrument was released under a Creative Commons license, you have full permission to use part or all of the TICS, and you can modify it to suit your needs.

Best of luck, and let me know if you have any questions.

--Jeremy

Jeremy M. Browne, PhD
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APPENDIX E

School District Authorization/Site Approval

ADLA Research Approval Granted

Tony Galla, Ed. D. tgalla@la-archdiocese.org Friday, August 16, 2019, 8:41AM
To: Frank Gomez frankgomez@u.boisestate.edu

Hello Frank,

Thank you for reaching out to ask for permission to conduct research in Catholic Elementary schools in the Archdiocese of Los Angeles. I have read and reviewed your materials and appreciate letting you know that all looks in line and you have full permission from our office to proceed. Please let me know if there is any specific form that you need signed or if you need any specific letter that our office can provide.

Kind Regards,

Tony

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APPENDIX F

Institutional Review Board (IRB) Approval

Boise State University IRB Research Approval Granted

This study was conducted with approval of the Institutional Review Board (IRB), Boise State University, IRB approval # 101-SB19-170.