EFFECT OF SCHOOL SOCIOECONOMIC STATUS AND TEACHERS' PERCEPTION OF SCHOOL CULTURE ON TEACHERS' PROFICIENCY WITH INFORMATION AND COMMUNICATIONS TECHNOLOGY TOOLS IN THE CLASSROOM

By

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(Under the Direction of Robert Maribe Branch)

ABSTRACT

Information and Communication Technology (ICT) has been widely adopted in education and is useful in helping to improve students' academic performance. Unfortunately, teachers' pedagogical use of ICT tools in low socioeconomic status (SES) schools are not as rigorous as teachers' pedagogical use of ICT tools in high SES schools. The purpose of this study is to investigate the effect school-level SES and teachers' perception of school culture on teachers' ICT proficiency in the classroom. An analysis of data collected from 509 middle and high school teachers of core subjects using an online survey yielded some significant results. Results showed teachers' background knowledge in educational technology, teachers' attitude toward ICT proficiency, teachers' perception of school culture, teachers' number of hours of ICT-related professional development, and teachers' overall approach to using ICT in the classroom were influential to teachers' proficiency with technology in the classroom. School-level SES was shown to have no impact on teachers' technology integration. Results highlight the need for ICT-related professional development and an increase in positive elements of school culture such as

administrative encouragement and support, increased teacher collaborations, and an increase in ICT resources.

INDEX WORDS: Information and Communication Technology (ICT); technology integration; perception of school culture; socioeconomic status

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DEDICATION

"It is dangerously destabilizing to have half the world on the cutting edge of technology while the other half struggles on the bare edge of survival."

--William J. Clinton

In the hope that my research may in some way contribute to improving the quality of teaching in schools within low-income areas, I dedicate this dissertation to all those who are passionate about righting the wrongs of the digital divide and improving the education of poor students in this country. I hope that my work will add to your endeavors and that you will be spurred on to continue the struggle of improving technology integration practices for the less fortunate.

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CHAPTER 1:

INTRODUCTION

Educators worldwide have adopted information and communication technology (ICT) due to some positive influences on student academic performance. Access and usage knowledge of ICT resources can play a crucial role in student learning, cognitive skill development, and academic performance. Usage knowledge of ICT resources can favor a more effective use of the information available on the internet and be expected to enhance the ability to use computers in educationally productive ways (Pagani, Argentin, Gui, & Stanca, 2016). Computer usage can affect academic achievement and cognitive skills. Children using computers with various content such as educational software, email, and other Internet web applications are more likely to score better on cognitive skill tests (Fiorini, 2010). Academic performance improvement can improve from internet usage. Jackson, Von Eye, and Biocca (2003) found that ICT proficiency can predict grade point averages and standardized test scores. Various aspects of student academic performance can improve through the use of ICT resources.

Despite the apparent benefits of ICT knowledge and resources, access to those benefits remains challenged by the existence of the digital divide, and school culture. The digital divide, described as a problem of an indefinite size (Stone, 2003), amplifies the technological, economic, and social differences existing in society (Gunkel, 2003). The socioeconomic factors encompassing the digital divide are ethnicity, income, the level of education, and geographical location (Attewell, 2001; Valadez & Duran, 2007; Warschauer, 2003). As a former K-12 teacher, this researcher discovered firsthand that there are pedagogical strategies of ICT proficiency that

vary based on the school's level of socioeconomic status (SES) and is subject to the expectations of specific school culture.

School culture can influence the decisions that surround teaching and learning. School culture focuses on teachers' and students' shared values and beliefs (Deal & Peterson, 1999; Johnston, 1987), and teaching and learning approaches (Poore, 2005). School culture has been known to influence teachers' pedagogical decisions in general, and specifically their incorporation of ICT in the classroom. Teachers who engage in innovative teaching practices feel pressure from school administration and other teachers to conform to an alternative teaching style if their methods greatly differed from the common practices in their school (Zhao & Frank, 2003). Additionally, belief, values, and culture have been known to affect the usage of new technologies in the classroom (Ertmer & Ottenbreit-Leftwich, 2010; Windschitl & Sahl, 2002). Hsu and Kuan (2013) indicated that past studies that examined the connection between teachers' ICT proficiency and teacher-related factors did not consider the social and organizational background factors of the school environments where teachers worked, which is essential in assessing teachers' proficiency with ICT. School culture encompasses a school's norms, unwritten rules, traditions, and expectations of the use of ICT in the classroom.

School socioeconomic composition is a vital school-level attribute. The school composition refers to the collective, rather than the individual, the influence of student characteristics and is partly a result of the combination, at the school level, of students' SES, ethnicity, and academic characteristics (Brault, Janosz, & Archambault, 2014). The percent of students in a district, eligible to participate in either the free or reduced price lunch programs based on family size and income under the National Schools Lunch Act, determines a school's socioeconomic status (Orfield, Losen, Wald, & Swanson, 2004). Schools identified as 'low SES'

and ‘high SES’ indicate schools with majority populations of low-income and high-income students, respectively.

Students’ collective SES and academic characteristics can influence teachers’ perceptions. School socioeconomic structure is related to students’ academic achievement because students from high SES backgrounds usually do better in school (Cowan et al., 2012). Teachers base their expectations on their perceptions of their students' academic achievement (Auwarter & Aruguete, 2008), which means that the SES of a school can influence teachers’ perceptions via a school’s academic composition (Brault et al., 2014). School’s academic composition can influence teachers in schools with a specific school-level socioeconomic status.

A school’s socioeconomic composition or status can influence teachers’ perceptions and subsequent pedagogical decisions. A school’s socioeconomic structure can influence teachers’ perception that they can make an educational difference for their students (Belfi, Gielen, De Fraine, Verschueren, & Meredith, 2015; Brault et al., 2014). One possible reason is that low SES schools are more likely to have lower student achievement levels, more student behavioral problems, lower levels of parent involvement, high student mobility rates, chronic student absenteeism, and a poorer physical environment (Knoblauch & Hoy, 2008). Additionally, teachers in low SES schools are more likely to have lowered their expectations for student performance compared to teachers in high SES schools (Auwarter & Aruguete, 2008). Lowered student performance expectations can influence teacher beliefs that they can make an educational difference (van den Bergh, Denessen, Hornstra, Voeten, & Holland, 2010), which can influence teachers’ pedagogical decisions (Rubie-Davies, Hattie, & Hamilton, 2006). Pedagogical decisions in schools of various SES are often inconsistent.

The SES of a school may influence teachers' pedagogical use of ICT in the classroom. Students in low SES schools consistently have less home and school access to computers compared to students in high SES schools and are more likely to be assigned rote learning technology activities as opposed to ones that are cognitively demanding (Warschauer, 2000). Besides access to technology, when teachers do incorporate ICT activities into their lessons, their usage of offline and online activities are starkly different between high and low SES schools (Darling-Hammond, Zielezinski, & Goldman, 2014; Dolan, 2016). Teachers in low SES schools most frequently use technology for lower-order tasks, such as drill, practice, and test taking, students in high SES schools, have more opportunities to create websites and multimedia presentations (Reid, 2001). The use of ICT in low SES schools lack in consistency and rigor with the pedagogical strategies in high SES schools.

Problem Statement

The problem is that teachers' pedagogical use of ICT in low SES schools are not as rigorous as teachers' pedagogical use of ICT in high SES schools due to teachers' perception of school culture. Teachers incorporation of ICT due to perceptions of school culture encourages students in low SES schools to be passive consumers of technology and students in high SES schools to be producers of technology (Owens, Song, & Kidd, 2007; Reinhart, Thomas, & Toriskie, 2011). Darling-Hammond (1997) and Haycock (2000) agree that pedagogical inequalities exist in the curriculum offered to students of low SES where higher-order thinking tasks that require critical thinking are often missing. Lack of proper usage instruction of how best to utilize ICT resources may continue to enhance the difference in knowledge of students in low and high SES schools, which can sustain or increase the digital divide.

Few researchers who have studied this problem did not consider school socioeconomic composition and teachers' perception of school culture as possible effects of the disparity of ICT proficiency between low SES and high SES schools. Valadez and Duran (2007), Warschauer, Knobel, and Stone (2004), and Wood and Howley (2012) have all conducted investigations into the ICT-related pedagogical gaps between schools of varying socioeconomic status. Valadez and Duran (2007) attributed these gaps to a lack of resources as a result of social consequences such as poverty and inequality. Warschauer et al. (2004) attributed these gaps to a lack of school support such as more access to professional development, more training and support, and more consistent communication among all staff about digital content. Wood and Howley (2012) found that disparities such as training opportunities and availability of computer resources presented constraints for teachers, who used technologies in less sophisticated ways in teaching compared with their counterparts in urban schools. Using schools that had comparable computer and internet access, Warschauer et al. (2004) found that the organizational systems present in the low and high SES schools played a role in determining how computers were deployed and used in the broader social context of the schools. The incorporation of ICT in the classroom cannot be viewed in isolation from the social, economic, and cultural contexts of education (Warschauer et al., 2004). Though it is not a new revelation that school culture can influence teachers' pedagogical decisions (C.-H. Chen, 2008; Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010), it is not known if teachers' perception of school culture based on school socioeconomic status influences how proficient they are using ICT in their lessons.

Purpose

The purpose of this study was to investigate the effect school-level SES and teachers' perception of school culture on teachers' ICT proficiency in the classroom. This study examined

the factors that influence teachers' ICT proficiency to determine teachers' perception of school culture and determine the effect a school's SES has on teachers' ICT proficiency. The context for this study was in public secondary schools in the state of Georgia.

Assumptions

Prior to conducting this study, I assumed there were several reasons why teachers have certain attitudes, beliefs, and perceptions about ICT proficiency in the classroom. I was confident that the participants would answer all questions truthfully based on knowledge and desire to improve the use of ICT in the classroom throughout their perspective school districts. Participants' responses are expected to represent their perceptions of school culture as it pertains to their use of ICT in the classroom.

Conceptual Framework

Socioeconomic status is the central concept that frames this study. Specific concepts such as the SES of secondary schools, the characteristics of a school's culture, and teacher demographics frame the examination of factors that influence teachers' ICT proficiency. Socioeconomic status is operationally defined for this study as the relative position of a plurality of students in a social structure, based on their parents access to wealth (Marks, McMillan, Jones, & Ainley, 2000). This study defined socioeconomic status based on the percentage of students, in the majority, who are eligible to participate in the National School Lunch Program.

Socioeconomic Status. Socioeconomic status is an educational term that is the most frequently used concept in research on social status used and understood by educators and readers of educational research. Socioeconomic status is used to convey the relative financial position based on students' eligibility for free and reduced lunch under the National Schools

Lunch Act (Orfield et al., 2004). Schools of low SES and high SES will serve as the context for this study. Socioeconomic status is a factor that can influence teachers' pedagogical decisions for the classroom. This study seeks to determine if teachers' perception of their school's culture relate to their level of ICT proficiency (Figure 1). This study may determine if the social demographics of a school influences teachers' pedagogical decisions to incorporate ICT activities into their lessons.

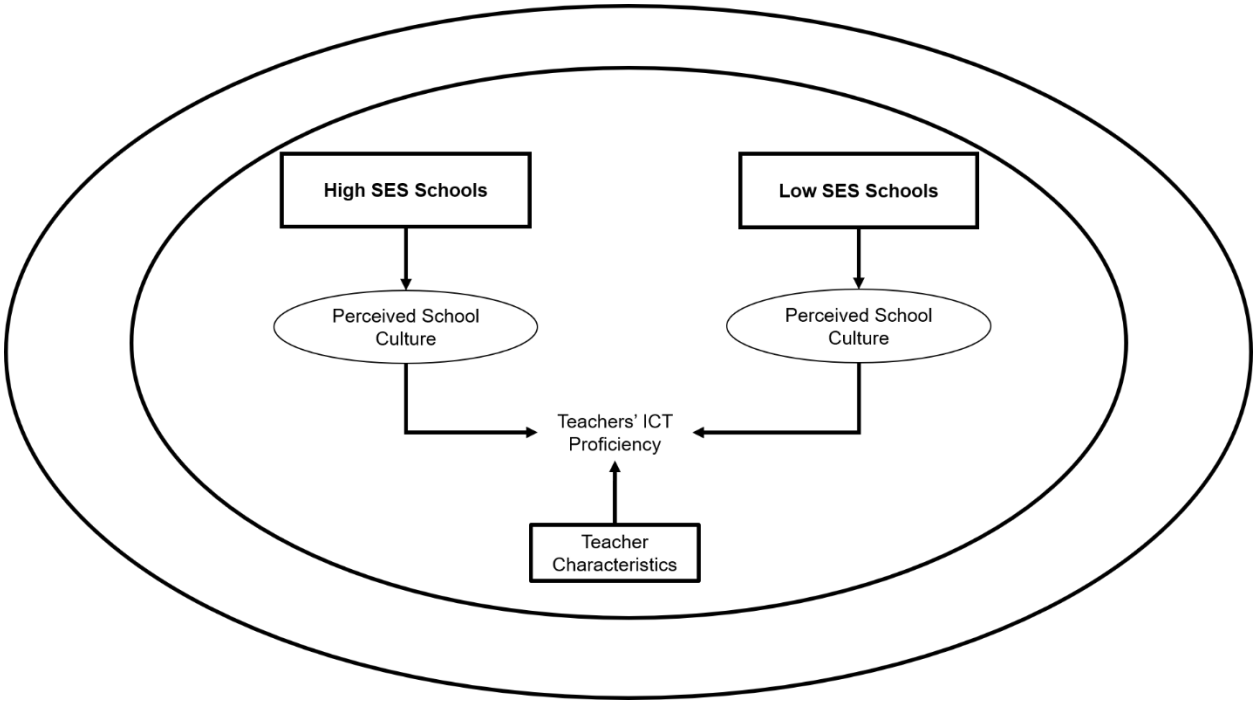

Figure 1. Teachers' Proficiency with ICT Conceptual Framework

Perceived School Culture. Perceived school culture is a factor that affects both low SES and high SES schools. School culture is known to influence teachers' proficiency of ICT in the classroom (Ertmer & Ottenbreit-Leftwich, 2010; Young, 2008). School policy provides limitations, mandates, and support for teachers to incorporate ICT in their classes. Baek, Jung,

and Kim (2008) found that teachers' ICT proficiency was a result of external requests by school administration and meeting the expectations of other personnel.

Administrative support is essential to teachers' efforts to use ICT in their classes. A school culture that supports teachers' creative and new approaches to ICT proficiency would be welcomed and encouraged (Tondeur, Valcke, & Van Braak, 2008). Peer and technical support are important factors as they can influence a teacher's learning and growth. School culture characteristics are difficult to generalize as schools are unique (Deal & Peterson, 2016) as are teachers attitudes, beliefs, and perceptions. Perceived school culture is operationally defined as teachers' perceptions of first-order or external barriers (Ertmer, 1999) such as teachers' perceived support from school administrators, peers, and technical staff to use ICT as a part of their pedagogical strategy. This study will highlight the influence of teachers' perceptions of school culture on teachers' proficiency of ICT in the classroom.

Teacher Characteristics. An examination of teacher demographics may help to illuminate specific teacher characteristics that influence teachers' incorporation of computer and internet activities. Teacher demographics can affect the innovative use of technology in the classroom. Numerous teacher-related factors such as teachers' backgrounds influence ICT proficiency (Perrotta, 2013), training (Buabeng-Andoh, 2012; Lawless & Pellegrino, 2007), and peer support (Inan & Lowther, 2010). Examining teachers' demographics can help the researcher get a better sense of what socio-demographic factors if any, contribute to variations in teachers' usage of ICT among poor and wealthy schools. Though teacher demographics can influence teachers' proficiency of ICT in the classroom, this study will only focus on the influence of school SES and teachers' perception of school culture.

Teachers' ICT Proficiency. A teacher's ability to incorporate ICT into the classrooms is essential for student outcomes. Teachers who can plan lessons and activities that effectively and creatively incorporate technology can improve students' learning (Koehler, Mishra, & Yahya, 2007). Teachers who are literate in the use of ICT need to have certain skills. Teachers should have the ability to plan and integrate ICT into their lessons, access and manage the use of ICT, and evaluate their effectiveness through collaboration and reflection (Markauskaite, 2007). Teachers' ICT proficiency is operationally defined as the teacher's knowledge about how to use ICT pedagogically within the context of their course curriculum.

This conceptual framework presents a holistic approach to analyzing the influence of school-level SES and teachers' perception of school culture on teachers' ability to effectively use ICT pedagogically in the classroom. The analysis of school-level SES and teachers' perception of school culture may determine the existence of relationships that can influence teachers' ICT proficiency.

Theoretical Framework

The theory that was used to inform this study is organizational culture. Schein (1992) defined school culture as:

> The culture of a group can now be defined as a pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore to be taught to new members as the correct way to perceive, think, and feel in relation to those problems (p. 12).

Schein's (2004) definition of school culture is cited to define organizational culture. Schein identified three basic levels on which organizational culture demonstrates its existence:

artifacts, espoused beliefs and values, and basic underlying assumptions. The norms and values of members of an organization can establish a specific type of organizational culture, and this study will investigate teachers' perception of the norms and values of their school as it pertains to the incorporation of ICT in the classroom.

Significance of the Study

Information and communications technology (ICT) has been widely adopted as a necessary investment for our schools, though efforts have not always been successful. School districts have invested considerable resources in ensuring schools take advantage of the enormous potential of ICT as it pertains to teaching and learning (Machin, McNally, & Silva, 2007). Some schools have struggled to take advantage of the full potential of ICT as pedagogical gaps of teacher usage exists between schools of varying socioeconomic status. Lack of resources, school support, and a lack of quality of technology and software availability (Valadez & Duran, 2007; Warschauer et al., 2004; Wood & Howley, 2012) have been provided as possible reasons to explain this phenomenon, though Warschauer et al. (2004) suggested existing inequalities in school and society as a possible factor. Schools are being challenged to improve student academic performance, which should encourage educators to discover and rectify any factor that directly affects teachers' pedagogical strategies and subsequently student learning.

School administrators and policymakers would benefit from the results of this study. Teachers influenced by their perception of various elements of school culture such as access to technology (Buabeng-Andoh, 2012), school policy (Vanderlinde, Dexter, & van Braak, 2012), and school support (Phelps & Graham, 2008) is the sort of information administrators need. An awareness of teachers' perception of school culture can allow school administrators to understand better the barriers to effective ICT proficiency that may be unique to their school's

student population and community. Administrators need to know if a relationship exists between teachers' perception of their school culture and teachers' ICT proficiency based on the SES of a school. This study will help administrators understand if the SES of a school influences teachers.

In-service and pre-service teachers would directly benefit from the findings of this research study. Exploring specific teacher internet usage can help to inform teacher education programs for pre-service teachers and professional development training for in-service teachers. Factors that influence teachers' pedagogical use of ICT is crucial to effective professional growth and development (Avalos, 2011). Moreover, understanding the influences of educators' usage patterns of ICT and the need for quality professional development will guide educational professionals in creating quality teacher training sessions (Vannatta & Nancy, 2004). Professional development programs offer an attempt to change teachers' attitudes and beliefs while also changing their classroom practices (Guskey, 1986). Highlighting the ongoing issue of digital inequality, which "is concerned with equitable access to the benefits derived from Internet and computer use" (Kvasny, 2006, p.161), may encourage educators to develop solutions that may improve students' digital literacy.

Students from low-income backgrounds would also benefit from this research. This research study may identify a lack of cultural understanding by administrators and teachers of their students' ability to gain access to internet service and learn valued technological competencies. This study highlights the need to understand that challenges in incorporating ICT into lessons may have more to do with the use of technology rather than having access to internet and communication technologies.

Research Questions

Implementation of ICT has been inconsistent among schools of different socioeconomic status. This study is poised to investigate the effect school SES, and teachers' perception of school culture has on teachers' ICT proficiency in the classroom. Improving the use of ICT in the classroom requires the identification and correction of all school-related phenomena that can impede teaching and learning. Therefore, this study focuses on three main questions:

1. What effect does teachers' perception of school culture have on teachers' ICT proficiency in the classroom?
2. What effect does teachers' characteristics have on teachers' ICT proficiency in the classroom?
3. What effect does school SES have on teacher's ICT profieicncy in the classroom?

Summary

This chapter provided an overview of how an established relationship exists between teachers' perceptions of school culture and teachers' ICT pedagogical decisions. Considering how teachers in schools of different SES incorporate ICT into their classes in ways that can promote or sustain the digital divide, this study is designed to determine the effect of school SES, and teachers' perception of school culture influence teachers' proficiency of ICT in the classroom. This study seeks to contribute to the gap in the research on why teachers' proficiency of ICT significantly differs among schools of different socioeconomic status.

The following chapter presents a review of the related literature. Included in the chapter is an overview of ICT proficiency, Edgar Schein's organizational culture, and digital equity as a possible benefit of addressing the stated problem.

CHAPTER 2:

REVIEW OF RELATED LITERATURE

This chapter includes a review of the literature on teachers' perceptions of school culture, school culture, schools as organizations, organizational culture, information communication technology (ICT), teachers' pedagogical use of ICT, and the role of socioeconomic status in this study. The literature review also defines perception, school culture, ICT, technology integration, usage, and socioeconomic status.

Search of Related Literature

A literature search organized through a funneling process started with broad search terms and then systematically the narrowing of terms permitted the researcher to locate the most relevant literature. The researcher collected articles and searched by author and keywords. The first series of searches was a broad investigation with the search terms *technology* and *schools* using an academic database, which accessed Academic Search Premier, EBSCO, ERIC, PsycINFO, and Google Scholar. The search results managed by the narrowing of the search terms only to include K–12 U.S. schools and peer-reviewed journals.

Numerous identified and saved articles focused on how teachers access to technology or the use of technology in the classroom, and how teachers directed students to use technology. Another series of searches were conducted by specifying terms *use of technology* and adding *socioeconomic status* and *digital divide*, retrieving only peer-reviewed journals. The third series of searches were conducted, using *pedagogy*, *perception*, *ICT proficiency*, *technology integration*, *teachers and digital tools*, and *school culture* as keywords, attempting to obtain

multiple perspectives. Based on the results, the researcher conducted additional searches that incorporated keywords such as *school-level SES*, *school composition*, and *organizational culture*.

Information and Communication Technology

Information communication technology (ICT) is the term that has been chosen to represent a series of technological devices available to teachers. Blurton (1999) defined ICTs as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information" (p.1). Similarly, L. Cohen, Manion, Morrison, and Wyse (2010) defined ICT as "a means of accessing, storing, sharing, processing, editing, selecting, presenting and communicating information through a variety of media" (p.53-60). In simpler terms, Nicholls (2004) defined ICTs as electronic and computerized devices and associated human interactive materials applied to a range of teaching and learning processes. Information and communication technology refer to hardware devices, software applications, and internet connectivity. Hardware devices such as computers, printers, scanners, digital cameras, and software used for word processing, calculations, multimedia, and communication are considered components of information and communication technology (Hsu & Kuan, 2013). ICT is defined as any communication, application, or technological device, including cell phones, computers, software, and network connections applied to a range of teaching and learning processes.

Instructional materials in the form of technology are becoming increasingly available to students and teachers. Teachers are expected to integrate ICT into their lessons (Becker, 2001). As equipment and technology infrastructure expands, teachers are expected to improve how they use ICT in the classroom. ICT proficiency is discussed here as an element of teachers' pedagogical strategy to understand better the importance of pedagogical strategies and how they

relate to the problem of teachers' pedagogical use of ICT and the influence of school-level SES and teachers' perception of school culture.

Perception

Perception is a sensory awareness of the world that involves both the detection of environmental stimuli and actions that are in response to the stimuli (Schiff, 1980). The concept of perception can be wide-ranging. According to Romanov (2011), perception includes the five senses, emotions, thought processes, and theories. Several internal and external factors can influence perception. Social norms and expectations influence perception based on one's previous relatable experiences (Hutchison & Reinking, 2011). The basis of perception is on stimuli from within an individual. An individual's interests, motives, and desires influence their perception (Vernon, 2017). A teacher's perception of a school's culture begins to form once the teacher is introduced to a school's culture, thinks about the norms of a school's environment, or is given an expectation or goal for teacher pedagogical practice.

Teachers' Perception. Teachers' perceptions refer to the composition, recognition, and awareness of sensory information in the mainstream classroom to represent and understand a subject and the learning environment (Gebremedhin & Fenta, 2015). Teachers' perception is an important factor that can enhance and influence the teaching-learning process. Teachers' perceptions play a crucial role in teaching and learning processes since their perceptions not only influence their actions and pedagogical decisions but also provide insight into various aspects of education (Tournaki & Lyublinskaya, 2014). Teachers' perceptions appear to be the foundation on which they build and base their educational decisions.

Teachers' Perception of ICT. Teachers' perception of Information and Communication Technology (ICT) is defined as the process of interpreting and understanding information

gathered by the senses about ICT (Ashcraft, 2006). Teachers who do not believe that technology can be useful in the classroom, will probably not use ICT regardless of their skill level (Ropp, 1999). Additional factors influence teachers' perception of information and communication technology. Perceptions and beliefs about ICT, teaching and learning, and course content can influence a teacher's approach to educating students (Ertmer, 2005; Windschitl & Sahl, 2002). Loveless (2003) studied the relationship between teachers' perceptions of ICT and their pedagogical strategies. Loveless suggested that the social and cultural elements within the professional environment in which teachers' practice influences teachers' perception of ICT proficiency. Teachers' perception of ICT can influence their pedagogical strategies.

Teachers' Perception of ICT Proficiency. Teachers' perceptions about teaching can influence their use of ICT in the classroom. Teachers are not likely to deliver innovative use of ICT in their classrooms if they have negative perceptions associated with technology integration (Hutchison & Reinking, 2011). Teachers' perceptions of ICT proficiency in the classroom as a critical factor continues in exploration. Inan and Lowther (2010) conducted a study to examine the direct and indirect effects teachers' characteristics and the school environment has on teachers' technology integration. The purpose of Inan and Lowther's study was to examine the effects of teachers' characteristics and perceptions of their school environment and how those characteristics and perceptions influence their use of ICT in the classroom. Key findings supported the hypothesis that both teacher characteristics and teachers' perception of the school environment influenced teachers' proficiency of ICT in the classroom (Inan & Lowther, 2010). One of the theories that drive this study is that teachers' perception of school culture influences teachers' ICT use in the classroom.

Culture

Culture is a familiar concept definable in numerous ways. Berger (1995), Godin and Gingras (2000), and Owete and Iheanacho (2016) found that culture is one of the most dominant and indefinable concepts of which there are more than a hundred definitions. The definitions presented in Table 1 highlight terms and descriptors that are consistent with one another. Concepts such as shared norms, (Barth, 2002; Bustamante, Nelson, & Onwuegbuzie, 2009; Deal & Kennedy, 1982), shared values and beliefs, (Barth, 2002; Bolman & Deal, 2017; Bustamante et al., 2009; Fullan, 2005; Kruse & Louis, 2008; Tylor, 1871), and assumptions (Bolman & Deal, 2017; Deal & Kennedy, 1982; Schein, 2010) emerge as foundational concepts of culture.

Table 1

Definitions of Culture

Author(s)	Definitions of Culture
Barth (2002)	A complex pattern of norms, attitudes, beliefs, behaviors, values, ceremonies, traditions, and myths that are deeply ingrained in the very core of the organization. It is the historically transmitted pattern of meaning that wields astonishing power in shaping what people think and how they act (p. 7).
Bolman and Deal (2017)	A product and a process (p. 263). Culture as a product explains the work done and accumulated from the experiences within an organization. Culture as a process is when newcomers to an organization learn from the current members how to carry out the values and beliefs of the organization; eventually, these newcomers will teach future members of the organization.
Bustamante, Nelson, and Onwuegbuzie (2009)	A learned system of shared beliefs, values, norms, symbols, customs, behaviors, and artifacts that members of a group use to make sense of their world and foster a sense of identity and community (p. 796).
Deal and Kennedy (1982)	The way we do things around here (p. 4).
Fullan (2005)	The shared values and beliefs in the organization (p. 57).
Kruse and Louis (2008)	Deeply rooted traditions, values, and beliefs that result from external stimuli helps to develop culture.

Schein (2010)	A pattern of shared basic assumptions learned by a group as it solved its problems of external adaptation and internal integration, which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems (p. 18).
Tylor (1871)	That complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society (p.1).

School Culture. Culture in schools has numerous definitions. Though it is accurate in some cases that schools can have a dominant culture, most schools have multiple cultures that coexist with each other, although most schools exhibit a dominant culture (Kruse & Louis, 2008). The definition of school culture requires the consideration of some elements presented in Table 2. These elements of school culture can determine how positively or negatively culture impacts schools and its members.

Table 2

Elements of School Culture

Elements of School Culture	Definition	Author(s)
Espoused beliefs and values	Morals held by members that contribute to the standards of the organization.	(Barth, 2002; Fullan, 2005; Schein, 2010)
Observed behavior	Actions regularly witnessed in the organization environment.	(Barth, 2002; Schein, 2010)
Ritual and ceremony	Expressive occasions that define symbolic behavior in the organization.	(Barth, 2002; Bolman & Deal, 2017)
Humor and play	Members of the organization engaged in joking and playful	(Bolman & Deal, 2017)

	conversations in the work environment.	
Specialized Language	Words and phrases members of a culture use that are unique to the environment.	(Bolman & Deal, 2017; Schein, 2010)
Stories	Events that are seminal to an organization and how they are passed on to new members of the organization.	(Bolman & Deal, 2017)
Underlying assumptions	Set of rules held by members that contribute to the overall functioning of the organization.	(Schein, 2010)
ICT	An artifact used by the members of the organization.	(Schein, 2010)

Organizational Culture. Researchers view schools as organizations because schools and workplace organizations have similar elements of culture. Schein's definition of organizational culture is the most widely used explanation of school culture (Schein, 2004). More recently, Schein (2010) defined culture as "shared learning experiences that lead to shared, taken-for-granted basic assumptions held by the members of the group or organization" (p. 21). Definitions of organizational culture often include beliefs, values, rituals, and symbols in addition to social norms, and behavior expectations. Organizational culture is essential to the elements of culture can determine strategy, goals, and operational standards (Schein, 1992).

Levels of Schein's Organizational Culture. Each level of Schein's organizational culture model is viewable in Figure 2. Schein (2010) maintained that an examination of school's culture happens at three conceptual levels of organization: (1) the artifact level, (2) the level of espoused beliefs and values, and (3) the level of basic underlying assumptions. Figure 3 shows an adaptation of Schein's model that is relevant to this study and technology integration in

schools. Purcell, Heaps, Buchanan, and Friedrich (2013) conducted a study using Advanced Placement and National Writing Project middle and high school teachers to determine if the use of digital technologies has helped their efforts to educate. Purcell et al. (2013) found striking differences in the experiences and perceptions of teachers working in schools of high and low socioeconomic status. The findings that are relevant to this study are presented at each level of organization to highlight the stated problem that the researcher wants to address and the need for

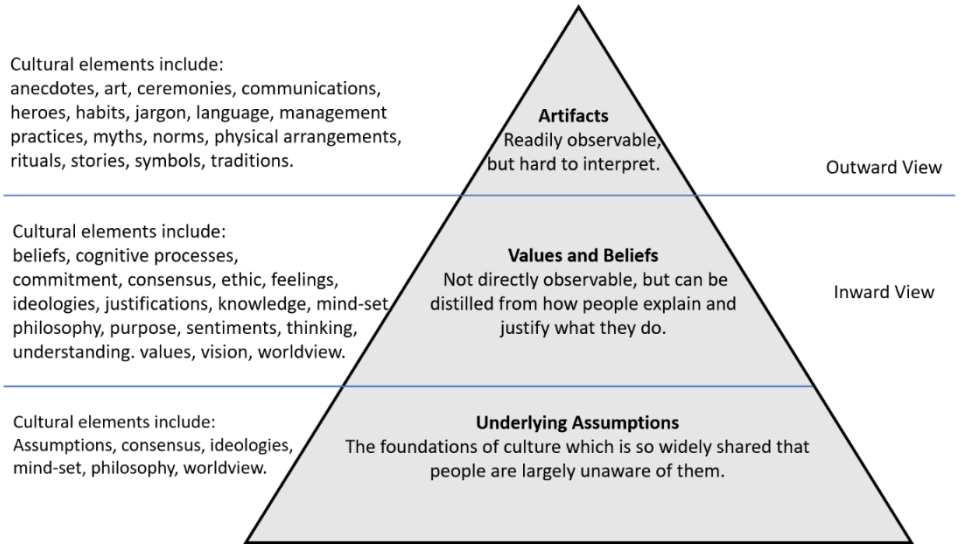

Figure 2. Schein's (1982) Model for Organizational Culture

this study.

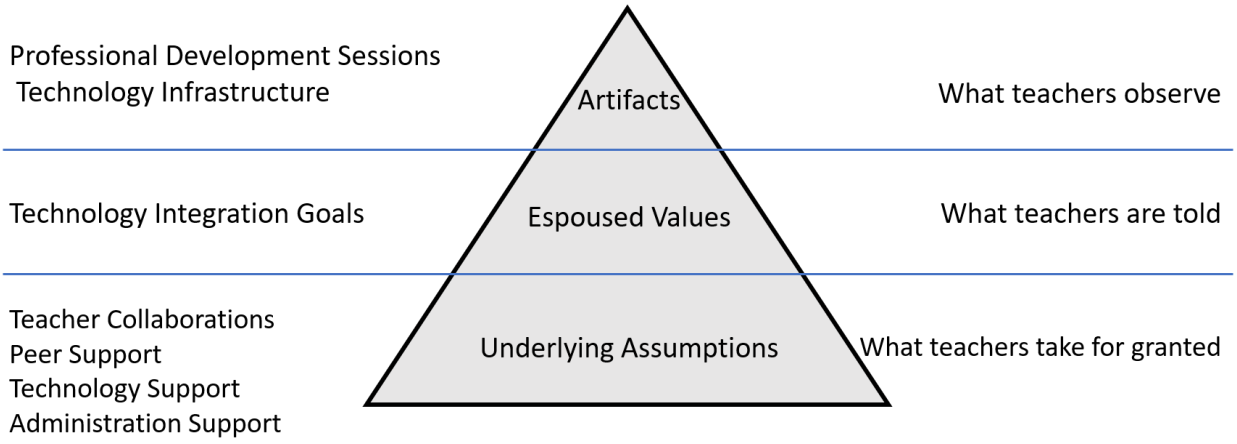

Figure 3. An Adaptation of Schein's Model for School Technology Integration

Artifacts. The artifact level of the organization includes the visible aspects of an organization. "Artifacts include all the phenomena that teachers see, hear, and feel at school as well as the visible products of the school" (Schein, 2004, p.25). Artifacts also include the school processes by which behavior is made routine. Artifacts include phenomena such as:

1. The school building and physical facilities;
2. Professional development;
3. Students' and teachers' visible behavior;
4. ICT availability and technology infrastructure;
5. Observable rituals and ceremonies

Various elements of school culture that have influenced teachers' practice are known as artifacts. According to Purcell et al. (2013), 56% of teachers at low socioeconomic status (SES) schools credit a lack of access to digital technologies due to student affordability as a major barrier to incorporating more digital tools into their teaching, compared to only 21% of teachers at high SES schools that report the same problem. Access to ICT and training on how to best use

the tools in the classroom is a school culture-related factor that can influence teachers' proficiency of ICT in the classroom (Hsu & Kuan, 2013). The restriction of artifacts such as ICT resources can influence teachers' classroom pedagogical strategies.

School administrators deem it essential to provide access to ICT resources and to train to in-service teachers through professional development. Purcell et al. (2013) found that 73% of teachers in high SES schools receive formal training in the incorporation of ICT in the classroom compared to 60% of teachers in low SES schools. School artifacts are natural for teachers to observe but difficult for teachers to interpret without knowledge of the other levels (Schein, 2010). Teachers' access to ICT and training communicates a cultural meaning that can influence teaching strategies.

Espoused Beliefs and Values. Statements that members make about the way things are within an organization and what people are supposed to do represent the espoused beliefs and values level of an organization. Espoused beliefs and values include professed statements of strategies, goals, and philosophies (Schein, 2010). Espoused beliefs and values include phenomena such as:

a. School's philosophy
b. Technology integration goals
c. Mission statement

Espoused beliefs and values is a level of organizational culture where people in an organization share values or beliefs that reflect in their work. Various elements of school culture that have influenced teachers' practice can be a result of espoused beliefs and values. Purcell et al. (2013) also found that 49% of teachers in low SES schools viewed school internet filter

policy as a hindrance to classroom ICT proficiency compared to 24% of teachers in high SES schools.

Additionally, 33% of teachers in low SES schools say school rules about students' classroom cell phone use has a major impact on their teaching, compared to 15% of teachers in high SES schools (Purcell et al., 2013). Restrictive use of internet service and student-owned ICT devices are aspects to a school policy that can influence teachers' proficiency of ICT in the classroom (Baek et al., 2008; Hew & Brush, 2007). Espoused values and beliefs in the form of school policy that restrict teachers' use of school resource for education purposes can influence teachers' ICT proficiency.

Underlying Assumptions. The third level of an organization is understood by exploring its underlying assumptions. While challenging to communicate, underlying assumptions are a combination of beliefs, perceptions, thoughts, and feelings about the organization's culture manifested as actions with little awareness (Schein, 2010). Underlying assumptions include *perceived* phenomena such as:

a. Work culture
b. Teacher collaborations
c. Peer support
d. Technology support
e. Administration support of teachers' ICT proficiency

Various beliefs and assumptions which include teachers' perception of how supportive the school organization is are ingrained in the school's culture and influential on teachers' pedagogical decisions. Purcell et al. (2013) found that 70% of teachers working in high SES schools believe their school does well in providing teachers the resources and support they need

to incorporate ICT in the classroom, compared to 50% of teachers working in low SES schools. Teacher beliefs and perceptions regarding school support (Hew & Brush, 2007) and peer support (Reid, 2012; Vanderlinde et al., 2012) can influence teachers' ICT proficiency in the classroom (Hsu & Kuan, 2013). Teachers' perceptions of workplace support at school can come from various sources. The two perceptions of workplace support that seem most influential to the perception of teachers' effectiveness are administrative support and peer support (Tsouloupas, Carson, & Matthews, 2014). Beliefs and perceptions promoted by school culture can influence teachers' proficiency of ICT in the classroom. Numerous research studies presented in the next few paragraphs will provide evidence that school culture can influence teachers related to the school level, ICT proficiency, and teachers' perceptions.

Tsouloupas et al. (2014) conducted a study to investigate personal and school cultural factors that influence teacher efficacy beliefs in handling student misbehavior. Individual factors such as personality traits (e.g., neuroticism, conscientiousness, and extraversion) and years of teaching experience were assessed along with school cultural factors such as school climate (e.g., perceived workplace support, perceived job autonomy, and professional development) and school structure (e.g., student socioeconomic status (SES) and school-level). Results for personal factors showed that all of the personal factors except neuroticism and conscientiousness were significant in influencing teachers' perceptions of their effectiveness in handling misbehaving students (Tsouloupas et al., 2014). Additionally, the amount of professional development and student SES were also significant in influencing teachers' perception of their efficacy in handling misbehaving students. Teachers who take advantage of opportunities to professionally improve their skills will likely feel more efficacious in their ability to do their jobs.

Perrotta (2013) conducted a study to determine the relationship between teachers' perceptions of ICT proficiency and school and school district issues. Surveys completed by teachers in secondary schools across the UK revealed that teachers' perceptions of the advantages of using technology are affected more by organizational characteristics as opposed to individual characteristics (Perrotta, 2013). The findings suggested that the social and cultural contexts of ICT use in education were significant factors. Balkar (2015) conducted a study to determine the profile of an empowering school culture using the perceptions of teachers. The responses of secondary school teachers were analyzed using qualitative methods and techniques. Findings revealed that the dominant characteristics of an empowering school culture were confidence, change, innovation and collaborative management (Balkar, 2015). Teacher efficacy, job satisfaction, strong social relationships and leadership of the school principal were the primary generated characteristics of an empowering school culture. Balkar (2015) suggested that school principals should share their responsibilities with teachers and endeavor to build close relationships with teachers.

Teachers' perception of school culture can be examined in terms of the school's artifacts, espoused beliefs and values, and basic underlying assumptions. The stronger an organization's collective belief that they can help students educationally, the more likely its members will put forth the sustained effort and persistence required to attain desired goals (Goddard & Skrla, 2006). Through data collection and analysis, the researcher hopes to discover if teachers' perception of school culture and school SES can address why teachers working in low and high SES schools incorporate ICT unevenly.

Usage

The use of terms such as *teachers' use* and *teachers' usage* indicate teachers' pedagogical practice in the classroom for this study. Usage or 'pedagogy' focuses on the interactions between teachers, students, course content, and the learning environment. Numerous scholars have provided definitions of pedagogy. Murphy, Hall, and Soler (2008) stated that:

> "[Pedagogy] takes account of two phenomena and their dynamic relationship: (a) the social order as reflected in, for example, policy and its associated cultural beliefs and assumptions; and (b) the experienced world, as reflected in both the enactment and the experience of the policy, including the beliefs underlying the approaches used in its enactment and the beliefs mediating how it is experienced. The parallels in curriculum can be thought of as being at three levels: curriculum as specified (the social order, the policy), curriculum as enacted, and curriculum as experienced (the experienced world)" (p. ix).

A popular definition of pedagogy is provided by Robin Alexander (2013) where he described pedagogy as "the act of teaching together with its attendant discourse about learning, teaching, curriculum, and much else" (p.3). Alexander (2013) goes on to say that pedagogy is "what one needs to know, and the skills one needs to command, to make and justify the many different kinds of decisions of which teaching is constituted" (p.173). The term 'usage,' for this study, will refer to pedagogical decisions, regarding learning, teaching, and curriculum, that is subject to school policy, cultural beliefs, and underlying assumptions.

The term pedagogy is fundamental to the discussion of education and has several approaches. Teaching approaches have been divided into two main categories: direct and non-direct instruction (Cicchelli, 1983; Knowlton, 2000; Mascolo, 2009). "Direct instruction is

generally characterized as a highly structured environment in which the teacher organizes learning tasks, establishes times and methods for instruction, and presents material according to her or his objectives" (Hancock, 2002; p.63). Direct instruction is also referred to as teacher-centered classroom behavior because it describes a teacher who is at the center of attention, is the sole authority on correct and wrong answers, and organizes and presents content to students (Cicchelli, 1983; Knowlton, 2000; Mascolo, 2009). "Non-direct instruction involves a less-structured setting in which students influence the organization of learning tasks and establish the time and nature of instruction while the teacher encourages open exchange of ideas." (Hancock, 2002; p.63). Non-direct instruction is also referred to as student-centered classroom behavior because the teacher makes the students the center of attention, gives students the opportunity to choose work activities and groups and encourages students to suggest alternative responses to questions (Cicchelli, 1983; Knowlton, 2000; Mascolo, 2009). For this review of the literature, teacher-centered and student-centered classroom behavior will be referred to as teacher-centered and student-centered pedagogical approaches, respectively, that are presented in more detail in Table 3.

Table 3

Pedagogical Approaches

Pedagogical Aspect	Teacher-Centered	Student-Centered	Author(s)
Introduction of new content	The teacher determines objectives, presents content-related information, and reviews or summarizes the lesson.	The teacher encourages students to identify objectives and to summarize or review the lesson.	(Cicchelli, 1983)
	The teacher introduces content worthy of being studied and tells students how to interpret it.	The students are also responsible for finding content that they can use to create knowledge and understanding.	(Knowlton, 2000)

	"Based upon a model of an active teacher and a passive student" (p.2).	"The professor is viewed as a facilitator or "coach" who assists students who are seen as the primary architects of their learning." (p.2).	(Mascolo, 2009)
Teacher's Role	The teacher establishes and enforces rules and discipline; structures directions, tasks, and use of time; actively maintains on-task involvement; poses lower-order content-focused questions, and signals transition and introduces a new topic.	The teacher permits students to establish and enforce classroom rules; permits students to choose tasks and determine how and when to do them; passively maintains on-task involvement; poses higher-order content-focused questions; and asks students if they have finished current activity before suggesting a new topic, which includes student preference.	(Cicchelli, 1983)
	Restricted to providing knowledge.	Coach, counselor, or mentor to students.	(Knowlton, 2000)
	The teacher decides the structure and content of all classroom lectures and activities.	"'Facilitators' or 'coaches' whose function is to support a student's active attempts to discover and reconstruct knowledge through their own actions." (p.7).	(Mascolo, 2009)

Teacher-centered and student-centered pedagogical approaches can be complex. In real-world classrooms, pedagogical styles are often restricted by practical issues, such as student expectations and experiences, class sizes, and teacher training (Kain, 2003). Practical issues of a school that are deeply embedded in a school's organizational culture can influence teachers' style of pedagogy. Experienced teachers who have been established at a school for some time help to develop and sustain school norms of pedagogical culture and can influence new incoming teachers to adjust their teaching style to meet the norms of school (Ertmer & Ottenbreit-

Leftwich, 2010). Innovative teachers can be overpowered by the pressure to conform to the popular pedagogical culture of a school.

ICT Proficiency. ICT proficiency refers to teachers' pedagogical use of ICT in the classroom and is often referred to as 'technology integration,' which can mean many different things. There is no universal definition of 'technology integration' (Bebell, Russell, & O'Dwyer, 2004; Ertmer, 2015), although the general elements include the use of computing devices such as computers, software, and internet for instruction (Hew & Brush, 2007). Sample variations of how technology integration has been defined are presented in Table 4.

Table 4

Definitions of Technology Integration

Researcher(s)	Technology Integration Definition
Bebell et al. (2004)	Use of technology to deliver instruction, develop products that facilitate learning, e-mailing, lesson preparation, and record keeping, as well as personal use.
Belland (2009)	"The sustainable and persistent change in the social system of K–12 schools caused by the adoption of technology to help students construct knowledge" (p.354).
Griffin (2003)	Purposeful use of instructional technology in the development and methodology of curriculum delivery.
Hew and Brush (2007)	"The use of computing devices such as desktop computers, laptops, handheld computers, software, or Internet in K-12 schools for instructional purposes" (p. 225).
Lim (2007)	Use of tools that engage students in higher-order thinking skills that require analyzing, synthesizing, problem-solving, imagining, and connecting.
Ogle et al. (2002)	Use of technology and technology-based practices such as collaborative work, communication, and internet-based research into daily routines, work, and management of schools.
Okojie, Olinzock, and Okojie-Boulder (2006)	"Technology integration should incorporate the technological skill and ability to use pedagogical knowledge as a base for integrating technology into teaching and learning" (p.3).
Protheroe (2005)	Use of technology to provide opportunities to support new models of learning, including opportunities for students to collaborate and construct knowledge.
Wachira and Keengwe (2011)	"Incorporating technology and technology-based practices into all aspects of teaching and learning specifically, incorporating appropriate technology in objectives, lessons, and assessment of learning outcomes" (p.17).

There seem to be inconsistencies in teachers pedagogical use of technological devices in the classroom (Owens et al., 2007; Reinhart et al., 2011). Inconsistent definitions and perspectives on what constitutes ICT proficiency can lead to inconsistencies in implementation.

Judson (2006) describes the inconsistencies by stating, “Some teachers maintain tight control and use technology only for presentation purposes. Other teachers, with the same resources and access, allow students nearly full reign of technology decisions” (p.582). Another possible reason for the inconsistency is that the goals for technology integration are always changing as once teachers helped students learn *from* the technology they are now encouraged to help students learn *with* technology (Ertmer, 2015). Even though educators are being called on to be more innovative in their use of ICT in the classroom, inconsistencies in the use of technology integration may contribute to inconsistencies of ICT proficiency between schools of varying socioeconomic composition.

Teachers are encouraged to use ICT approaches that move away from direct instruction or teacher-centered to student-centered approaches. School administrators and leaders in educational technology who support the incorporation of ICT in the classroom want teachers to use pedagogical strategies that are student-centered and based on a constructivist paradigm (Ertmer, 2015; Judson, 2006). Constructivist pedagogy is a style of teaching where the student constructs their interpretation of an experience; thus, constructing their knowledge (Krahenbuhl, 2016). Utilizing constructivist pedagogical strategies allows students to become the expert who researches, studies and creates their knowledge (Krahenbuhl, 2016) in an environment that promotes independence and collaborative learning. Koehler et al. (2007) encourages teachers to incorporate ICT into their lessons using an approach that “is closely related to constructivist and project-based approaches such as learning-by-doing, problem-based learning, collaborative learning frameworks, and design-based learning” (p.744). The use of constructivism as an approach to incorporating ICT into education has been widely promoted (Ertmer, 2015; Koehler

et al., 2007). Specific strategies can be used to help students construct their knowledge using information and communication technology.

School-Level Socioeconomic Status

Socioeconomic status (SES) is a variable that is often used in educational research to determine relationships among concepts. The National Center for Education Statistics assembled a panel of experts to provide recommendations concerning SES as a construct. The panel, Cowan et al. (2012), defined SES as:

> One's access to financial, social, cultural, and human capital resources. Traditionally a student's SES has included, as components, parental educational attainment, parental occupational status, and household or family income, with appropriate adjustment for household or family composition. An expanded SES measure could include measures of additional household, neighborhood, and school resources. (p.4)

The SES of a school was determined based on the percentage of students who are eligible to participate in the National School Lunch Program (NSLP). The percent of students in a district who are eligible to participate in either the free or reduced price lunch programs based on family size and income under the National Schools Lunch Act determines the SES of a school (Orfield et al., 2004). Schools identified as 'low SES' and 'high SES' indicate schools with majority populations of low- and high-income students, respectively.

School socioeconomic composition has been a well-known research topic in the field of educational research (Hattie, 2002). School socioeconomic composition or status has been known to influence teachers. Auwarter and Aruguete (2008) conducted a study to determine if teachers' expectations of students were being influenced by students' gender and socioeconomic status (SES). Teachers perceived that low SES students had less promising futures than do high

SES students. Findings suggest that teachers are likely to develop negative attitudes toward low-SES students in general (Auwarter & Aruguete, 2008). Preconceived attitudes may help explain why teacher behavior towards students is not comparable between schools of varying socioeconomic status.

Goddard and Skrla (2006) conducted a study to determine how school social composition is related to perceived collective efficacy. Findings indicated that a school's past academic achievement, the rate of special program placement for gifted children, and faculty ethnic composition explained influenced teachers' collective belief that they could make an educational difference for their students. Brault et al. (2014) conducted a study to investigate the effect of educational climate and school socioeconomic, ethnic and academic composition on teacher expectations of student success. Results showed that while academic composition had the greatest influence on teacher expectations, school composition, and school educational climate were also important factors. Lastly, Agirdag, Van Avermaet, and Van Houtte (2013) conducted a study to investigate the effects of school segregation and self-fulfilling prophecies by examining the mediating role of teacher expectations regarding the impact of school composition on students' math achievement. Findings showed that teachers of low SES students had an indirect impact on students' achievement through students' feelings of academic futility. Socioeconomic status at the school level can influence teachers' behavior in the classroom.

Socioeconomic Status and ICT Proficiency. There is some evidence that links teachers' directed use of ICT in a classroom setting to the SES of a school. Proficiency is influenced by students' SES, the SES of their school, and how their teachers understand and use technology (Garland & Wotton, 2001; Swain & Pearson, 2002). Students' teacher-directed use of ICT can be described as producing or consuming. Producers of technology create a product or

communicate their thoughts compared to consumers of technology who passively perform rote acts such as memorizing facts, drill and practice, or use technology to create word processing documents (Dolan, 2016). There is evidence in the literature that teachers working in schools of varying SES utilize different types of ICT proficiency in the classroom. The following research studies are presented as examples of the differences in ICT proficiency between schools of varying socioeconomic status.

Warschauer et al. (2004) observed high and low SES schools to assess the inequalities that exist between the two SES groups by comparing computer access, availability, and use. Although results showed that high and low SES schools were similar in computer accessibility, there were considerable differences in teacher usage. Students in high SES schools used computers to complete statistical analyses in their mathematics courses while students in low SES schools used computer software to complete lower-order thinking tasks such as viewing geometric shapes (Warschauer et al., 2004). In English courses, students in both low and high SES schools used educational technology to make Microsoft Word essays and PowerPoint presentations. However, students in the high SES schools also used computers to plan, edit, and analyze essays and conduct research on the Internet. Students who attended social studies class, in both low SES and high SES schools carried out Internet-based research, but students in high-SES schools also created Power-Point presentations and video presentations (p. 572). The results of this study show that SES is a factor in a teacher's ability to provide relevant and meaningful learning engagements. This study highlights how teachers in different SES schools had different types of ICT incorporation.

Levin and Arafeh (2002) conducted a mixed-methods study with data gathered from 136 students in 200 middle and high schools. The secondary school students shared stories about

their technology use and their attitudes toward how they use the internet in the classroom. Levin and Arafeh (2002) found that students use the internet in many ways at home for school purposes such as conducting research, clarifying concepts learned in school, collaborating with fellow students, making life decisions, and staying organized using online web applications. However, most of the students' indicated that while they do use the internet in school, the vast majority of internet-related tasks in which students engage happens outside of the school day. Levin and Arafeh (2002) identified this phenomenon as the "digital disconnect" (p.14). Although the respondents believed that the school administration was responsible for setting the school's technology usage policy, the respondents also reported variations in their perception of their teacher's support of technology use in the classroom (Levin & Arafeh, 2002). This study emphasizes the role school rules may play in influencing teachers' proficiency of ICT in the classroom.

Ritzhaupt, Liu, Dawson, and Barron (2013) discovered that students in low SES families had limited access to ICT and therefore less opportunity to use ICT for personal empowerment. The results also showed that the students' most significant area of weakness was their ability to construct and demonstrate knowledge using ICT resources. Ritzhaupt et al. (2013) noted that this is primarily problematic since teachers are providing more opportunities for students to demonstrate their understanding via ICT resources such as the use of word processing or graphic design programs. Teachers who can provide transformative opportunities when incorporating ICT into the classroom can improve students knowledge of information and communication technology.

Summary

The literature discussed in this chapter highlights five major themes that were considered for this research on the effect of school SES and teachers' perception of school culture on teachers' proficiency of ICT in the classroom:

1. Teachers' perceptions (in general), perceptions regarding ICT, and perceptions regarding the use of ICT in the classroom can influence how or even if they will use ICT in the classroom;
2. Elements of school culture such as artifacts, espoused beliefs and values, and basic underlying assumptions can influence teachers' proficiency of ICT in the classroom;
3. ICT is defined as any communication, application, or technological device, including cell phones, computers, software, and network connections, in which a range of teaching and learning processes is applicable;
4. Usage or teachers' pedagogical practice that is supported by ICT in a student-centered or constructivist environment can improve students' ability to construct their knowledge; and
5. Socioeconomic status is a variable that is often used in educational research to determine relationships, and there is a relationship between teachers' directed use of ICT and school SES.

Teachers' pedagogical strategies with technology have been studied for many years. This research study is designed to determine if the SES of a school and teachers' perceptions of school culture play a role in teachers' differing ICT proficiency between schools of low and high socioeconomic status. Behavioral norms, assumptions about learning, and school rules have a

large effect on teachers' proficiency of ICT in the classroom (Anthony & Clark, 2011; Hew & Brush; Warschauer & Matuchniak, 2010). Perception of school culture and school SES may be factors that explain why teachers' ICT proficiency in the classroom is notably different in low SES schools compared to non-low SES schools.

CHAPTER 3:

RESEARCH DESIGN

This chapter describes the research design that was used to study the effect of school SES and teachers' perception of school culture on teachers' proficiency of ICT in the classroom. Specifically, it presents the demographics of the participants in the study, provides the context of the environment where data collection occurred, identifies the data collection tool, describes the sequence of data collection procedures, and explains the steps followed during the data analysis procedure. The following research questions guided this study:

1. What effect does teachers' perception of school culture have on teachers' ICT proficiency in the classroom?
2. What effect does teachers' characteristics have on teachers' ICT proficiency in the classroom?
3. What effect does school SES have on teacher's ICT proficiency in the classroom?

Pilot Study

A pilot study was conducted to establish the reliability of a survey instrument designed to answer the questions in this research study. A sample of secondary teachers, mostly from the state of Georgia, were solicited to complete the pilot study.

Pilot Study Instrumentation. The survey instrument that was used in this study is the Teacher ICT Integration Usage Survey (TIUS) (i.e., six subscales) (Hsu, 2010) of which the researcher was given permission (Creswell, 2014). Hsu (2010) developed the TIUS used in this study by interpreting and focusing on the National Educational Technology Standards for

Teachers (ISTE, 2007). Working alongside elementary and junior high school teachers in Taiwan a questionnaire was designed that reflected the ISTE standards and teachers' experience which included lesson planning, classroom instruction, student monitoring and class evaluations (Hsu, 2010).

The results of Hsu's (2010) factor analysis suggested six subscales for teachers' ICT proficiency:

1. Preparation of lessons using ICT,
2. Production of ICT-created materials to use in class,
3. Communication with parents and students using ICT,
4. Instruction using ICT,
5. Professional development to improve ICT knowledge and classroom usage, and
6. Ethics associated with ICT proficiency in the classroom.

Hsu's (2010) instrument varied between 2 and 18 items per subscale with a total of 101 interval, attitudinal items. Several modifications had to be made to the survey. First, the instrument (see Appendix B for the original version) was originally written in Chinese and was therefore translated to English by a colleague whose native language is Chinese (see Appendix C for translated version). Second, the researcher removed the last section that referred to technology integration experiences since becoming a teacher because the data from this section is beyond the scope of this study. Lastly, the researcher adjusted the phrasing on several items to create complete sentences and improve coherency (see Appendix D for pilot study version). Here is a list of the five main sections of the survey instrument:

1. Teachers' ICT Integration and Planning;
2. Teachers' and the Environment;

3. Teachers' ICT Integration in Lesson Planning and Teaching;
4. Teachers' Observations of Student ICT Usage; and
5. Technology Integration Experiences.

The Teachers' ICT Integration and Planning part of the survey is used to determine teachers' proficiency in their use of ICT in the classroom and contains survey items from three different sections: (a) Teachers' ICT Integration in Lesson Planning and Teaching, (b) Teachers' Observations of Student ICT Usage, and (c) Teachers' ICT Integration and Planning. In the Teachers' ICT Integration and Planning section, response items range from 'I have no idea' to 'I often need help' to 'I can demonstrate these skills by myself' to 'I am very familiar and good at this' (Hsu, 2010).

The combination of survey items from the Teachers' and the Environment section and the Technology Integration Experiences section enables the researcher to determine teachers' perception of school culture and teacher attitudes. In the Perception of School Culture and Teacher Attitudes section, response items range from 'strongly disagree' to 'disagree' to 'agree' to 'strongly agree' (Hsu, 2010).

Due to concerns over the time needed for participants to complete the survey, the researcher limited the survey to the section that measures teachers' integration and planning and the environment which has a total of 34 items along with teacher and school demographic questions that total 19 items.

Hsu (2010) conducted an item analysis to ensure that the instrument was valid and reliable, where meaningful and useful inferences could be drawn from the scores internal consistency is apparent among the instrument's items (Creswell, 2014). The scale was verified by exploratory factor analysis and confirmatory analysis on a split data set. For the entire

sample, reliability coefficients of the six subscales were between .71 and .96, and factor loadings for the items included ranged from .58 to .91 (Hsu, 2010). These results demonstrated the effectiveness of the survey items used to answer the research questions of this study.

The pilot study collected data to assess teachers' proficiency of using ICT, attitudes towards using ICT, desire to learn more about the use of ICT, and teachers' perception of school culture regarding the use of ICT in the classroom (Hsu & Kuan, 2013). The survey instrument contains 34 items that were scored on a four-point Likert-type scale. Nineteen items focused on the backgrounds of teachers and schools, 22 items focused on teachers' ICT classroom proficiency and professional development priorities and opportunities, and 12 items focused on teachers' perception of the school environment and overall attitude regarding the use of ICT in the classroom.

Pilot Study Procedures and Research Methodology. An anonymous link was sent to participants via email and short message service. The pilot survey instrument was launched on July 29, 2018, and data was collected through August 14, 2018. Nine respondents, of the 14 possible participants in the survey, completed the instrument within the data collection window, which indicates a response rate of 64.43%. Responses were collected in an electronic database for purposes of data analysis. The survey instrument was made available through a link to an off-site host so that all responses were anonymous.

Pilot Study Data Analysis. After responses were collected from the participants, the data were analyzed and interpreted using the statistical program Statistical Package for Social Sciences (SPSS) for Windows Graduate Student Version 24.0. Nominal and ordinal variables were coded as 0, 1, and 2 or 0, 1, 2, and 3 depending on the possible number of responses for survey items. The reliability of the TIUS instrument was calculated in SPSS and determined

using Cronbach's Alpha. Cronbach's alpha (α) is used to calculate the internal consistency of some variables and is commonly used to analyze a set of variables measured on an ordinal scale such as Likert items (Cronbach, 1951). Cronbach's alpha was calculated to compute a reliability index for each Likert-scale that was featured in the pilot survey. During the reliability analysis, it was discovered that all 9 of the respondents provided the same response to the statement, "I know how to use technology to improve my work efficiency," which caused the SPSS program to remove the item from the reliability analysis due to the lack of variance in responses. Therefore, the reliability statistics for the Teacher's ICT Proficiency subscale is based on 21 items as opposed to 22 items. The Teacher's ICT Proficiency subscale (21 items), the Teacher's ICT Attitude subscale (5 items), and the School Culture Perception subscale (7 items) had Cronbach alpha values of .931, .514, and .848 respectively.

Pilot Study Research Question 1. A cumulative odds ordinal logistic regression with proportional odds was run to determine the effect of teacher's perception of school culture and demographics on teacher's ICT proficiency. The Pearson and Deviance goodness-of-fit test indicated that the model was a good fit to the observed data, $\chi^2(48) = .769$, $p = 1$ and $\chi^2(48) = 1.445$, $p = 1$, respectively, but most cells were sparse with zero frequencies in 87.5% of cells. Thus these results may not be reliable due to the small number of participants. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $\chi^2(8) = 36.777$, $p < .001$.

Pilot Study Research Question 2. The ordinal logistic regression equation produced coefficients that represented each teacher characteristic and whether that characteristic would result in a higher or lower ICT proficiency score. Results showed greater odds of a higher ICT proficiency score for:

- male teachers compared to female teachers,
- Teachers with bachelor's degrees compared to teachers with master's degrees,
- Teachers with 3-5 years & 16-20 years of experience (whereas teachers with 6-15 years show lesser odds),
- Teachers with higher perceptions of school culture were more likely to have lower ICT proficiency scores, and
- Teachers with high ICT attitude scores.

The overall effect of the independent variables was not statistically significant as it pertains to teacher's ICT proficiency score.

Pilot Study Research Question 3. A Mann-Whitney U test was run to determine if there were differences in ICT Proficiency score between teachers in low SES schools and teachers in high SES schools. Distributions of the ICT Proficiency scores for teachers in low SES schools and teachers in high SES schools were not similar, as assessed by visual inspection. Median ICT Proficiency score for teachers in low SES schools (2.23) and teachers in high SES schools (2.77) was not statistically significantly different.

Pilot Study Summary. Establishing the reliability of the instrument led to a few changes in the survey instrument. The analysis resulted in the removal of one item from the Teacher's ICT Attitude Scale which caused the Cronbach alpha value to increase from .514 to .643. Additionally, in the interest of improving survey response, four items were removed from the Teacher's ICT Proficiency Scale which caused the Cronbach alpha value to increase from .931 to .951.

The goal of the pilot study was to establish the reliability of the instrument that was used to survey secondary core-subject teachers that will help to determine the effect of school-level

SES, teachers' perception of school culture, and teacher characteristics on teachers' ICT proficiency in the classroom. While the results of this small pilot study are not generalizable to the larger population, they did reveal important issues concerning the length of the survey and the validity of the survey scales. Cronbach's alpha for each scale provided a reliability value range of .643 to .951 which indicates high reliability within the items of the survey. Lastly, several items were removed from one of the scales to shorten the duration of the survey and improve the number of complete survey responses.

Although the data is received in ordinal form, an ordinal logistic regression will not be used for the actual study. Determination of participants' ICT proficiency score required the ordinal values to be converted to an average, making it a continuous variable. Thus, a multiple linear regression will be used to answer research question 1 and 2. Additionally, the Mann-Whitney U test is expected to be used if there are only two school-level SES groups to compare. If there are 3 or more groups to compare, the Kruskal-Wallis H test will be used to answer research question 3.

Self-report surveys of teachers' practices and attitudes are a useful way to collect information. Unfortunately, teachers who provide information on their pedagogical practices can be biased in their self-assessments (Kopcha & Sullivan, 2007). Even though self-report surveys are widely used (Bielefeldt, 2002), teachers have been known to portray themselves in ways that are not consistent with their actual practice (Kopcha & Sullivan, 2007). To understand better the level of technology integration participation demonstrated by respondents and to determine if respondents could be consistent in their self-reporting, an additional question was added to the survey. Teachers were required to describe their use of instructional technology in the classroom in the demographic section of the survey and these responses will be compared to their teacher

ICT proficiency score to check for consistency. Each response corresponds to levels of technology integration such as entry, adoption, adaptation, infusion, and transformation (Harmes, Welsh, & Winkelman, 2016). Possible responses include:

1. I have just begun to use technology tools to deliver content to students.
2. I teach students in the conventional and procedural use of technology.
3. I facilitate students in exploring and independently using technology.
4. I provide the learning context and allow students to choose the technology.
5. I encourage the innovative use of technology by creating activities that are not possible without the use of technology (Harmes et al., 2016).

Present Study

Participants

The population identified for this study consisted of public school teachers working in various school districts within the state of Georgia. This group of teachers makes up a population because they share similar characteristics (Creswell, 2014). The selected participants included individuals meeting the criteria of teaching full-time or part-time in a middle or a high school and teaching a Core (math, ELA, science, and social studies) subject. According to the 2017 Georgia K-12 Teacher and Leader Workforce Status Report, 29,211 teachers were certified to teach secondary Core subjects (G.O.S.A, 2018). Three hundred and eighty secondary Core-subject teachers would be an ideal sample for a population of 29,211 secondary Core-subject teachers in Georgia, with a 95% confidence level and a 5% margin of error.

Participants were recruited through a comprehensive sampling strategy. Comprehensive sampling is a strategy researchers use when an entire group has been chosen to participate in a study based on a specific criterion (McMillan & Schumacher, 1997). The researcher e-mailed

various school district personnel (SDP) handling research authorizations such as school principals, curriculum directors, and assistant superintendents (see Appendix A for recruitment letters) to nearly every school district in the state of Georgia and invited them to encourage their teachers to participate in the study. Some school districts were not able to be contacted due to their internal policies on educational research. Due to the layers of SDP that provided permission for the conducting of this study and its subsequent distribution to teachers, the researcher has no way of knowing how many teachers, who met the sample criteria, had the option to take the survey. A total of 509 Core-subject middle and high school teachers agreed to participate in the present study and completed the survey.

Context

The context for this study was in public secondary schools in the state of Georgia that has schools classified as having low, middle, and high socioeconomic status based on students eligibility for free or reduced lunch. The data collection will potentially take place wherever participants can complete an online survey using any technological device that has internet access from any location of their choosing.

Data Collection Tools

The primary data collection tool was a survey instrument. The survey instrument that was used in this study is the Teacher ICT Integration Usage Survey (TIUS) (i.e., three subscales) (Hsu, 2010) that has been modified based on the results of the pilot study (see Appendix E for modified TIUS survey).

Variables. The main dependent variable is based on the data collected from the Teachers' ICT Integration and Planning section of the survey (Hsu, 2010) and the independent variables are divided into teacher and school-level factors and are defined in Table 5. Most of

the variables were collected using the survey of teacher ICT proficiency survey except school district and school demographic information which was retrieved from Georgia's Office of Student Achievement website (G.O.S.A, 2017b).

Table 5

Teachers' Integration Usage Defined Variables

Variable	Description
Teacher Characteristics	Age, gender, years of teaching, highest level of education, level of schooling taught, and EdTech knowledge (Hsu & Kuan, 2013).
Teachers' ICT Attitude	Teachers' perception and beliefs about the use of ICT and general technology integration in classrooms (Hsu & Kuan, 2013).
School-Level SES	Low SES, Middle SES, & High SES based on FRL participation (Zamudio, 2004).
Teachers' Perception of School Culture	Teachers' perception of school culture based on elements such as professional development, administrative support, and peer support (Hsu & Kuan, 2013).
Teachers' ICT Proficiency	Teacher's knowledge about how to use ICT pedagogically within the context of their course curriculum (Hsu & Kuan, 2013).

Following Hsu's (2010) research design, independent variables include school and teacher level variables. School-level factors are categorized into structural and cultural variables, and teacher level factors are categorized into teacher characteristic and attitudinal variables (Hsu, 2010; Hsu & Kuan, 2013). The four types of independent variables, teacher characteristics variables, teacher attitudinal variables, school structural variables, and school cultural variables is discussed and presented in Table 6 (Items are in Appendix E).

Table 6

Variables, Research Questions, & Survey Items

Variable Name	Research Question	Survey Item
Dependent Variable: Teachers' ICT Proficiency	What effect does teachers' perception of school culture have on teachers' ICT proficiency in the classroom?	See Part 2 for all items.
Independent Variable$_1$: Teacher Characteristics	What effect does teachers' characteristics have on teachers' ICT proficiency in the classroom?	See Part 1, Item #s: 1, 2, 8, 9, 17, and 19
Independent Variable$_2$: Teacher Attitudinal	What effect does teachers' perception of school culture have on teachers' ICT proficiency in the classroom?	See Part 1, Item #s: 16. See Part 3, Item #s: 1, 2, 7, 8, 9, 10, 11, and 12
Independent Variable$_3$: School Structural	What effect does school SES have on teacher's ICT proficiency in the classroom?	See Part 1, Item #s: 1, 5, 10, and 11
Independent Variable$_4$: School Culture	What effect does school SES have on teacher's ICT proficiency in the classroom?	See Part 1, Item #s: 13, 16 See Part 3, Item #s: 7, 8, 9, 10, 11, and 12

Teacher Characteristics. Teacher characteristics variables include age, gender, years of teaching, the highest level of education, level of schooling taught, and background knowledge of educational technology. Teachers' age has shown to have a positive relationship with their use of ICT in a classroom setting (Elsaadani, 2013). Teachers' gender and years of teaching are factors which potentially influence the use of computers. Male teachers have been known to use ICT in the classroom with greater frequency than female teachers (Chiero 1997). Inan and Lowther (2010) suggest that excessive years of teaching can have a negative impact on teachers' proficiency of ICT in the classroom. Teachers' proficiency of ICT is different at different school levels. Becker and Ravitz (1999) surveyed 151 U.S. elementary and secondary school teachers

who use ICT in the classroom and discovered that elementary school teachers were more likely to adhere to constructivist pedagogical strategies than secondary school teachers. Teachers who had research experience or obtained a degree in educational technology may have a greater understanding and experience with ICT proficiency (Hsu, 2010). Teachers' background information can be useful in assessing teachers' proficiency of ICT in the classroom.

Teachers' Attitudinal Variables. Teachers' perceptions are an important factor that can influence teachers' proficiency of ICT in the classroom. Teachers' perceptions of school culture can influence a teacher's use of ICT based on their perceptions of technical support, peer support, and administrative support (Schein, 2010). Teachers' perception of ICT proficiency can be influenced by various external demands that may make ICT proficiency challenging. The realities of the classroom can make it challenging for teachers to be able to balance the use of technology with district demands and expectations associated with students' learning and achievement (Anthony & Clark, 2011). Teachers' training and professional development is also a key factor for ICT proficiency in the classroom. Attending training workshops offered by the school, however, has to be a combined effort of teachers and schools (Hsu & Kuan, 2013). Information regarding teachers' perceptions can be valuable to this study.

School Structure. Artifacts such as ICT equipment and internet access provided by the school is a crucial factor in teacher ICT proficiency. Tondeur et al. (2008) found that computers must be available to teachers, have internet connections available for teachers for lesson planning and teaching, and computers with internet access should be available in classrooms to enhance students' learning. School-level SES was determined based on the percentage of students who qualify for free or reduced lunch (FRL) using information from Georgia's student achievement website (G.O.S.A, 2017b). School SES can help the researcher to determine the role of school

composition in teachers' proficiency of ICT (Brault et al., 2014) given the lack of consistency in teachers' pedagogical strategies (Dolan, 2016).

School Culture. School culture can influence ICT proficiency for teachers. School policy can create exterior constraints, demand, and support for teachers to use ICT in classes (Hsu & Kuan, 2013). Administrative support can play a key role in teachers' proficiency of ICT in the classroom and is usually vital for teachers' ICT proficiency. School administrators with a vision for the school's use of ICT as a community can be an important step in successful ICT proficiency (Lim, 2007). Phelps and Graham (2008) found that schools can develop a supportive workplace culture for teachers' ICT proficiency by implementing a process consistent with teachers' ICT knowledge development. Lastly, teachers need the support of their peers. Teachers can develop new knowledge and skills for ICT proficiency, by having a workplace community within the school (Hsu & Kuan, 2013).

Data Collection Procedures

Prior to data collection, the Institutional Review Board should give the researcher permission to conduct the study (Creswell, 2014). The Institutional Review Board of the University of Georgia granted permission to conduct this study (see Appendix F). Various school district superintendents were identified and invited to participate in this research study. After receiving a total of zero responses, the researcher proceeded to contact various school district personnel (SDP) handling research authorizations such as school principals, curriculum directors, and assistant superintendents in more than 70% of the school districts in the state.

Given that the researcher received permission to conduct research from various SDP, numerous approaches may be used to ensure that teachers ultimately receive an anonymous link via email that will enable them to participate in the research study (see Figure 4). Email

addresses that are collected were archived along with some basic information about each school district up until five years where the data will be discarded so that it does not fall into the hands of other researchers who might misappropriate it (Creswell, 2014). Once permission was given to conduct research in a school district, various SDP were electronically sent an email that contains a unique link to the survey. District authorizing personnel forwarded the survey invitation email message to their teachers for the second step. Lastly, teachers who decide to complete the survey will have their results electronically sent back to the researcher via the Qualtrics website according to the unique link they were sent.

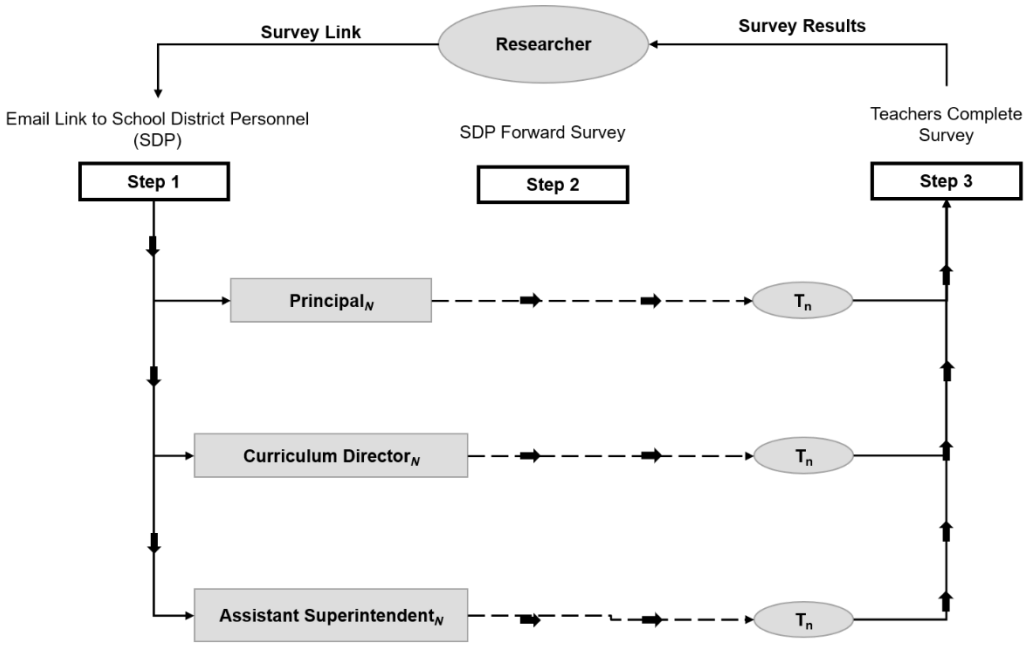

Figure 4. Data Collection Procedure

The researcher never contacted any teacher directly and made certain that all correspondence was routed through the SDP so that participation in the study can be seen as voluntary (Creswell, 2014). No incentives were offered to teachers, though SDPs will receive a customized report of the survey for their school or district if at least 50% of their teachers complete the survey.

Data Analysis Plan

This section describes the data analysis plan from screening the data to addressing each research question. Each district was initially be kept separate, and within each district, middle school teachers and high school teachers were divided into sample strata to enable the researcher to compare the views of middle school and high school teachers as well as make more valid inferences from the sample to the population.

Data Screening. Once the survey information has been collected, the researcher will ensure that there is a complete data set. This part of the data analysis will require the researcher to examine the data for inconsistencies as well as make decisions about incomplete data and data cleaning (Keim, Mansmann, Schneidewind, & Ziegler, 2006). The dataset will automatically be created in Qualtrics and downloaded in SPSS format. SPSS was used to organize and clean all data for the analysis. The researcher will then determine the presence of response bias because biased responses can substantially change the overall results (Creswell, 2014). After the initial screening of the data, questionnaires where all 22 items in the Teachers' ICT Integration and Planning section (ICT Proficiency subscale) are marked as 4 'very familiar' and questionnaires completed within 5 minutes or less were excluded from the final analysis (Hsu, 2010).

The researcher began by calculating descriptive statistics for all independent and dependent variables in the study, which will indicate the means, standard deviations, and range of scores for these variables (Creswell, 2014). If the number of participants is large enough, the researcher will calculate inferential statistics such as correlations, multiple regressions, cluster analyses, and various statistical tests to address the research questions. Small sample sizes may make calculating inferential statistics irrelevant (Creswell, 2014).

Research Questions. To address Research Question #1, "What effect does teachers' perception of school culture have on teachers' ICT proficiency in the classroom," the researcher used the aggregate responses for the corresponding survey items to answer this question. Specifically, responses from part 3 (Teachers and the Environment) were examined to determine the effect on participants' responses from part 2 (Teachers' ICT Integration and Planning) of the survey which represents the dependent variable.

To address Research Question #2, "What effect does teachers' characteristics have on teachers' ICT proficiency in the classroom," the researcher used the aggregate responses for the corresponding survey items to answer this question. Specifically, responses from the demographics section of the survey were examined to determine the effect on participants' responses from part 2 (Teachers' ICT Integration and Planning) of the survey which represents the dependent variable.

To address Research Question #3, "What effect does school SES have on teacher's ICT proficiency in the classroom," the researcher used the aggregate responses for the corresponding survey items to answer this question. Specifically, school demographic information was examined to determine an effect on participants' responses from part 2 (Teachers' ICT Integration and Planning) of the survey.

Reliability and Validity. The researcher utilized a variety of techniques to demonstrate the consistency of the research findings. The reliability of the survey has been addressed using Cronbach's alpha during the pilot study (Santos, 1999). Measuring internal consistency helps to demonstrate how well the items on each scale correlate with each other or measure the same construct. Given that the researcher is using a survey instrument that has already been validated (Hsu, 2010; Hsu & Kuan, 2013), additional validation may not be necessary. However, if needed

the researcher can conduct a principal components analysis. A principal components analysis is commonly used to emphasize variation and bring out strong patterns in a dataset (Jolliffe, 2011) to ensure that the variables used in this study are measuring the basic underlying construct.

CHAPTER 4:

RESULTS

Quantitative data collected using the Teacher ICT Integration Usage Survey (TIUS) questionnaire is presented using tables, graphs and brief explanations that were used to answer the research questions previously discussed. Where appropriate, relationships are tested for significance between variables, using statistical software and techniques, towards providing answers to the research questions. The chapter begins with a discussion of the demographics of primary data collection; it then proceeds to discuss findings in context of the research questions. Discussions and implications of findings of theory and practice are discussed in Chapter 5 after the presentation of data findings.

Participants

A comprehensive sampling technique was employed to recruit all middle and high school teachers who are at least in their second year of teaching and who primarily teach a Core subject (e.g., math, science, social studies, and ELA). Only 807 of a possible 29,211 of teachers who are certified to teach secondary Core subjects (G.O.S.A, 2018) in Georgia consented to participate.

Due to the layers of school district personnel that distributed this study, the researcher has no way of knowing how many teachers, who met the sample criteria, had the option to take the survey. As a result, the researcher cannot provide a response rate because the specific schools or a total number of teachers that sent this survey remain unknown to the researcher.

Eight hundred and seven teachers consented to participate, where only 509 participants answered every survey item and met the inclusion criteria. Although every survey item required

a response, a technical issue with the Qualtrics website enabled numerous respondents to skip questions, which led to the removal of incomplete responses.

Demographics. Table 7 shows the teacher characteristics of the respondents who participated in the present study. The majority (76%) of the respondents were female, earned master's degrees (67%), and have more than 11 years (65%) of teaching experience.

Table 7

Teacher Characteristics

Characteristic	Frequency (n)	Percent (%)	(N = 509)
Gender			
Male	117	23	
Female	387	76	
Prefer not to say	5	1	
Educational Degree			
Bachelors	131	26	
Masters	340	67	
Doctoral	38	7	
Years of Teaching Experience			
1-2 years	22	4	
3-5 years	65	13	
6-10 years	91	18	
11-15 years	110	22	
16-20 years	88	17	
More than 20 years	133	26	
Schooling Level			
Middle School	276	54	
High School	233	46	
EdTech Knowledge			
No Credits or Degree	315	62	
Earned Few Credits	165	32	
Earned EdTech Degree	29	6	

Respondents answered questions about their overall level of technology integration in the demographics section of the survey. Teachers self-reporting of technology integration

implementation overall showed evidence of consistency and correlation with their summative answers in the survey used to determine teachers' ICT proficiency.

Summary of the Results

Summary of Principal Components Analysis. A principal components analysis was run on 29 Likert-scale statements (see Appendix G, Table G1). The PCA revealed three components that had eigenvalues greater than one and which explained 40.5%, 10.1% and 5.4% of the total variance, respectively. Therefore, a three-component solution met the interpretability criterion, and all three components were retained.

Summary of Multiple Linear Regression. A multiple linear regression (MLR) was run to determine what factors, if any, had a statistically significant effect on teachers' ICT proficiency. Teachers' ICT attitude, teachers' perception of school culture, teachers' reported hours of ICT-related professional development, earned credits in Educational Technology courses, and level of technology integration in the classroom had a statistically significant effect on teachers' ICT proficiency in the classroom. The multiple regression model was statistically significant for ICT Proficiency, $F(12, 496) = 19.074$, $p < .001$, adj. $R^2 = .30$. Age, gender, education, years of experience, schooling level taught, core subject taught, and level of course taught all had no statistical significance on teachers' ICT proficiency in the classroom.

Summary of Kruskal-Wallis H Test. A Kruskal-Wallis H test was run to determine if there are statistically significant differences between three groups of school-level SES and teachers' ICT proficiency. The results showed no significant differences between the teachers' ICT proficiency and the school-level SES in which they teach.

Detailed Analysis

Principal Components Analysis. An exploratory factor analysis was conducted using principal components analysis to investigate whether teacher's ICT proficiency, teachers' attitude towards ICT, and teachers' perception of school culture could be used as observed variables in this analysis. Principal components analysis (PCA) is a variable-reduction technique that shares many similarities to exploratory factor analysis (Costello & Osborne, 2005; Jolliffe, 2011). A PCA was run on 29 Likert-scale statements (see Appendix G, Table G1). Given the presence of many strong correlations between these items greater than .30, (see Appendix G, Tables G2 & G3), factor analysis was appropriate for these data (Pallant, 2010).

Further, additional measures, that supported a factor analysis of these items, were used to detect sampling adequacy: (1) the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the overall data set; (2) the KMO measure for each individual variable; and (3) Bartlett's test of sphericity (Pallant, 2010). The KMO measure is used as an index of whether there are linear relationships between the variables and thus whether it is appropriate to run a PCA on the current data set (Taherdoost, Sahibuddin, & Jalaliyoon, 2014). The overall KMO measure is 0.961, which is very good or "marvelous" based on the established meaning of KMO measures (Beavers et al., 2013). Kaiser-Meyer-Olkin measures for individual variables are greater than 0.6, so sampling is adequate.

Bartlett's Test of Sphericity is used to determine if there are any correlations between any of the variables because if there are no correlations between variables, reduction of variables cannot happen which would make the PCA irrelevant (Pallant, 2010). Bartlett's Test of Sphericity was statistically significant, χ^2 (406) = 8306.48, $p < .0005$, indicating that the data was likely factorizable.

The PCA revealed three components that had eigenvalues greater than one and which explained 40.5%, 10.1% and 5.4% of the total variance, respectively. Visual inspection of the scree plot (see Appendix G, Figure G1) indicated that three components should be retained (Cattell, 1966; Raîche, Walls, Magis, Riopel, & Blais, 2013). Also, a three-component solution met the interpretability criterion, and all three components were retained.

The three-component solution explained 56% of the total variance. A Varimax orthogonal rotation was used to support interpretability. The rotated solution exhibited 'simple structure' (Kline, 2014; Thurstone, 1947). The understanding of the data was consistent with the attributes the questionnaire was designed to measure with strong loadings of teacher's ICT proficiency items on Component 1, teacher's perception of school culture items on Component 2, and teacher's attitude toward ICT on Component 3. Component loadings and commonalities of the rotated solution are presented in Appendix G, Table G4.

Research Question 1

What effect does teachers' perception of school culture have on teachers' ICT proficiency in the classroom?

Teachers' perception of school culture had a statistically significant effect on teachers' ICT proficiency in the classroom. A multiple linear regression (MLR) was used to assess the relationship between the continuous dependent variable (Teachers' ICT proficiency) and the independent variable, teachers' perception of school culture.

Research Question 2

What effect does teachers' characteristics have on teachers' ICT proficiency in the classroom?

Teachers' attitude towards ICT, teachers' hours spent in professional development, and teachers' earned credits in educational technology courses had a statistically significant effect on teachers' ICT proficiency in the classroom. A multiple linear regression (MLR) was used to assess the relationship between the continuous dependent variable (Teachers' ICT proficiency) and 11 independent variables, namely, age, gender, education, years of experience, schooling level taught, core subject taught, level of course taught, teachers' ICT attitude, teachers' reported hours of ICT-related professional development, earned credits in Educational Technology courses, and level of technology integration. Eight assumptions were considered that relate to the classification of the dependent and all independent variables, and how well the data fits the multiple regression model when conducting a multiple regression (P. Cohen, West, & Aiken, 2014).

Assumptions. Before conducting an MLR analysis, it is appropriate to conduct assumptions to make sure that the data can be analyzed using the selected tests. To begin the analysis, a set of assumptions were validated. An MLR requires the dependent variable to be measured at the continuous level and independent variables to be either continuous or nominal (P. Cohen et al., 2014). For this study, the dependent variable (Teachers' ICT proficiency mean) is measured as a continuous variable, and the independent variables were a mixture of continuous and nominal variables. An MLR requires an independence of observations, which can be checked using the Durbin-Watson statistic, which was run as part of the multiple regression procedure (Draper & Smith, 2014; Fox, 1991). There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.868 (see Appendix H, Table H1). The Durbin-Watson statistic can range from 0 to 4, but a value of approximately 2 indicates that there is no correlation between residuals (Fox, 1991).

A linear relationship must exist between the dependent variable and each independent variable, and the dependent variable and the independent variables collectively. The assumption of linearity in a multiple regression needs to be tested to establish if a linear relationship exists between the dependent variable and each independent variable, which can be achieved using partial regression plots between each independent variable and the dependent variable (Fox, 2015). There was linearity as assessed by partial regression plots (see Appendix H, Figure H1 through H12). The assumption of linearity must also be tested to establish if a linear relationship exists between the dependent and independent variables collectively, which can be achieved by plotting a scatterplot of the studentized residuals against the predicted values (Fox, 2015). There was linearity as assessed by a plot of studentized residuals against the predicted values (see Appendix H, Figure H13).

The data needs to show homoscedasticity of residuals or equal error variances. Homoscedasticity assumes that the residuals are equal for all values of the predicted dependent variable, which can also be checked using a plot of studentized residuals against the unstandardized predicted values (Draper & Smith, 2014). There was homoscedasticity, as assessed by visual inspection of the plot of studentized residuals versus unstandardized predicted values (see Appendix H, Figure H13).

The data must not show multicollinearity. Multicollinearity occurs when two or more independent variables that are highly correlated with each other, can be checked by inspecting the correlation coefficients and Tolerance or VIF values (P. Cohen et al., 2014; Draper & Smith, 2014; Hair, Black, Babin, & Anderson, 2014). There was no evidence of multicollinearity, as none of the independent variables have correlations greater than 0.7 and all the tolerance values are greater than 0.1 (see Appendix H, Table H3).

The data must not have any significant outliers, leverage or influential points. Identifying unusual points is necessary because they can have a very negative effect on the regression equation and reduce the statistical significance of the analysis results (Hair et al., 2014). There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1.

The residuals need to be normally distributed. Determination of statistical significance requires the errors in prediction (residuals) be normally distributed and can be checked using a histogram with a superimposed normal curve and a P-P Plot (Fox, 2015; Hair et al., 2014). The assumption of normality was met, as assessed by a histogram with a superimposed normal curve and a P-P Plot (see Appendix H, Figure H14 & H15). The data met all of the assumptions and the results of the MLR analysis is discussed in the following section.

Analysis. The multiple regression model of teacher's ICT proficiency was statistically significant, $F(12, 496) = 19.074$, $p < .001$, adj. $R^2 = .30$. R^2 for the overall model was 31.6% with an adjusted R^2 of approximately 30%, a small size effect (J. Cohen, 1988) (see Appendix H, Table H1). Teachers' ICT attitude, teachers' perception of school culture, teachers' reported hours of ICT-related professional development, earned credits in Educational Technology courses, and level of technology integration in the classroom had a statistically significant effect on teachers' ICT proficiency in the classroom, $F(12, 496) = 19.074$, $p < .05$ (see Appendix H, Table H2). Regression coefficients and standard errors can be found in Table 8.

Table 8

Summary of Multiple Regression Analysis - Overall

Variable	*B*	SE_B	β
Intercept	.770	.165	
Teacher's Attitude Toward ICT (ICT_ATT)	.185	.057	.139*
Teacher's Perception of School Culture (SCP)	.300	.057	.223*
Teacher's Hours of Professional Development	.055	.020	.109*
Teacher Credits Earned in EdTech Courses	.111	.038	.112*
Overall Level of Technology Integration	.133	.020	.268*
Age Range	-.037	.027	-.069
Gender	-.059	.047	-.047
Education	.055	.045	.051
Experience	-.030	.021	-.075
Schooling Level Taught	-.006	.046	-.005
Core Subject Taught	.018	.019	.036
Course Level Taught	.025	.015	.065

Note: * $p < .05$; B = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient.

Teachers' Attitude Variable. A multiple linear regression analysis was run to determine if all four survey items that were used to assess teachers' attitude towards ICT proficiency can predict teachers' ICT proficiency in the classroom. Almost all attitudinal survey items had a significant impact on teachers' ICT proficiency (see Table 9).

Table 9

Teachers' ICT Attitude Regression Analysis Summary

Variable	*B*	SE_B	β
Constant			
I use IT resources to develop teaching materials or class activities that make me more for effective in teaching.	.965	.109	.408*
I find that using technology can improve students' learning efficiency.	.383	.037	.321*
If I had enough time, I would increase the frequency of using technology.	.310	.041	-.135*
I hope I can get more training on how to design and implement technology-integrated teaching.	-.116	.036	-.063

Note: * p < .01; B = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient.

Teachers' Perception of School Culture Variable. A multiple linear regression analysis was run to determine if all seven survey items that were used to assess teachers' perception of school culture can predict teachers' ICT proficiency in the classroom (see Table 10).

Table 10

Teachers' Perception of School Culture Regression Analysis Summary

Variable	*B*	SE_B	β
Constant	.701	.117	
The school's computer equipment (software, hardware) can meet the needs of my technology integration goals.	-.019	.035	-.024
My efforts in integrating technology into teaching are encouraged and appreciated by school administrators.	-.090	.045	-.095**
Technology integration is a school initiative that my school tries to support and develop.	.030	.046	.032
My colleagues and I always discuss technology integration in department meetings.	.035	.036	.041

I collaborate with technology professionals to help me integrate technology into my lessons and class activities.	.138	.034	.175*
I can find people to help me solve problems I have associate with technology integration.	.059	.044	.061
I am willing to assist and answer my colleagues' questions about integrating technology into their lessons.	.472	.040	.468*

Note: * $p < .001$; ** $p < .05$; B = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient.

Research Question 3

What effect does school SES have on teacher's ICT proficiency in the classroom?

School-level SES had no statistically significant effect on teachers' ICT proficiency in the classroom. The Kruskal-Wallis H test is a nonparametric test that was used to determine if there are statistically significant differences between teachers in school-level low SES, middle SES, and high SES schools and teachers' ICT proficiency. Respondents were divided into three classifications of socioeconomic status based on their school district's reported percentage of students in free and reduced-price meal programs (G.O.S.A, 2017b). Districts that had 66.1 to 100%, 33.1 to 66%, and 0 to 33% participation in the free and reduced-price meal program were classified as low SES, middle SES, and high SES respectively (Zamudio, 2004). Four assumptions, related to the study design and the nature of the data, must be met when running a Kruskal-Wallis H test.

Assumptions. A Kruskal-Wallis H test requires the dependent variable to be measured at either the continuous or ordinal level, while the independent variable consists of three or more categorical and independent groups (Kruskal & Wallis, 1952). The dependent variable, teachers' ICT proficiency, was originally ordinal but later converted to the continuous form. The independent variable, school-level SES, are independent categories of low, middle, and high.

The data must demonstrate an independence of observations, where no relationship between the observations in each group of teachers at various school-level SES exists (Kruskal & Wallis, 1952). Each respondent accessed the online survey using a link that was specific to their school district ensuring that no participant could be in more than one group of school-level SES.

For the last assumption, the researcher determined if the distribution of scores for each school-level SES (low, middle, and high) have the same shape or a different shape to interpret the results of the Kruskal-Wallis H test (Dunn, 1964; Kruskal & Wallis, 1952). Boxplots were created to visually inspect the distributions to determine whether the distributions for teachers' ICT proficiency for the different levels of school-level SES groups are similar in shape. If there is a statistically significant difference in the medians (boxplots) of the groups of the independent variable, the shape of the distributions in each group will be similar to each other and is determined by the researcher's judgment (Vargha & Delaney, 1998). Distributions of teachers' ICT proficiency means were similar for all groups, as assessed by visual inspection of a boxplot and can be seen in Figure 5.

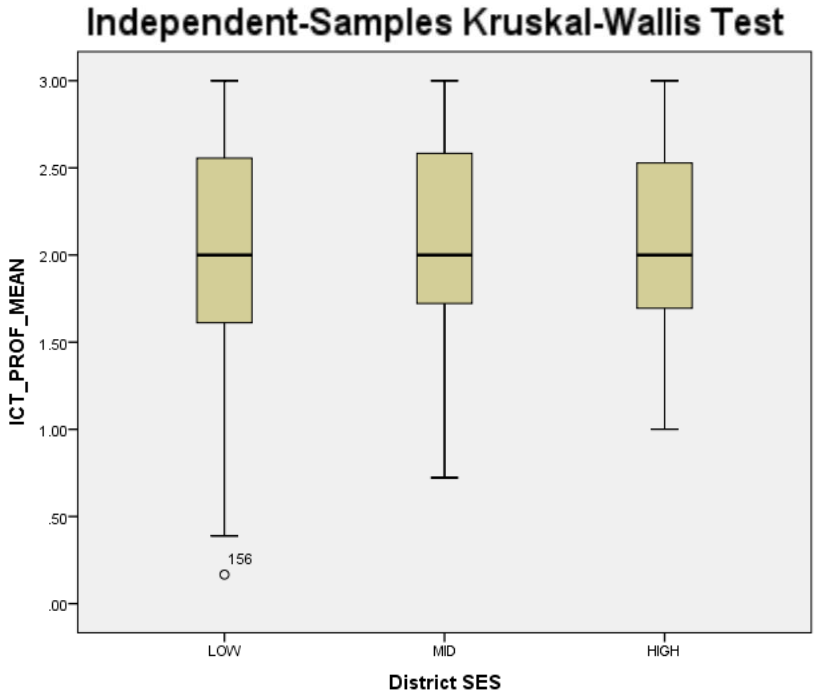

Figure 5. Similarly-shaped distributions for all school-level SES groups

All of the assumptions have been met, and now the Kruskal-Wallis H analysis is discussed in the next section.

Analysis. A Kruskal-Wallis H test was run to determine if there were differences teachers' ICT proficiency between three groups of participants in different school-level SES categories: "low," "mid," and "high" school-level SES groups. Distributions of teachers' ICT proficiency were similar for all groups, as assessed by visual inspection of the previously discussed boxplot. Median teachers' ICT proficiency scores remained constant from low (*Mdn* = 2.00), to mid (*Mdn* = 2.00), to high (*Mdn* = 2.00) school-level of SES, but the similarities were not statistically significant, $\chi^2(2) = .082$, $p = .960$ (see Table 11).

Table 11

Teachers' ICT Proficiency Median Values Report

District SES	Median	N
Low	2.00	275
Mid	2.00	171
High	2.00	63
Total	2.00	509

The results of the Kruskal-Wallis H test was not statistically significant; therefore there is no need to follow up with a post hoc test (Sheskin, 2011).

Chapter 4 Summary

The research questions in this study were used to determine whether the effect school-level SES and teachers' perception of school culture has on teachers' ICT proficiency in the classroom. A standard multiple regression analysis was conducted to identify which of the 12 independent variables significantly influenced teachers' ICT proficiency. The regression analysis showed that there was enough evidence to reject the null hypothesis for five out of 12 independent variables for the first research question. A Kruskal-Wallis H test determined if there were statistically significant differences between teachers in school-level low SES, middle SES, and high SES schools and teachers' ICT proficiency. Results showed there was no statistical significance between groups and subsequently no reason to follow up with post hoc analysis.

CHAPTER 5:

DISCUSSION

This study aimed to get an understanding of how middle and high school teachers in Georgia incorporate technology into their classrooms. This study sought to describe teachers' technology integration efforts by examining key factors that either promote or hinder teachers' proficiency with information and communication technology (ICT) in their classrooms. Additionally, teachers' characteristics were studied to see what, if any, effect they have on teachers' proficiency of ICT in the classroom. Further, the study expanded to test whether identified factors had an impact on technology integration in the classrooms of secondary core subject teachers.

The study built a case for studying technology integration in Georgia classrooms due to known inconsistencies in implementation among schools of varying socioeconomic status. This study, as discussed in Chapter 1, would bring awareness of teachers' perception of school culture to school administrators that may better understand the barriers to effective ICT proficiency and address technology integration issues that may be unique to their school's student population and community. Additionally, the results of this study could help inform teacher education programs for pre-service teachers and professional development training for in-service teachers.

The review of related literature, which was built on three research questions, aimed to discover factors that could influence teachers' proficiency of ICT in the classroom. The five main themes that were explored were: (a) ICT, (b) perception, (c) culture, (d) usage, and (e) socioeconomic status. The research questions were designed to collect quantitative data, a

process that was discussed in Chapter 3 and the findings were presented in Chapter 4. Chapter 5 focuses on the results, implications, limitations, and recommendations for further research.

Summary of Results

Research Question 1. To examine the effect of teachers' perception of school culture on teachers' ICT proficiency in the classroom, this study used the Teacher's Integration Usage Survey (TIUS) which included Likert-scale items that determined teachers' ICT proficiency score and teachers' perception of school culture score for analysis. Elements of school culture such as school policy, professional development, administrative support, peer support, and technical support were investigated to determine if a linear relationship existed between these factors and teachers' perception of school culture score. Results showed that teachers' perception of school culture has a statistically significant impact on teachers' ICT proficiency in the classroom.

Research Question 2. The TIUS was used to determine the effect teachers' characteristics have on teachers' ICT proficiency in the classroom. Teacher characteristics such as age, gender, education, years of experience, schooling level taught, core subject taught, level of course taught, teachers' ICT attitude, teachers' reported hours of ICT-related professional development, earned credits in Educational Technology courses, and level of technology integration were investigated to determine if a linear relationship existed between each of them and teachers' ICT proficiency score. Results showed that teachers' attitude towards ICT, teachers' hours spent in professional development, and teachers' earned credits in educational technology courses had a statistically significant effect on teachers' ICT proficiency in the classroom.

Research Question 3. To examine the effect of school-level SES on teachers' ICT proficiency in the classroom, this study used the TIUS and analyzed teachers' ICT proficiency score to determine if there was a statistically significant difference between respondents who worked in schools that were classified by school-level SES of low, middle, and high. Results showed that there was no statistical significance between groups based on school-level socioeconomic status.

Discussion of Results

Teacher Characteristics and Predicting ICT Proficiency. Teacher characteristics variables include age range, gender, years of teaching, the highest level of education, level of schooling taught, and background knowledge of educational technology. Teachers' gender and years of teaching are factors which potentially influence the use of computers. For the results of this study, respondents' gender was shown to have no statistical significance on teachers' ICT proficiency in the classroom though male teachers have been known to use ICT in the classroom with greater frequency than female teachers (Chiero, 1997; Mahdi & Al-Dera, 2013). Teachers' age range and years of teaching experience were shown to have no statistical significance on teachers' ICT proficiency which is supported by Mahdi and Al-Dera (2013) and contested by Inan and Lowther (2010).

Although Becker and Ravitz (1999) found that teachers at different schooling level were more likely to incorporate ICT activities than the other, this study showed no statistically significant impact of schooling level on teachers' proficiency of ICT in the classroom, which is supported by Hsu (2013). Lastly, teachers who have earned some educational technology course credits or have obtained a degree in educational technology is a teacher characteristic that was found to have a statistically significant effect on teachers' ICT proficiency and builds upon Hsu's

(2010) study of teacher's integration of ICT in the classroom. Teachers' background knowledge of educational technology concepts had a positive linear relationship with teachers' ICT proficiency in the classroom.

Some of the results for this variable were unexpected. Gender was shown not to have any statistical significance on teachers' ICT proficiency although male teachers have routinely incorporated ICT in the classroom more frequently than female teachers (Chiero, 1997; Mahdi & Al-Dera, 2013). Norris, Sullivan, Poirot, and Soloway (2003) found that gender is a variable that cannot consistently predict ICT proficiency, which is supported by this study. Inan and Lowther (2010) found that teachers years of experience has an impact on teachers' ICT proficiency in the classroom, yet there was no statistically significant relationship found in this study. This result was surprising as newer teachers would be challenged to fully incorporate ICT in the classroom as most of their time would be spent getting familiar with the school's curriculum and classroom management (Buabeng-Andoh, 2012). However, Granger, Morbey, Lotherington, Owston, and Wideman (2002) found that teachers' years of experience is not a reliable factor of ICT proficiency, and the results for this research study supports their findings.

Teacher Attitude Towards ICT Proficiency. Teachers' attitude or perceptions are an important factor that can influence teachers' proficiency of ICT in the classroom. Teachers' proficiency of ICT in teaching and learning strongly depends on the attitudes of the teachers (Gebremedhin & Fenta, 2015). Teachers' perceptions play a crucial role in teaching since their perceptions not only influence their actions and pedagogical decisions but also provide insight into various aspects of education (Tournaki & Lyublinskaya, 2014). For this study, teachers' attitude toward ICT proficiency overall was positive and predictive of teachers' ICT proficiency.

Teachers' belief in the usefulness of ICT in the classroom can provide insights into their attitude towards ICT proficiency. Teachers are not likely to deliver innovative use of ICT in their classrooms if they have negative perceptions associated with technology integration (Hutchison & Reinking, 2011). The teachers in this study did not appear to have a negative attitude toward ICT proficiency. Results showed that teachers who were more likely to believe that their teaching can be more effective with the use of IT resources had higher scores of ICT proficiency. It seems that the more teachers use ICT to develop teaching materials or class activities, they will do a better job in improving their teaching methods.

Teachers need to believe that technology will benefit their students for teachers to improve their use of ICT in the classroom. Teachers who do not believe that technology can be useful in the classroom, will probably not use ICT regardless of their skill level (Ropp, 1999). The teachers in this study seemed to believe that ICT can improve students' learning efficiency. Results showed that teachers who are more likely to believe that ICT can improve students' learning efficiency demonstrated a higher ICT proficiency score. The results support the idea that perceptions and beliefs about ICT and teaching and learning can influence a teacher's approach to educating students (Ertmer, 2005; Windschitl & Sahl, 2002).

Teachers' incorporate ICT into their classrooms with varying frequencies. As numerous variables can impact the frequency of teachers' ICT proficiency, the results of this study showed an encouraging trend. The multiple regression model predicts that the higher the desire to increase the frequency of integrating IT, the lower teachers' ICT proficiency is. Teachers with high ICT proficiency scores may feel comfortable with their level of usage whereas teachers with low ICT proficiency scores are more likely to want to increase the frequency of their usage.

Teachers' Perception of School Culture is Important. Schein (2010) maintained that any school's culture has three conceptual levels of organization: (1) the artifact level, (2) the level of espoused beliefs and values, and (3) the level of basic underlying assumptions. The results of this study are discussed in the next section with respect to Schein's theory of organizational culture.

Technological infrastructure, professional development, and ICT availability are examples of elements of school culture that can influence teachers' practice and be classified as artifacts. Access to ICT and training on how to best use the tools in the classroom is a school culture-related factor that can influence teachers' proficiency of ICT in the classroom (Hsu & Kuan, 2013).

Artifacts such as ICT equipment and internet access provided by the school is a crucial factor in teacher ICT proficiency. Tondeur et al. (2008) found that computers must be available to teachers, have internet connections available for teachers for lesson planning and teaching, and computers with internet access should be available in classrooms to enhance students' learning. Valadez and Duran (2007) studied teachers use of ICT proficiency among schools of varying SES and attributed the difference in implementation style to a lack of resources as a result of social consequences such as poverty and inequality.

The majority of respondents (98.8%) indicated the presence of a projector screen, interactive whiteboard, or a document camera was available to them in their classrooms. Additionally, 99.4% indicated that their school has a wireless network, and 87.8% of respondents claimed that computers and networks are stable and operational when they are teaching. These results would suggest that most teachers who participated in this study are equipped with the technological infrastructure needed to incorporate ICT into their classrooms.

Teachers' training and professional development is also a key factor for ICT proficiency in the classroom. Wood and Howley (2012) studied the difference in ICT proficiency among schools of varying SES status and attributed the differences to disparities such as training opportunities and the availability of computer resources. For this study, teachers' participation in ICT-related professional development was statistically significant and showed a positive linear relationship to teachers' proficiency of ICT in the classroom. This result would indicate that the more time teachers receive professional development training, the more likely their ICT proficiency scores will increase. Teachers' access to ICT resources communicates a cultural meaning that can influence teaching strategies. The results showed that while 69.2% of respondents claim to have access to a laptop computer provided by their district, only 13.9% indicated that they had a laptop to use that was not issued by their school district. The results show that while the vast majority of respondents have access to some form of ICT resources, access is not consistent and could impact teachers' proficiency of ICT in the classroom.

Espoused belief and values suggest a level of organizational culture where people in an organization share values or beliefs that reflect in their work. School philosophy and technology integration goals are elements of school culture that have influenced teachers' practice and can be a result of espoused beliefs and values. Teachers were asked if they were aware of an official school philosophy or stated goals regarding the use of ICT in the classroom. Results showed that only 47.9% claimed to be aware of a holistic plan or a process for teachers to incorporate ICT into their classrooms. This result would suggest that either schools of teachers that participated in this study do not have stated technology integration goals, or administrators may need to change the way those goals are communicated to the faculty. Teachers in schools with non-

existent or unclear technology integration goals cannot be expected to have increased levels of ICT proficiency.

Schein's (1992) third level of organizational culture is understood by exploring the underlying assumptions in an organization or school. Work culture, peer collaborations, and support are underlying assumptions which include teachers' perception of how supportive the school organization is which are ingrained in the school's culture and influential on teachers' pedagogical decisions. Teacher beliefs and perceptions regarding school support (Hew & Brush, 2007) and peer support (Reid, 2012; Vanderlinde et al., 2012) can influence teachers' ICT proficiency in the classroom (Hsu & Kuan, 2013). The effect teachers' perception of school culture has on teachers' ICT proficiency is the main focus of the first research question though teachers' characteristics, teachers' attitudes, and school structure can have indirect effects.

Teachers' perceptions of school culture can influence a teacher's use of ICT based on their perceptions of technical support, peer support, and administrative support (Schein, 2010). The results of this study showed that teachers' perception of school culture has an overall positive and statistically significant effect on teachers' ICT proficiency in the classroom. Teachers were asked if their technology integration efforts were encouraged and appreciated by school administrators. The results showed that teachers who felt highly encouraged and appreciated by school administration were more likely to have a low ICT proficiency score. This result would suggest that teachers who are not being challenged to improve their ICT proficiency in the classroom, may not be motivated to use more innovative practices.

Teachers were asked about their collaboration with technology professions to improve their use of ICT in the classroom. Results showed that teachers who collaborate with technology professions often are more likely to have high levels of ICT proficiency in the classroom. Lastly,

teachers were asked about their willingness to help their colleagues with strategies to incorporate ICT into their lessons. Results showed that teachers who are most comfortable with assisting their peers are more likely to have a high ICT proficiency score.

The results were as expected and builds upon several research studies that discuss the influence of school culture in terms of how teachers perceive workplace support, the impact of school educational climate on teacher expectations, and how school-related factors can influence teachers' perception of ICT proficiency in the classroom (Auwarter & Aruguete, 2008; Perrotta, 2013; Tsouloupas et al., 2014). Teachers' perception of school culture can predict teachers' proficiency of ICT in the classroom.

Socioeconomic Status Was Not Impactful. School socioeconomic composition is a type of school-related factor that can be difficult to distinguish from school culture, as school culture, which includes administration, teacher, and student behavior, can change based on a school's socioeconomic composition (Agirdag, Van Houtte, & Van Avermaet, 2011; Ferrão, Costa, & Matos, 2017; Moore et al., 2017). There was no statistical significance among school-level SES groups for this study.

Socioeconomic status as a factor of educational inequality can be defined in various ways. Many studies use a combination of parental education, occupation and income (Perry & McConney, 2010), others include parental expectations (Q. Chen, Kong, Gao, & Mo, 2018), and many simply use whether the student gets a free or reduced-price lunch (Harwell & LeBeau, 2010). Defining school SES using parental education, occupation, the family's cultural capital, and financial resources as a measure would be more complicated, though some would argue that it would be more precise than using simpler measures such as parental postal address or participation in a subsidized school meals program (Perry & McConney, 2010). Free and

reduced lunch (FRL) participation was used in this study and may be related to the results of finding no statistical significance between schools of varying socioeconomic status.

Free and reduced lunch participation was used to define school-level SES because it is a common practice and FRL participation information is readily available from online public school records. The use of online public information allowed the researcher to obtain useful information without having to ask questions about occupation and education of students or their parents. Despite the ease of using public information associated with FRL, the use of FRL participation as a way to classify schools based on SES can be complicated and lead to problematic results.

Sirin (2005) and Hauser (1994) strongly urge against the use of FRL participation to define school socioeconomic status. Sirin (2005) contends that it would be difficult to differentiate the effect of student participation in FRL and the effect of school SES on teacher practice. Hauser (1994) argues that the variables used to determine FRL eligibility is too crude to provide a clear understanding of the financial background of a student. Additionally, results of defining school SES based on FRL participation can be inconsistent since parents of high school students are less likely than the parents of elementary school students to file FRL applications (McLoyd, 1998). Depending on how it's defined, SES can be an influencing factor on the use of ICT in the classroom.

The result of school-level SES having no effect was unexpected given several research studies that did find statistical significance. Valadez and Duran (2007), Warschauer et al. (2004), and Wood and Howley (2012) all found that school SES characteristics are a determining factor in the way that teachers used ICT in the classroom. Valadez (2007) used the ratio of students to computers to define school SES, where high SES schools were schools that were more likely to

have low student to computer ratios. Warschauer et al. (2004) determined school SES based on the SES of the neighborhood in which the schools resided though it is not known how they distinguished between a low SES and a high SES neighborhood. Wood and Howley (2012) conducted a statewide study that compared school districts using location-based characteristics such as rural (high poverty), rural (low poverty), urban, major urban, suburban, and suburban affluent. The results of these studies and their classification of school SES supports the idea that using FRL participation may not be the best way to define school socioeconomic status.

The locales of the school districts that were represented in this study may have contributed to school-level SES having no effect on teacher's ICT proficiency in the classroom. The school districts represented a mixture of locales that have been classified as being located in a *city*, *town*, *suburb*, and *rural* area based on population numbers in the state of Georgia (G.O.S.A, 2017a). Overall, out of the total number of school districts in the state, approximately 7% are classified as being located in a *city*, approximately 21% are classified as being located in a *town*, approximately 8% are classified as being located in a *suburb*, and approximately 64% are classified as being located in a *rural* area (G.O.S.A, 2017a). Based on this information it is apparent that Georgia is primarily a rural state.

The relationship between school locale and educational outcomes are not the same for all students who live in different regions. Sirin (2005) found that the relation between SES and academic achievement is stronger for students in suburban schools than for students in rural or urban schools. For this study, approximately 5% of participating school districts are classified as being located in a *city*, 26% are classified as being located in a *town*, 5% are classified as being located in a *suburb*, and approximately 63% are classified as being located in a *rural* area. Given that most of the school districts that participated in this study are located in rural areas

may have contributed to there being no effect of school SES on teachers' ICT proficiency in the classroom.

Limitations of the Study

The scope of this study limited the number of questions posed in the research study as a way to keep the study manageable. The number of participants in this study was slightly reduced because not all teachers finished the entire survey. Additionally, this study was limited by the number of school districts that agreed to participate. There are currently 180 school districts in the state of Georgia, and the researcher received participation from only 38 or 21% of the school districts in the state.

Additionally, due to policies in some districts, the researcher was not able to send the survey to each middle school and high school principal in approving districts. School district personnel often distributed the survey. The nature of this process prevented the researcher from knowing how many teachers, who met the sample criteria, had the option to take the survey. Therefore, it is not likely that the results can be generalized for the entire state of Georgia.

Next, the online survey would make data collection and management easy and reduce the likelihood of data entry errors. However, study participation may have been limited to those teachers that have easy and reliable access to the internet and feel comfortable utilizing a computer or cell phone to complete an online survey. Additionally, teachers reported on their use of ICT in the classroom which could have led to over-estimations in usage reporting.

School-level SES may not have been a factor in this study for two reasons. One, school socioeconomic status can be determined in numerous ways. School and neighborhood SES could be combined to represent a school's SES based on the neighborhood in which it resides, all individual students' SES can be aggregated to represent the school's SES, or more commonly

school SES can be measured by Title I status and percentage of students eligible for the National School Lunch Program (NSLP) (Cowan et al., 2012). Two, Tschannen-Moran and Woolfolk Hoy (2007) explained that school cultural factors related to the structural aspect of schools alone (e.g., socioeconomic status, classroom size, school size, student ethnicity, school location, level) are often not strongly predictive of teacher beliefs and perceptions. Therefore, this study considered two broad varieties of cultural factors: (1) school culture and (2) school structure which is based on school-level socioeconomic status.

Lastly, the participants in this study were limited to secondary teachers without the inclusion of primary teachers. Therefore, this study cannot be generalized for all K-12 teachers in the school districts from which participants were recruited. Additionally, most of the school districts in the state are rural similar to the districts that agreed to participate in the study.

Implication of the Results for Practice

The results on the influence of teacher characteristics were somewhat unexpected. Even though teachers' background in educational technology influenced teachers' ICT proficiency, age, gender, education, years of experience, schooling level, courses taught, and level of courses taught had no impact. This result questions whether teacher characteristics can successfully predict teachers' technology integration efforts in all circumstances.

The results of teacher attitude as a factor in technology integration were encouraging. Teachers had a positive view of technology integration, believed that using technology can improve students' learning efficiency, and those who struggle with ICT proficiency indicated that they would like to increase the frequency of using ICT in the classroom. Teachers who are not as skilled at technology integration, but would like to increase their frequency of use, may require more training or professional development to improve their skills.

Teachers' perception of school culture is a critical factor. The results showed that teachers with a positive perception of school culture were more likely to be better at technology integration. Teachers' technology integration efforts would improve if administrators encouraged and appreciated their staff's ICT proficiency, supported and developed a school initiative that is well-communicated, and encourage teacher and technology professional collaborations.

Recommendations for Further Research

This study revealed some opportunities for future studies. Some of the noted opportunities are based on addressing the limitations of the current study and others are aimed at expanding on the results that emerged from this study.

1. Some participant responses were not used because not all teachers finished the entire survey. Thus, it may be worthwhile to reduce the number of survey items or employ the use of a paper-based self-administered survey, which could increase completed surveys and reduce or eliminate internet access issues.
2. The current study was limited by the number of school districts that agreed to participate. Perhaps a future study that uses data collected from state departments of education or government agencies would eliminate this issue.
3. School-level SES, as determined by participation in free and reduced meal programs, was not found to be a factor in the current study. Perhaps conducting the study using a region that has more of a balance between school districts that can be classified as low SES and high SES, as well as urban areas and rural or suburban areas could lead to a statistically significant result.

4. Finally, the participants for this study were middle and high school teachers so future studies need to include primary teachers as well.

The apparent benefits of ICT knowledge and resources and access to those benefits remain challenged by perceptions of school culture. School culture can influence the decisions that surround teaching and learning and encompasses a school's norms, unwritten rules, traditions, and expectations of ICT proficiency in the classroom. The current study provides an opportunity to improve teachers' and students' digital competence. Educators need to become digitally fluent for the 21st century to teach the digital skills that are necessary for students entering the workforce or post-secondary institutions. Understanding technology integration in secondary Georgia schools, by analyzing influential factors is essential.

The goal of this study was to explore and understand the factors that influence teachers' ICT proficiency usage in the classroom. The influential factors include teachers' background knowledge in educational technology, teachers' attitude toward ICT proficiency, teachers' perception of school culture, teachers' number of hours of ICT-related professional development, and teachers' overall approach to using ICT in the classroom. Further, the study sought to ascertain whether school-level SES had any impact on teachers' ICT proficiency in the classroom. School-level SES was found not to have an impact on teachers' ICT proficiency in the classroom.

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APPENDICES

Appendix A: Recruitment Letter

Dear District Authorizing Personnel,

My name is Catrice Erika Mané and I am a fourth-year doctoral student at the University of Georgia (UGA) who has designed a study to measure teachers' perception about school culture as it pertains to their use of technology in the classroom under the direction of Dr. Robert Maribe Branch who chairs the Department of Career and Information Studies here at UGA. The focus of my study will be middle school and high school teachers from various school districts across the state of Georgia, and I would really appreciate the contribution of your school. The study consists of a simple, 15-minute online survey for teachers.

In return for participation, I will provide leaders in participating districts with a report of study results that offers information about teachers' perceptions of their school culture regarding their use of technology in the classroom. In this report, combined responses from your district and/or school will be compared to those of other schools like yours in Georgia.

If you are willing to participate, I ask that you please send the following link to your teachers: *Teachers' survey link*

Please note that the survey, which take only 15 minutes to complete, will be active from *October 1, 2018 to December 1, 2018*. Respondents will not be personally identified in any way. Individual responses will be kept strictly confidential. I will write about this study in terms of the combined information I have gathered for my dissertation. In addition, if you have questions, suggestions, or concerns about the study, please don't hesitate to contact me at Erika.Mane@uga.edu at any time.

Thank you very much in advance for your attention and your time. Additionally, I have attached my IRB approval letter to conduct this research on behalf of UGA to this email. I look forward to hearing from you.

Best regards,

C. Erika Mané
Graduate Teaching Assistant
Learning, Design, and Technology
Career and Information Studies Department
University of Georgia

Appendix B: Original Chinese Version of the Survey Instrument

中小學教師資訊科技融入教學自評表

Part I　教學背景（請以您所教學的「主科」為填答依據）

1. 你教學的對象為國小還是國中？在你主要教學科目中，上個學期教的是幾年級的課程？	□國小，上個學期主要是教 □低 □中 □高年級的課程。 □國中，上個學期主要是教 □國一 □國二 □國三的課程。
2. 你主要的教學領域/科目為何？	(　　)領域 (　　)學科
3. 你每個星期上多少堂主要學科專業領域的課?	(　　)堂課
4. 承上題，在你上學科科目時，使用電腦的比例為何?	以上個學期來看，每週平均(　　)堂課使用電腦
5. 承上題，你最常使用電腦教學的場所是以下何種？(請單選)	□普通教室 □視聽教室 □專科教室 □電腦教室 □其他
6. 承上題，上述的場所中，有幾台電腦是可連結到網路?	總共有(　　)台電腦，其中有(　　)台可連到網路
7. 你有多少年的教學經驗?	(　　)年

8. 你的性別為? □男　□女

	是	否	不知道
9. 在你的教室中有螢幕、單槍投影機等裝置，或者你很容易就可以取得這些裝置供教學使用嗎？	□	□	□
10. 你在教學時，電腦及網路是否都穩定可用、運作正常?	□	□	□
11. 你的學校是否有無線網路?	□	□	□
12. 你的學校有整體性的資訊科技融入教學規劃嗎?	□	□	□
13. 你是否有一台屬於你自己的筆記型電腦?　如果是，其是否為公發？ □是 □否	□	□	□
14. 你的學生平常是否能方便地使用電腦?　在學校能方便使用嗎？□是 □否	□	□	□

15. 你上個學年度中，大約花多少小時(包含寒暑假)在資訊科技與融入教學的專業發展上?（例如研習或進修專業課程）
□零小時　□少於四小時　□五~十小時　□十一~二十小時　□超過二十小時

16. 你有取得「教育科技」或「資訊融入教學」的學分或學位嗎? □修過___學分 □得過學位 □做過相關研究 □無

17. 你知道在你的學科有專門的教學軟體嗎？ □應用過，請舉例：_____ □沒用過 □不知道

18. 你的最高學歷為? □師專或專科 □學士 □40 學分班 □碩士 □博士 □其他：_____

19. 你有擔任過行政職務嗎? 有，擔任過□資訊組長、設備組長或資訊相關職位 □其他主任或____組長 □否

20. 承上題，你上個學期有擔任行政職位嗎? 有，上個學期擔任了□資訊相關職位 □其他主任或組長 □否

21. 你上個學期有擔任導師嗎？□是 □否。　如果有，是擔任_____年級的導師？

Part II　教師資訊融入教學面向				
請你依照以下五種程度，對自己在各個項目所列的技能及能力上進行自我評估：				
(1) 操作與概念	完全沒概念	常需別人幫忙	自己可完成	熟悉及專精
1.1 我有具備資訊科技相關的基礎知識和技能	1☐	2☐	3☐	4☐
1.2. 我會隨著資訊科技的演進，持續增進個人之資訊科技知識與技能	1☐	2☐	3☐	4☐
(2) 規劃及計劃學習環境及經驗				
2.1. 我會依據不同學生的學習程度因材施教，設計適當的資訊融入教學活動	1☐	2☐	3☐	4☐
2.2. 我會運用資訊融入教學的理論與研究，規劃學生學習的環境及歷程	1☐	2☐	3☐	4☐
2.3. 我會辨識並找到可以利用的資訊科技資源，並評估其運用在教學上的正確性或適當性	1☐	2☐	3☐	4☐
2.4. 於設計資訊融入教學時，我懂得如何選擇資源及規劃布置資訊教學環境	1☐	2☐	3☐	4☐
2.5. 於設計資訊融入教學時，我懂得如何選擇及規劃學生的學習策略及活動	1☐	2☐	3☐	4☐
(3) 教學、學習及課程				
3.1. 我會運用資訊科技使學生達到學科領域能力指標，以及六大議題之資訊教育指標	1☐	2☐	3☐	4☐
3.2. 我會運用資訊科技來支援以學生為中心之教學，滿足不同之學習需求	1☐	2☐	3☐	4☐
3.3. 我會運用資訊科技來促進學生創造力與高層次的學習，包括分析、判斷、評估等能力	1☐	2☐	3☐	4☐
3.4. 我會在資訊融入教學環境中，管理及經營學生的學習活動，如引導學生運用科技或進行合作學習等	1☐	2☐	3☐	4☐
(4) 評量和評鑑				
4.1. 我會應用資訊科技對學生於學科（領域）的學習進行多元評量	1☐	2☐	3☐	4☐
4.2. 我會運用資訊科技蒐集、分析、呈現學習成果、並與他人溝通，以改進教學成效	1☐	2☐	3☐	4☐
4.3. 我會應用多元的評鑑方法來判斷學生是否適當地運用資訊科技進行學習	1☐	2☐	3☐	4☐
(5) 生產力與專業成長				
5.1. 我會利用資訊科技資源持續進行自我之專業發展及終身學習	1☐	2☐	3☐	4☐
5.2. 我會在教學專業上不斷地反省與評估，以能更精確地瞭解如何利用科技提升學生學習	1☐	2☐	3☐	4☐
5.3. 我會運用資訊科技來增進工作效率	1☐	2☐	3☐	4☐
5.4. 我會運用資訊科技與同事、家長和社區溝通、合作以豐富學生的學習	1☐	2☐	3☐	4☐

(6) 社會、倫理、法律、人類等議題	完全沒概念	常需別人幫忙	自己可完成	熟悉及專精
6.1. 我會以身作則並教導學生有關運用資訊科技的法律和倫理規範	1☐	2☐	3☐	4☐
6.2. 我會運用資訊科技資源來幫助各種背景、特性、能力的學生	1☐	2☐	3☐	4☐
6.3. 選用各種資訊科技資源時，會顧及社會正義，避免對社會上弱勢者造成衝擊	1☐	2☐	3☐	4☐
6.4. 我會促進、倡導安全而健康的使用資訊科技資源的使用方式	1☐	2☐	3☐	4☐
6.5. 我會協助每位學生都有均等的機會去使用資訊科技資源	1☐	2☐	3☐	4☐

Part III 教師與環境

這個部分會詢問您，有關您對自己的資訊科技教學及身邊教學環境的看法：	非常不同意	不同意	同意	非常同意
1. 運用資訊科技來發展教材或經營班級，讓我在教學工作上更有效率	1☐	2☐	3☐	4☐
2. 我發現使用資訊科技可以提升學生學習成效	1☐	2☐	3☐	4☐
3. 如果我有時間，我會希望增加資訊融入教學的比例	1☐	2☐	3☐	4☐
4. 只有在傳統教學法無法達到目的時，我才會考慮使用資訊科技來教學	1☐	2☐	3☐	4☐
5. 我希望在如何設計及執行資訊科技融入教學上，獲得更多的訓練	1☐	2☐	3☐	4☐
6. 學校的資訊設備（軟、硬體）能夠滿足我資訊融入教學的需要	1☐	2☐	3☐	4☐
7. 我在資訊融入教學上的努力受到校方的鼓勵與讚賞	1☐	2☐	3☐	4☐
8. 資訊融入教學是我們學校希望努力推展的重點項目	1☐	2☐	3☐	4☐
9. 我和同科的老師經常在教學會議中討論資訊融入教學	1☐	2☐	3☐	4☐
10. 我會與資訊老師合作來設計及完成我的資訊融入教學單元	1☐	2☐	3☐	4☐
11. 我能夠找到人來協助我解決資訊科技方面的問題	1☐	2☐	3☐	4☐
12. 我樂意協助及回答我的同事有關資訊融入教學上的問題	1☐	2☐	3☐	4☐

Part IV 教師應用資訊科技融入教學狀況

(1) 資訊科技的應用 （請以上個學期的情況回答）	未曾有過	偶爾一、兩次	有時如此	經常如此
1. 使用電腦來製作講義、教材及考卷	1☐	2☐	3☐	4☐
2. 利用簡報處理軟體做上課教學的展示	1☐	2☐	3☐	4☐
3. 使用網路或資訊科技來收集一些上課要提供給學生的補充資料	1☐	2☐	3☐	4☐
4. 花時間篩選出符合教學目標、適合學生使用的教學媒體或資訊科技	1☐	2☐	3☐	4☐
5. 依據九年一貫的能力指標，自己設計融入課程的媒體教材	1☐	2☐	3☐	4☐
6. 利用電腦來錄製、編輯聲音或音樂來製作教材	1☐	2☐	3☐	4☐
7. 解決課堂上出現的科技相關問題（例如：電腦當機、單槍投影機無訊號）	1☐	2☐	3☐	4☐
8. 利用資訊科技來登錄學生遲到、請假及出席狀況	1☐	2☐	3☐	4☐
9. 在課餘時利用 e-mail 或即時通等與學生溝通	1☐	2☐	3☐	4☐
10. 製作或管理教學網站，以進行教學活動、展示教學成果或分享學習資源	1☐	2☐	3☐	4☐
11. 使用網路通訊工具（如電子郵件、即時通或網站）與家長聯繫	1☐	2☐	3☐	4☐
12. 學習資訊科技或軟體，以應用在教學上	1☐	2☐	3☐	4☐
(2) 資訊融入教學的設計與班級管理 （請以上個學期的情況回答）	未曾有過	偶爾一、兩次	有時如此	經常如此
1. 帶學生到電腦教室進行資訊融入教學	1☐	2☐	3☐	4☐
2. 將學生分成小組進行資訊融入教學	1☐	2☐	3☐	4☐
3. 為班上不同程度的學生，設計不同的資訊科技學習活動	1☐	2☐	3☐	4☐
4. 事先確定學生都具有足夠的資訊科技資源與資訊能力，以完成作業	1☐	2☐	3☐	4☐
5. 在課堂中安排部分時間加強學生在資訊能力的不足	1☐	2☐	3☐	4☐
6. 嘗試利用資訊科技來進行學科的補救教學	1☐	2☐	3☐	4☐
7. 指導學生如何在網路上蒐集到對學科學習有幫助的資料	1☐	2☐	3☐	4☐
8. 提供學習單以協助學生利用網站資料完成作業	1☐	2☐	3☐	4☐
9. 讓學生利用資訊科技蒐集資料製作專題報告	1☐	2☐	3☐	4☐
10. 嘗試新的策略來提高學生在資訊融入之課堂上的專注度	1☐	2☐	3☐	4☐
11. 有效管理學生在電腦教室的使用及學習狀況	1☐	2☐	3☐	4☐

(2) 資訊融入教學的設計與班級管理—承接上段 （請以上個學期的情況回答）	未曾有過	偶爾一、兩次	有時如此	經常如此
12. 利用資訊科技來設計學科評量，給學生紙筆測驗以外的成績	1☐	2☐	3☐	4☐
13. 分析學生在資訊科技分組活動的學習歷程，並列入成績考量	1☐	2☐	3☐	4☐
14. 利用適當的方法來追蹤檢測資訊融入教學課程後，學生的學科學習成效	1☐	2☐	3☐	4☐
15. 為學生利用資訊科技所製作的作業，設計有別於過去的作業有不同的評分標準	1☐	2☐	3☐	4☐
16. 與其他老師分享討論資訊融入課程中，學生的學習成果	1☐	2☐	3☐	4☐
17. 自己檢討上過的融入單元及教學策略，找出未來改進方法	1☐	2☐	3☐	4☐
18. 因為學生學習成效不佳而放棄某單元的資訊融入教學	1☐	2☐	3☐	4☐
19. 我會花時間去學習並練習資訊科技的技能	1☐	2☐	3☐	4☐
20. 我會參加研討會或閱讀期刊，去學習新資訊科技融入教學的方法	1☐	2☐	3☐	4☐
21. 使用線上資料庫或網路課程等資源以增加自己的教學專業	1☐	2☐	3☐	4☐
(3) 資訊倫理、規範、與安全 （請以上個學期的情況回答）	未曾有過	偶爾一、兩次	有時如此	經常如此
1. 在學生上網前，指導學生判斷網路上獲得知識的正確性及可靠性	1☐	2☐	3☐	4☐
2. 在學生上網前，教導學生在使用網際網路時應有的倫理及規範	1☐	2☐	3☐	4☐
3. 學生違反網際網路使用禮儀時，提醒及對其說明正確的行為方式	1☐	2☐	3☐	4☐
4 .當學生引用網路資料時，協助其評估資料的正確性、相關性、適當性及公正性	1☐	2☐	3☐	4☐
5. 要求學生尊重智慧財產權	1☐	2☐	3☐	4☐
6. 教導學生拒絕使用盜版的軟體或資料	1☐	2☐	3☐	4☐
7. 留意目前青少年網路成癮或網路色情的訊息	1☐	2☐	3☐	4☐
8. 檢查學生上網的紀錄，檢查他們是否有上不良網站	1☐	2☐	3☐	4☐
9. 教導學生使用大量資訊工具可能會對身體有哪些影響	1☐	2☐	3☐	4☐
10. 在長期使用資訊科技時，我會排定時間讓學生休息	1☐	2☐	3☐	4☐
11. 利用資訊科技來幫助特殊或弱勢的學生	1☐	2☐	3☐	4☐
12. 想出辦法讓家中沒有電腦的學生也能完成資訊融入的作業	1☐	2☐	3☐	4☐

Part V　學生使用

(1) 在你上本科科目的班級上，學生使用資訊科技的情況（請以上個學期的情況回答）	未曾有過	偶爾一、兩次	有時如此	經常如此
1. 用 word 寫報告	1☐	2☐	3☐	4☐
2. 上網找尋指定作業的答案	1☐	2☐	3☐	4☐
3. 上網蒐集資料做延伸閱讀	1☐	2☐	3☐	4☐
4. 製作多媒體的研究專題	1☐	2☐	3☐	4☐
5. 以資訊科技與其他人進行合作學習	1☐	2☐	3☐	4☐
6. 做多媒體或網路上的練習與活動	1☐	2☐	3☐	4☐
7. 做線上或網路上的測驗來檢視學習成果	1☐	2☐	3☐	4☐
8. 利用資訊科技或網路來繳交作業	1☐	2☐	3☐	4☐
9. 利用資訊科技互相欣賞彼此的作品並互相評鑑	1☐	2☐	3☐	4☐
10. 主動利用資訊科技進行自主性的學習	1☐	2☐	3☐	4☐
11. 運用資訊科技整理學習歷程檔案	1☐	2☐	3☐	4☐

＊ 以下題目請上個學期有擔任「班級導師」者，針對導師班的學生情況回答。＊

(2)你是否曾觀察到，班上的學生有過度或不當使用網路的現象？（請以上個學期的情況回答）	幾乎沒有	有一些	有許多	不知道
1. 因使用網路，導致上學遲到或影響生活作息	1☐	2☐	3☐	0☐
2. 上網時間過長，導致學生身體不適(如：腰酸背痛)的現象	1☐	2☐	3☐	0☐
3. 因為長期坐在電腦或電視前使用，而使得學生體重增加	1☐	2☐	3☐	0☐
4. 因長期沉迷網路，導致有精神方面的疾病需要就醫	1☐	2☐	3☐	0☐
5. 因長期使用網路，導致國語文能力變差	1☐	2☐	3☐	0☐
6. 沉迷網路，嚴重影響學校課業表現	1☐	2☐	3☐	0☐
7. 因為沈迷網路，造成蹺家或學業中輟	1☐	2☐	3☐	0☐
8. 因使用網路，導致交友或人際互動變得複雜	1☐	2☐	3☐	0☐
9. 因為網路交易，導致金錢的損失或糾紛	1☐	2☐	3☐	0☐
10. 因為網路不當使用，而造成犯罪行為	1☐	2☐	3☐	0☐
11. 其他：	1☐	2☐	3☐	0☐

Part VI 研習經驗

這個部分將會詢問，從你當老師以來，曾參加過的資訊融入教學相關的研習經驗：

(1) 過去的研習情況與效果

研習課程類別	是否參加過研習	課堂實際運用	再加強進修的意願
A. 軟硬體應用			
1. MS OFFICE 軟體應用	□有	□有	□有
2. 繪圖、影音、動畫編輯軟體	□有	□有	□有
3. 網頁編輯軟體	□有	□有	□有
4. 程式設計	□有	□有	□有
5. 特殊教學軟體：_____	□有	□有	□有
6. 其他：_____	□有	□有	□有
B. 資訊融入教學設計			
1. 資訊融入教學之概念與設計理念	□有	□有	□有
2. 實際製作資訊融入教學之教材	□有	□有	□有
3. 作品或教材之分享與評鑑	□有	□有	□有
4. 他人案例之觀摩與交流	□有	□有	□有
5. 資訊融入教學專案之實施規劃	□有	□有	□有
C. 資訊科技之適當使用與安全			
1. 網路禮節、倫理、智慧財產權	□有	□有	□有
2. 網路成癮、健康與安全之科技使用	□有	□有	□有

(2) 未來進修的建議

研習課程類別或主題	課程實施或進行方式	備註

Part VII 對此份自評表的意見：

感謝您花時間完成這份自評表！

Appendix C: Translated Version of the Survey Instrument

Information and Technology Integration Self Evaluation Form for Elementary and Middle School Teachers			
Part I Teaching Background (Please answer the following questions based on your primary teaching subject)			
1. Your students are primary school or middle school?	() Elementary School, your last semester mainly teach () lower () middle () high grade. () Middle School, your last semester mainly teach () First () Second () Third grade		
2. What is your primary teaching discipline/subject?	() Discipline () Subject		
3. How many primary classes were you teaching every week?	() classes		
4. Regarding to the question above, how often did you use computer in the class?	Based on last semester, I used computer every () classes per week.		
5. Regarding to the question above, which of the following places did you use computer most? (Single selection)	() Classroom () Multi-media Room () Specialized Classroom () Computer Lab () Other		
6. Regarding to the question above, in the place you selected, how many computers have internet access?	There are () computers in total, () computers have internet access.		
7. How many years have you been teaching?	( ) years		
8. What's your gender? ()Male () Female			
	Yes	No	I do not know
9. In the classroom you taught, did it have the screen, projector or you can very easily get access to those devices?			
10. During the teaching process, were the computer and internet reliable or working regularly?			
11. Did your school have Wifi?			
12. Did your school have a comprehensive plan for technology integration?			
13. Did you have a laptop on your own? If yes, was it provided by your school? () Yes () No			

14. Was it convenient for students to use computer? Was it convenient for students to use computer in school? () Yes () No			

15. In the last semester, how many hours (including summer and winter vacation) did you spend on your professional development of technology integration?

() Zero () Less than four hours () Five – ten hours () Eleven – Twenty hours () More than twenty hours

16. Did you ever get any credits or degrees on 'Instructional Technology' or 'Technology Integration'?

() _ Credits () Degree () Conducted related research () Nothing

17. Did you acknowledge any teaching or learning software in your discipline? () I used it before. For example:__

18. What is your highest degree? () Technological School () Bachelor Degree () 40 Credits Class () Master Degree () Doctoral Degree () Others

19. Have you ever been in an administrative position before? Yes, I was () Information and Technology Manager or related position. () Other Manager or leader , () No

20 . Regarding to the question above, were you in administrative position last semester? Yes, I was in the position () of information and technology. () other positions () No

21. Were you in the position of students' advisor last semester? () Yes () No. If yes, for which grade? ()

Part II Technology Integration on Teaching and Learning

Please self-evaluate your skills and abilities in terms of the following five dimensions.

(1) Control and concept	I have no idea	I always need help	I can do it by myself	I am very familiar and good at using technology
1.1 I have already had the related knowledge and skills on information and technology				
1.2 With the development of technology, I will keep updating the required skills and knowledge.				

(2) Lesson Plan, Learning Environment Plan, and Experience				
2.1 I can adapt my class for the needs of my students, and design suitable learning activities for technology integration.				
2.2 I can design the learning environment and process based on the theories and studies on technology integration.				
2.3 I can find the resources that I can use for technology integration and evaluate its effectiveness.				
2.4 Regarding the design for technology integration, I know how to select the resource and plan for the learning environment of technology integration.				

2.5 Regarding the design for technology integration, I know how to select and plan for the learning strategies and activities.				
(3) Teaching, Learning, and Lessons 3.1 I can use technology to help students reach the required abilities in the discipline and learning goals of the six technology topics.				
3.2 I can use technology to support student-centered teaching and satisfy the needs of different students.				
3.3 I can use technology to facilitate students' creativity and high level learning skills, such as analyzing, decision-making, evaluating, etc.				
3.4 I can manage students' learning activities in the teaching environment of technology integration, such as how to support collaborative learning.				
(4) Measurement and Evaluation				

4.1 I can use technology to measure learning from different dimensions.				
4.2 I can use technology to collect, analyze, and demonstrate learning outcome. I can also communicate with others to improve my teaching.				
4.3 I can use different evaluating methods to decide whether students can use technology to learn effectively.				
(5) Productivity and Professional Development				
5.1 I can use related information and technology resources to improve myself and engage in lifelong learning.				
5.2 I can continuously self-evaluate myself so as to form a deep understanding about how to use technology to improve students' learning.				
5.3 I can use technology to improve my working efficiency.				
5.4 I can use technology to collaborate and communicate with my colleagues, students' parents and community so as to enrich students' learning experiences. (6) Issues about Society, Ethics, Law, Human, etc.				
6.1. I can behave myself and teach students about the laws and ethics of using technology.				
6.2 I can use technology resources to help students who have different backgrounds, abilities and characteristics.				
6.3 When using technology resources, I always consider the justice of the society and avoid hurting people who are vulnerable.				
6.4 I can facilitate and support the healthy way of using technology resources.				

6.5 I can help every student to get a chance to use technology resources.				
Part III Teacher and Environment				
Please share your opinions of teaching with technology and the related teaching environment.				
1. I can use technology to create the teaching material and manage the class, which improves my teaching efficiency.				
2. I find that using technology can improve students' learning efficiency.				
3. If I had enough time, I would increase the frequency of using technology.				
4. I only consider teaching with technology when the traditional teaching is not effective.				
5. I hope I can get more training on how to design and implement technology-integrated teaching.				
6. The resources (software and hardware) satisfy my needs for technology integration.				
7. My work on technology integration was appreciated and supported by school.				
8. Technology integration is the major program that school tries to support and develop.				
9. My colleagues and I always discuss technology integration in faculty meeting.				
10. I would like to collaborate with technology professionals to help me integrate technology into my class.				
11. I can find people to help me solve the problem I had for technology integration.				

12. I would like to answer to the questions of my colleagues regarding technology integration.				

Part IV Teachers' Application of Technology Integration				
(1) Technology Application (Please answer the following questions based on your performance last semester)	Never	One or two times.	Sometimes	Always
1. Using computer to develop handouts, teaching material and tests.				
2. Using software to make slides for the class.				
3. Using Internet to collect the supplemental materials for the use of students in class.				
4. I spend times on selecting suitable teaching goal, software and technology information for students.				
5. Incorporating the multimedia materials into my class based on the class standard.				
6. Using computer to make teaching materials by recording or editing the sound or music.				
7. Solving the related technology problems happened in the class (For example, the computer died, no signals of the projector)				
8. Using technology to take students' attendance.				
9. Using email or other communicating software to communicate with students.				
10. Developing class management website so as to present the teaching outcome and share learning resources.				

11. Using communicating software (such as email) to communicate with students' parents.				

12. Learning new technology or software and apply them in teaching.				
(2) Design and Class Management of Technology Integration (Please answer the following questions based on your performance in last semester.) 1. Having students learn in computer lab.				
2. Dividing students in groups for technology integration.				
3. Designing different technology-based learning activities for different students.				
4. Identifying whether students have ability to using technology to finish their homework beforehand.				
5. Taking part of the class time to increase students' ability of using technology.				
6. Trying new technology to conduct amending teaching.				
7. Instructing students in how to use Internet to find the needed resources for the class.				
8. Providing guidelines to help students use online resources to finish the homework.				
9. Asking students to use technology to collect information and conduct project report.				
10. Trying new teaching strategies to improve students' attention in the technology-integrated class.				

11. Effectively managing students' learning activity and usage of computers in computer lab.				
(3) Information Ethics, Regulation and Safety.(Please answer the following questions based on your performance in last semester.)				
1. Before students access the Internet, instructing student in how to evaluate the validity and reliability of the information on the internet.				

2. Before students access the Internet, instructing students in the ethics and regulations about using Internet.				
3. When students violate the rules of Internet, reminding them of their inappropriate behavior and indicate the correct one.				
4. When students use resources from Internet, helping them evaluate the validity, relatedness, and fairness of the information.				
5. Asking students to respect intellectual property.				
6. Asking students to refuse the use of pirated software.				
7. Paying attention to the news about the internet addiction or internet pornography problem.				
8. Checking students online activity regularly to see whether they browse the inappropriate websites.				
9. Teaching students about the negative influence of the excessive use of software on their body.				

10. Assigning time for students to relax themselves after students use technology for a very long time.				
11. Using Technology to help special or marginalized students.				
12. Developing methods for students who do not have computer at home to finish the technology related homework.				
Part V Students' usage of technology				

(1) Please rate students usage of technology in your class last semester.				
1. Using word to write a project report.				
2. Searching answers to the designated questions through Internet.				
3. Collecting information through internet to conduct extensional reading.				
4. Conducting multi-media related research				
5. Using technology to collaboratively learn with other students.				
6. Doing practices provided by Multi-media or Internet.				
7. Conducting online or Internet test to evaluate the learning outcome.				
8. Using technology or Internet to submit homework.				
9. Using technology to review each other's homework.				
10. Using technology to learn independently.				
11. Using technology to make a learning portfolio.				

* The following questions are only for 'class advisors'. If you were a class advisor last semester, please answer the following questions.

(2) Did you ever notice that the students in your class have inappropriate internet using behaviors?	Never	A little	A lot	I do not know
1. Because of using Internet, students are often late for school or sleep-deprived.				

2. The excessive use of Internet caused body issues (e.g. pain in the back) in students				
3. Because of always sitting in front the computer, students' weight increased.				
4. Because of the Internet addiction, students had mental problem and needed to see a doctor.				
5. Because of the Internet addiction, students' class performance was negatively influenced.				
6. Because of the internet addiction, students' language and literacy ability decreased.				
7. Because of the Internet addiction, students had to drop out of the school.				
8. Because of using Internet, it becomes difficult for students to make friends or interact with people.				
9. Because of the online transaction, students lost money or were involved in the dispute.				
10. Because of the inappropriate use of Internet, students committed crime.				
11. Others:				

Part VI Experiences			

This part investigates your experiences of participating in the related learning activities (workshop, class, or training activities) for Technology Integration since you became a teacher.			
(1) Past technology learning experiences and outcomes			
Activities Types	Ever participated in the related learning activity?	Class Application	The willingness to participate again
A. Software Application	() yes	()yes	()yes

1. Ms Office Software			
2. Drawing, video and animation making and editing			
3. Website Making Software			
4. Programming			
5. Other Teaching and Learning Software:			
6. Other			
B. Technology Integration Class Design			
1. Technology Integration Design Theories and Principles			
2. Technology Integration - Teaching Content Design			
3. Teaching Product and Material Sharing and Evaluation			
4. Other Design Cases –Sharing and Communicating			

5. Technology Integration – Plan and Implementation			
C. Technology Integration – Technology Safety			
1. Internet Etiquette, Ethics, and Intelligent Properties			
2. Internet Addiction, Health and Safety (Technology)			
(2) Future Learning Plan			
Topics	Ways of Learning (Workshop, or online training, etc.)	Other	

Part VII Your suggestions for this survey:
Thanks for completing this survey!

Appendix D: TIUS (Pilot Study Version)

Overview and Demographic Information - Part 1 Please respond to each of the demographic questions.

What is your age range?

21 - 24

25 - 34

35 - 44

45 - 54

55 - 64

65 or older

What is your gender?

Male

Female

What is the highest level of schooling you have completed or the highest degree you have received?

Bachelor's degree in college (4-year)

Master's degree

Doctoral degree

How long have you been working as a teacher?

This is my first year!

1-2 years

3-5 years

6-10 years

11-15 years

16-20 years

More than 20 years

Overview and Demographic Information - Part 2

Please respond to each of the demographic questions.

In which level of schooling do you primarily work?

Elementary School

Middle School

High School

Overview and Demographic Information - Part 3

Please respond to each of the demographic questions.

In which department do you primarily teach classes?

Math

English

Social Studies

Science

Art

Music

Physical Education

Other

Teacher and School Background

This survey will take no more than **15 minutes** to complete.

There are **19** teacher and school background questions.

Then, in the section that follows, there are **22** statements that focus on the extent to which you incorporate technology resources in the classroom and your professional development priorities and opportunities.

Lastly, there are **12** questions that focus on the school environment.

Please answer each of the following questions based on the **previous academic year of 2017-2018**.

What level of courses did you primarily teach?

Below Level

On Level

Honors Level

Advanced Placement

I equally teach a combination of multiple options

What is your employment status as a teacher?

Employed full time

Employed part time (50% to 90% of full time hours)

Employed part time (less than 50% of full time hours)

What is the name of the course(s) that you taught?

How many times each week did your classes meet?

5 times a week

2 or 3 times a week

Once a week Other

What percentage of computer technology are used in your class during a week?

100%

50-75%

50%

25-50%

Less than 25%

What is the most common place for you to use computers as part of your instruction?

Your classroom

Computer lab

Other

From the previous question, how many computers in your common location are (or can be) linked to the internet?

Based on this total number of available computers...

This number of computers can be connected to the Internet...

Is there a projector screen, projector, interactive whiteboard, document camera, etc. in your classroom, or can you easily get these devices to use for teaching?

Yes

No

I don't know

When you are teaching, are computers and networks stable and operational?

Yes

No

I don't know

Does your school have a wireless network?

Yes

No

I don't know

Does your school have a holistic plan or process to incorporate Instructional Technology (IT) tools into teachers lessons?

Yes

No

I don't know

Do you have a laptop computer that you can use? If so, was it issued to you by the school district?

Yes, I have a laptop computer. It was issued to me by the school district.

Yes, I have a laptop computer. It was NOT issued to me by the school district.

No, I do not have a laptop computer.

Was it convenient for your students to use the school's computers?

Yes

No

I don't know

How many hours of your school year (including summer and winter vacations) do you spend on professional development of information technology and integration into education (e.g., studying or taking professional courses)?

None

Less than 4 hours

5 - 10 hours

11 - 20 hours

More than 20 hours

Have you earned any course credits or a degree in an Educational Technology-related area?

I have earned no such credits or degrees

I have earned few credits

I have a degree in an Educational Technology-related area

Do you know if there is specialized teaching software for your core subject?

Yes, and I have used

Yes, but I have never used any

I am not aware of specialized teaching software for my core subject

Have you EVER served in an executive position as a teacher?

Yes, I have served as a department head or team leader

Yes, I have served as a technology equipment manager

No

During the previous academic year, did you hold an executive position?

Yes, I served as a department head or team leader

Yes, I served as a technology equipment manager

No

Did you serve as a teacher mentor during the last academic year?

Yes No

Teacher ICT Integration and Planning Introduction

Please assess your skills and capabilities given the following statements in the upcoming section.

Teacher ICT Integration and Planning

I have already had the related knowledge and skills on information and technology.

I have no idea

I often need help

I can demonstrate these skills by myself

I am very familiar and good at using technology

As technology advances, my personal IT skills and knowledge improves.

I have no idea how to improve my IT knowledge

I often need help to improve my IT knowledge

I can improve my IT knowledge by myself

I am very familiar and good at improving my IT knowledge

I can adapt my class to the needs of my students, and design suitable learning activities for technology integration.

I have no idea how to adapt my class for IT usage

I often need help to adapt my class for IT usage

I can adapt my class for IT usage by myself

I am very familiar and good at adapting my class for IT usage

I know how to design the learning environment and process based on the theories and studies on technology integration.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to find the resources that I can use for technology integration and evaluate its effectiveness.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

Regarding the design of technology integration, I know how to select the resource and plan for the learning environment of technology integration.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

Regarding the design for technology integration, I know how to select and plan for the learning strategies and activities.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to support student-centered teaching and satisfy the needs of different students.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to facilitate students' creativity and high-level learning skills, such as analyzing, decision-making, evaluating, etc.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to manage students' learning activities in the teaching environment of technology integration, such as how to support collaborative learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to assess students' dimensions of learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use information technology to collect, analyze and present learning results and communicate with others to improve teaching effectiveness.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use different evaluating methods to decide whether students' use of technology leads to effective learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use IT resources to continue my professional development and lifelong learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to self-evaluate my teaching strategies to form a deep understanding of how to use technology to improve students' learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to improve my work efficiency.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to collaborate and communicate with my colleagues, students' parents, and community to enrich students' learning experiences.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to lead by example and teach students about the use of information technology laws and ethics.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology resources to help students who have different backgrounds, abilities, and characteristics.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

Regarding issues of social justice, I know how to use technological resources in ways that prevent socially disadvantaged students from being impacted negatively.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to facilitate and support the healthy use of technological resources in the classroom.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to ensure that every student has an equal opportunity to use IT resources.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

School Culture and Administration Influence Introduction

Please share your opinions on teaching with technology and the related teaching environment.

School Culture and Administration Influence

Choose the best response that reflects your point of view.

I use IT resources to develop teaching materials or class activities that make me more effective in teaching.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I find that using technology can improve students' learning efficiency.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

If I had enough time, I would increase the frequency of using technology.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I only consider teaching with technology when traditional teaching methods are not effective.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I hope I can get more training on how to design and implement technology-integrated teaching.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

The school's computer equipment (software, hardware) can meet the needs of my technology integration goals.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

My efforts in integrating technology into teaching are encouraged and appreciated by school administrators.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

Technology integration is a school initiative that my school tries to support and develop.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

My colleagues and I always discuss technology integration in department meetings.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I collaborate with technology professionals to help me integrate technology into my lessons and class activities.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I can find people to help me solve problems I have associated with technology integration.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I am willing to assist and answer my colleagues' questions about integrating technology into their lessons.

Strongly Disagree

Disagree

Agree

Strongly Agree

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Appendix E: TIUS (Final Version)

Overview and Demographic Information - Part 1 Please respond to each of the demographic questions.

What is your age range?

21 - 24

25 - 34

35 - 44

45 - 54

55 - 64

65 or older

What is your gender?

Male

Female

What is the highest level of schooling you have completed or the highest degree you have received?

Bachelor's degree in college (4-year)

Master's degree

Doctoral degree

How long have you been working as a teacher?

This is my first year!

1-2 years

3-5 years

6-10 years

11-15 years

16-20 years

More than 20 years

Overview and Demographic Information - Part 2

Please respond to each of the demographic questions.

In which level of schooling do you primarily work?

Elementary School

Middle School

High School

Overview and Demographic Information - Part 3 Please respond to each of the demographic questions.

In which department do you primarily teach classes?

Math

English

Social Studies

Science

Art

Music

Physical Education

Other

Teacher and School Background

This survey will take no more than **15 minutes** to complete.

There are **19** teacher and school background questions.

Then, in the section that follows, there are **18** statements that focus on the extent to which you incorporate technology resources in the classroom and your professional development priorities and opportunities.

Lastly, there are **11** questions that focus on the school environment.

Please answer each of the following questions based on the **previous academic year of 2017-2018**.

What level of courses did you primarily teach?

Below Level

On Level

Honors Level

Advanced Placement

I equally teach a combination of multiple options

What is your employment status as a teacher?

Employed full time

Employed part time (50% to 90% of full time hours)

Employed part time (less than 50% of full time hours)

What is the name of the course(s) that you taught?

How many times each week did your classes meet?

5 times a week

2 or 3 times a week

Once a week Other

What percentage of computer technology are used in your class during a week?

100%

50-75%

50%

25-50%

Less than 25%

What is the most common place for you to use computers as part of your instruction?

Your classroom

Computer lab

Other

From the previous question, how many computers in your common location are (or can be) linked to the internet?

Based on this total number of available computers...

This number of computers can be connected to the Internet...

Is there a projector screen, projector, interactive whiteboard, document camera, etc. in your classroom, or can you easily get these devices to use for teaching?

Yes

No

I don't know

When you are teaching, are computers and networks stable and operational?

Yes

No

I don't know

Does your school have a wireless network?

Yes

No

I don't know

Does your school have a holistic plan or process to incorporate Instructional Technology (IT) tools into teachers lessons?

Yes

No

I don't know

Do you have a laptop computer that you can use? If so, was it issued to you by the school district?

Yes, I have a laptop computer. It was issued to me by the school district.

Yes, I have a laptop computer. It was NOT issued to me by the school district.

No, I do not have a laptop computer.

Was it convenient for your students to use the school's computers?

Yes

No

I don't know

How many hours of your school year (including summer and winter vacations) do you spend on professional development of information technology and integration into education (e.g., studying or taking professional courses)?

None

Less than 4 hours

5 - 10 hours

11 - 20 hours

More than 20 hours

Have you earned any course credits or a degree in an Educational Technology related area?

I have earned no such credits or degrees

I have earned few credits

I have a degree in an Educational Technology-related area

Do you know if there is specialized teaching software for your core subject?

Yes, and I have used

Yes, but I have never used any

I am not aware of specialized teaching software for my core subject

Have you EVER served in an executive position as a teacher?

Yes, I have served as a department head or team leader

Yes, I have served as a technology equipment manager

No

During the previous academic year, did you hold an executive position?

Yes, I served as a department head or team leader

Yes, I served as a technology equipment manager

No

Did you serve as a teacher mentor during the last academic year?

Yes

No

Teacher ICT Integration and Planning Introduction

Please assess your skills and capabilities.

Teacher ICT Integration and Planning

I have already had the related knowledge and skills on information and technology.

I have no idea

I often need help

I can do demonstrate these skills by myself

I am very familiar and good at using technology

As technology advances, my personal IT skills and knowledge improves.

I have no idea how to improve my IT knowledge

I often need help to improve my IT knowledge

I can improve my IT knowledge by myself

I am very familiar and good at improving my IT knowledge

I know how to design the learning environment and process based on the theories and studies on technology integration.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

Regarding the design for technology integration, I know how to select and plan for the learning strategies and activities.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to support student-centered teaching and satisfy the needs of different students.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to facilitate students' creativity and high-level learning skills, such as analyzing, decision-making, evaluating, etc.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to manage students' learning activities in the teaching environment of technology integration, such as how to support collaborative learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to assess students' dimensions of learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use information technology to collect, analyze and present learning results and communicate with others to improve teaching effectiveness.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use different evaluating methods to decide whether students' use of technology leads to effective learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use IT resources to continue my professional development and lifelong learning.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to improve my work efficiency.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology to collaborate and communicate with my colleagues, students' parents, and community to enrich students' learning experiences.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to lead by example and teach students about the use of information technology laws and ethics.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to use technology resources to help students who have different backgrounds, abilities, and characteristics.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

Regarding issues of social justice, I know how to use technological resources in ways that prevent socially disadvantaged students from being impacted negatively.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to facilitate and support the healthy use of technological resources in the classroom.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

I know how to ensure that every student has an equal opportunity to use IT resources.

I have no idea how to do this

I often need help to do this

I can do demonstrate these skills by myself

I am very familiar and good at this

School Culture and Administration Influence Introduction

Please share your opinions on teaching with technology and the related teaching environment.

Perception of School Culture and Teacher Attitudes

Choose the best response that reflects your point of view.

I use IT resources to develop teaching materials or class activities that make me more effective in teaching.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I find that using technology can improve students' learning efficiency.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

If I had enough time, I would increase the frequency of using technology.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I hope I can get more training on how to design and implement technology integrated teaching.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

The school's computer equipment (software, hardware) can meet the needs of my technology integration goals.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

My efforts in integrating technology into teaching are encouraged and appreciated by school administrators.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

Technology integration is a school initiative that my school tries to support and develop.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

My colleagues and I always discuss technology integration in department meetings.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I collaborate with technology professionals to help me integrate technology into my lessons and class activities.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I can find people to help me solve problems I have associated with technology integration.

Strongly Disagree

Disagree

Agree

Strongly Agree

Choose the best response that reflects your point of view.

I am willing to assist and answer my colleagues' questions about integrating technology into their lessons.

Strongly Disagree

Disagree

Agree

Strongly Agree

Powered by Qualtrics

Appendix F: IRB Approval

UNIVERSITY OF GEORGIA

Tucker Hall, Room 212
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Athens, Georgia 30602

TEL 706-542-3199 | FAX 706-542-5638

IRB@uga.edu
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Office of Research

Institutional Review Board

EXEMPT DETERMINATION

April 3, 2018

Dear ROBERT Branch:

On 4/3/2018, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	The Effect of Schooling Mechanisms on Teachers' Use of Online Activities
Investigator:	ROBERT Branch
Co-Investigator:	Catrice Mane
IRB ID:	STUDY00005494
Funding:	None
Review Category:	Exempt Flex 7

The IRB approved the protocol from 4/3/2018 to 4/2/2023.

Please close this study when it is complete.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103).

Sincerely,

Kate Pavich, IRB Analyst
Human Subjects Office, University of Georgia

Appendix G: Principal Components Analysis Results

Table G1

Teacher ICT Proficiency Usage Scales with Variable Names

Variable Name	Survey Items
ICT_Prof_1	I have already had the related knowledge and skills on information and technology.
ICT_Prof_2	As technology advances, my personal IT skills and knowledge improves.
ICT_Prof_3	I know how to design the learning environment and process based on the theories and studies on technology integration.
ICT_Prof_4	Regarding the design for technology integration, I know how to select and plan for the learning strategies and activities.
ICT_Prof_5	I know how to use technology to support student-centered teaching and satisfy the needs of different students.
ICT_Prof_6	I know how to use technology to facilitate students' creativity and high-level learning skills, such as analyzing, decision-making, evaluating, etc.
ICT_Prof_7	I know how to manage students' learning activities in the teaching environment of technology integration, such as how to support collaborative learning.
ICT_Prof_8	I know how to use technology to assess students' dimensions of learning.
ICT_Prof_9	I know how to use information technology to collect, analyze and present learning results and communicate with others to improve teaching effectiveness.
ICT_Prof_10	I know how to use different evaluating methods to decide whether students' use of technology leads to effective learning.
ICT_Prof_11	I know how to use IT resources to continue my professional development and lifelong learning.
ICT_Prof_12	I know how to use technology to improve my work efficiency.
ICT_Prof_13	I know how to use technology to collaborate and communicate with my colleagues, students' parents, and community to enrich students' learning experiences.
ICT_Prof_14	I know how to lead by example and teach students about the use of information technology laws and ethics.
ICT_Prof_15	I know how to use technology resources to help students who have different backgrounds, abilities, and characteristics.
ICT_Prof_16	Regarding issues of social justice, I know how to use technological resources in ways that prevent socially disadvantaged students from being impacted negatively.
ICT_Prof_17	I know how to facilitate and support the healthy use of technological resources in the classroom.
ICT_Prof_18	I know how to ensure that every student has an equal opportunity to use IT resources.
ICT_Att_1	I use IT resources to develop teaching materials or class activities that make me more effective in teaching.

ICT_Att_2	I find that using technology can improve students' learning efficiency.
ICT_Att_3	If I had enough time, I would increase the frequency of using technology.
ICT_Att_4	I hope I can get more training on how to design and implement technology-integrated teaching.
SCP_1	The school's computer equipment (software, hardware) can meet the needs of my technology integration goals.
SCP_2	My efforts in integrating technology into teaching are encouraged and appreciated by school administrators.
SCP_3	Technology integration is a school initiative that my school tries to support and develop.
SCP_4	My colleagues and I always discuss technology integration in department meetings.
SCP_5	I collaborate with technology professionals to help me integrate technology into my lessons and class activities.
SCP_6	I can find people to help me solve problems I have associated with technology integration.
SCP_7	I am willing to assist and answer my colleagues' questions about integrating technology into their lessons.

Note: ICT_Prof = Teacher's ICT Proficiency ICT_Att = Teacher's ICT Attitude SCP = Teacher's perception of school culture.

Table G2

Correlation Matrix of Items Measuring Teacher's ICT Proficiency

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1.00	0.68	0.62	0.65	0.56	0.62	0.59	0.55	0.59	0.59	0.64	0.65	0.54	0.51	0.55	0.42	0.62	0.49
2		1.00	0.55	0.59	0.50	0.59	0.56	0.53	0.59	0.59	0.65	0.59	0.50	0.49	0.52	0.48	0.56	0.50
3			1.00	0.63	0.61	0.63	0.61	0.58	0.56	0.62	0.57	0.53	0.46	0.55	0.59	0.52	0.57	0.52
4				1.00	0.68	0.71	0.67	0.65	0.63	0.66	0.64	0.60	0.54	0.43	0.62	0.53	0.63	0.55
5					1.00	0.67	0.64	0.64	0.58	0.63	0.57	0.52	0.55	0.52	0.63	0.52	0.60	0.56
6						1.00	0.67	0.67	0.61	0.71	0.61	0.59	0.54	0.53	0.61	0.52	0.61	0.53
7							1.00	0.64	0.64	0.65	0.60	0.56	0.54	0.48	0.65	0.51	0.67	0.57
8								1.00	0.62	0.67	0.52	0.49	0.49	0.46	0.60	0.48	0.56	0.55
9									1.00	0.64	0.61	0.62	0.55	0.51	0.52	0.47	0.58	0.48
10										1.00	0.59	0.57	0.48	0.48	0.58	0.54	0.57	0.54
11											1.00	0.62	0.58	0.50	0.51	0.50	0.60	0.48
12												1.00	0.60	0.51	0.48	0.42	0.58	0.47
13													1.00	0.46	0.48	0.40	0.57	0.49
14														1.00	0.47	0.47	0.54	0.45
15															1.00	0.56	0.56	0.53
16																1.00	0.45	0.54
17																	1.00	0.57
18																		1.00

Note: Items 1 through 18 correspond to Items ICT_Prof_1 through ICT_Prof_18

Table G3

Correlation Matrix of Items Measuring Teacher's ICT Attitude & Teacher's Perception of School Culture

	IA_1	IA_2	IA_3	IA_4	SCP_1	SCP_2	SCP_3	SCP_4	SCP_5	SCP_6	SCP_7
IA_1	1.00	0.32	0.19	0.26	0.23	0.30	0.30	0.29	0.39	0.34	0.41
IA_2		1.00	0.37	0.30	0.15	0.17	0.19	0.18	0.21	0.19	0.32
IA_3			1.00	0.38	0.04	0.14	0.05	0.11	0.06	0.17	0.27
IA_4				1.00	0.04	0.18	0.17	0.11	0.14	0.12	0.28
SCP_1					1.00	0.36	0.46	0.30	0.29	0.39	0.19
SCP_2						1.00	0.57	0.35	0.37	0.40	0.24
SCP_3							1.00	0.37	0.35	0.42	0.22
SCP_4								1.00	0.37	0.35	0.20
SCP_5									1.00	0.42	0.27
SCP_6										1.00	0.34
SCP_7											1.00

Note: IA = Teacher's ICT Attitude; SCP = Teacher's Perception of School Culture

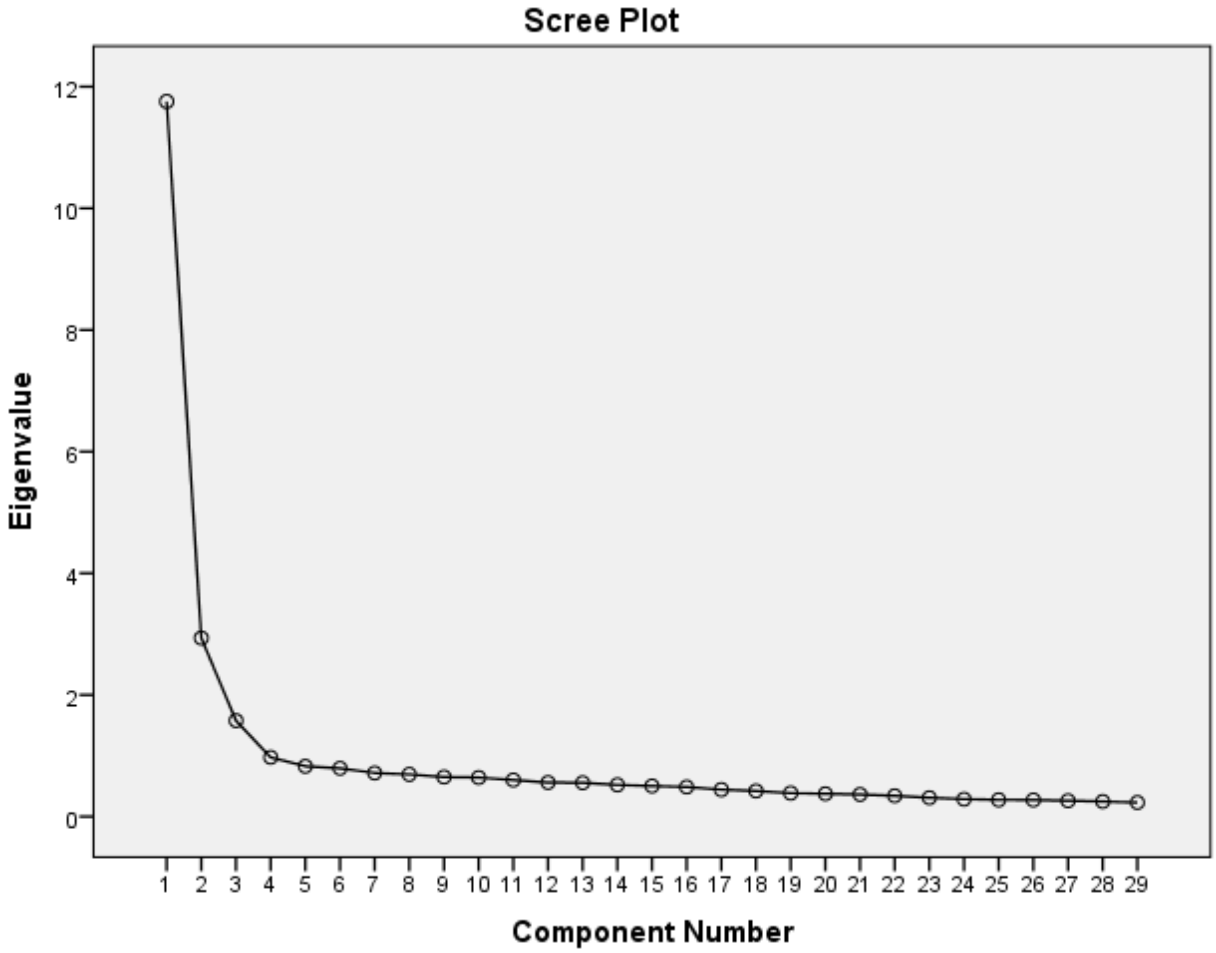

Figure G1. plot of the total variance explained by each component (its "eigenvalue") against its respective component.

Table G4

Rotated Structure Matrix for PCA with Varimax Rotation of a Three-Component Survey

Items	Rotated Component Coefficients			
	Component 1	Component 2	Component 3	Communalities
ICT_Prof_1	**.786**	.051	.078	.627
ICT_Prof_2	**.758**	.052	.051	.579
ICT_Prof_3	**.762**	.159	.058	.609
ICT_Prof_4	**.835**	.040	.028	.699
ICT_Prof_5	**.781**	.103	.133	.638
ICT_Prof_6	**.819**	.107	.082	.689
ICT_Prof_7	**.808**	.108	.064	.669
ICT_Prof_8	**.765**	.127	.033	.602
ICT_Prof_9	**.780**	.071	.057	.616
ICT_Prof_10	**.800**	.105	.042	.653
ICT_Prof_11	**.768**	.104	.106	.612
ICT_Prof_12	**.740**	.075	.132	.571
ICT_Prof_13	**.681**	.108	.162	.502
ICT_Prof_14	**.646**	.178	.076	.454
ICT_Prof_15	**.755**	.096	-.004	.579
ICT_Prof_16	**.656**	.149	-.002	.453
ICT_Prof_17	**.770**	.084	.131	.618
ICT_Prof_18	**.679**	.238	.021	.518
ICT_Att_1	.396	.430	**.329**	.450
ICT_Att_2	.320	.144	**.604**	.488
ICT_Att_3	-.050	.047	**.800**	.644
ICT_Att_4	-.002	.108	**.742**	.562
SCP_1	.041	**.677**	-.047	.462
SCP_2	.008	**.729**	.144	.553
SCP_3	.053	**.770**	.048	.598
SCP_4	.096	**.622**	.064	.400
SCP_5	.230	**.621**	.072	.443
SCP_6	.173	**.669**	.134	.496
SCP_7	.472	**.266**	.437	.485

Appendix H: Multiple Regression Analysis

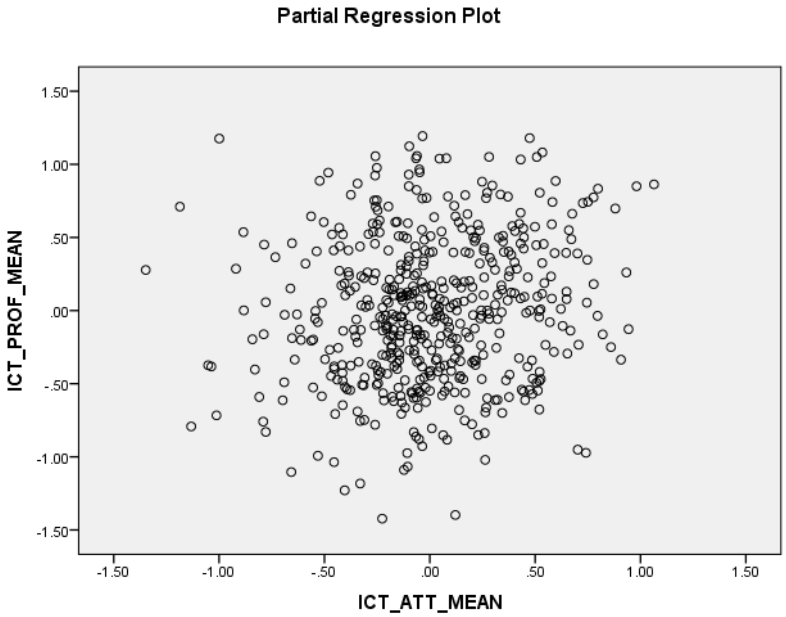

Figure H1. Scatterplot of Teachers' ICT proficiency and teachers' ICT attitude relationship

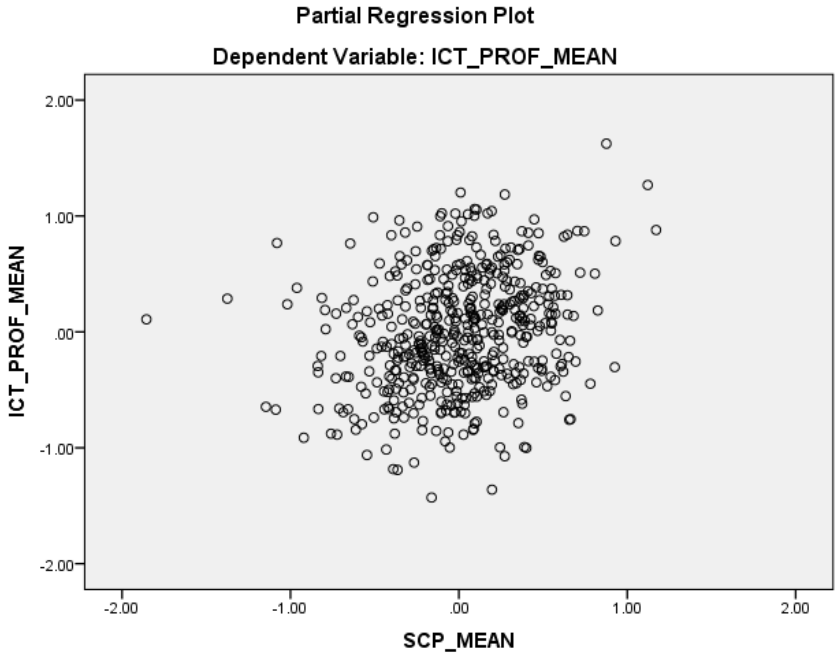

Figure H2. Scatterplot of Teachers' ICT proficiency and teachers' perception of school culture relationship

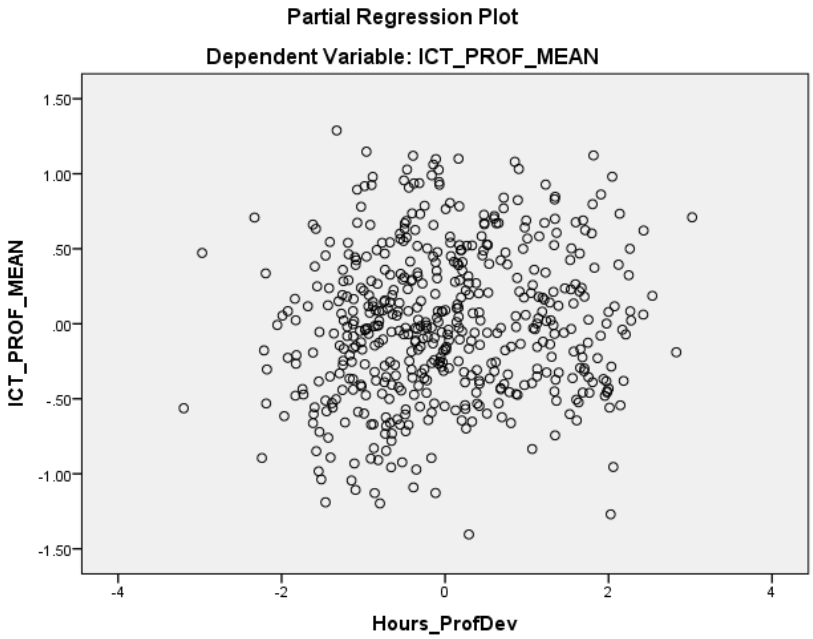

Figure H3. Scatterplot of Teachers' ICT proficiency and teachers' hours of professional development relationship

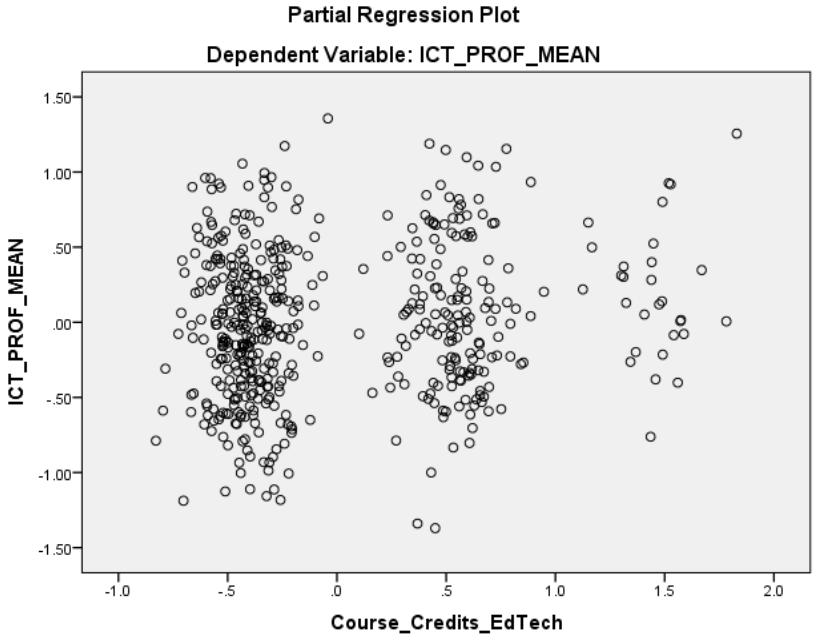

Figure H4. Scatterplot of Teachers' ICT proficiency and teachers' earned credits of educational technology courses relationship

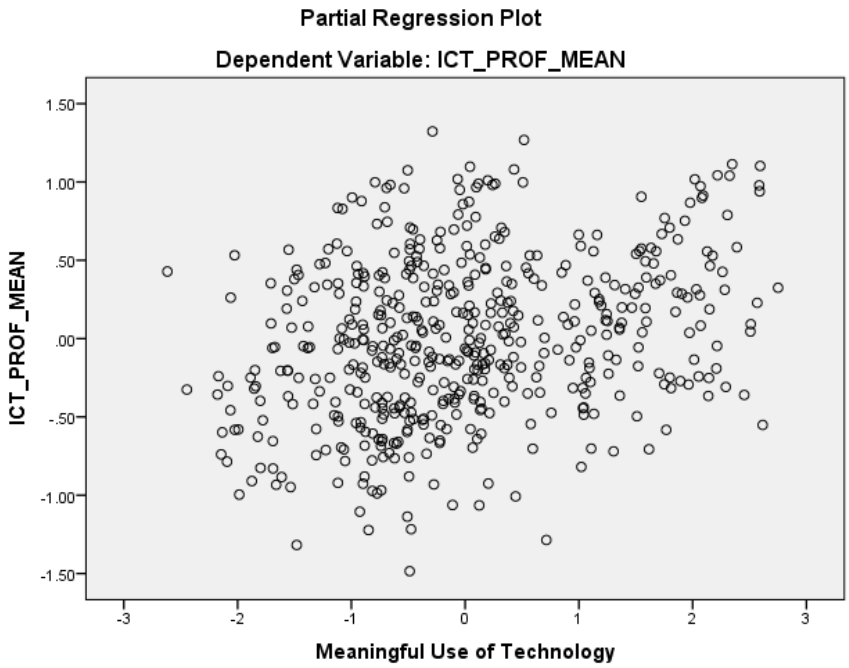

Figure H5. Scatterplot of Teachers' ICT proficiency and teachers' level of technology integration relationship

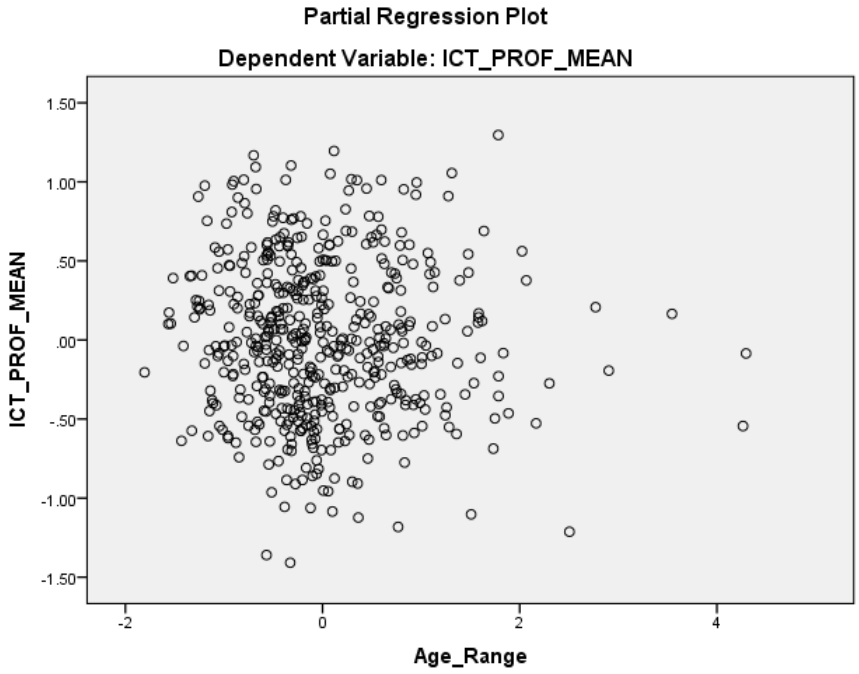

Figure H6. Scatterplot of Teachers' ICT proficiency and teachers' age range relationship

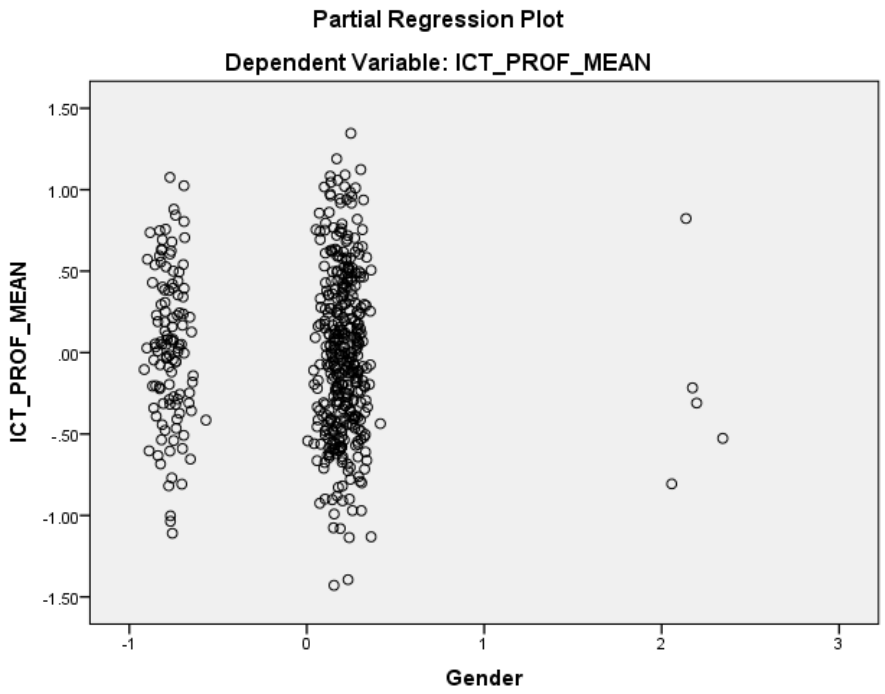

Figure H7. Scatterplot of Teachers' ICT proficiency and teachers' gender relationship

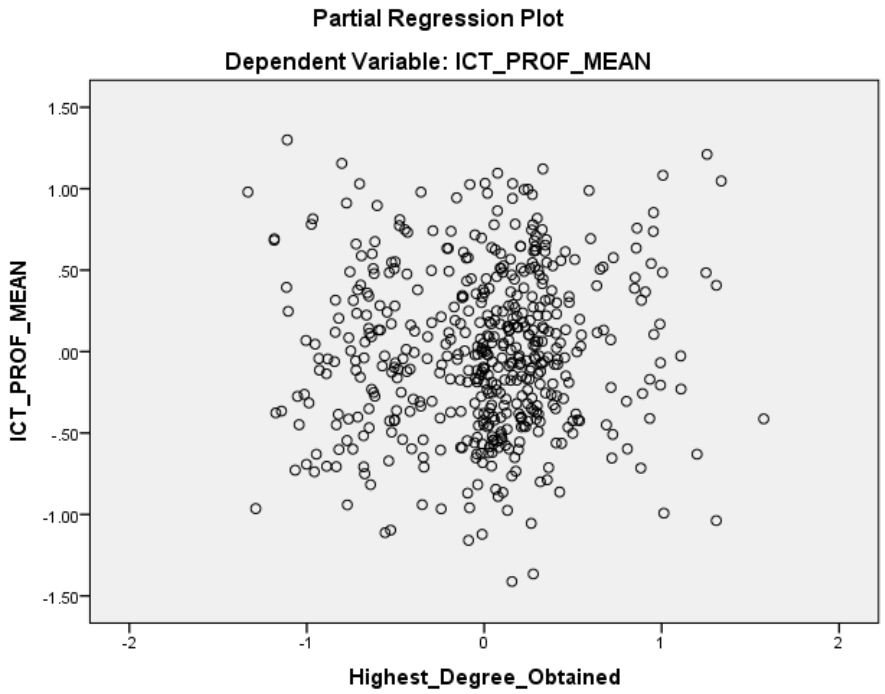

Figure H8. Scatterplot of Teachers' ICT proficiency and teachers' level of education relationship

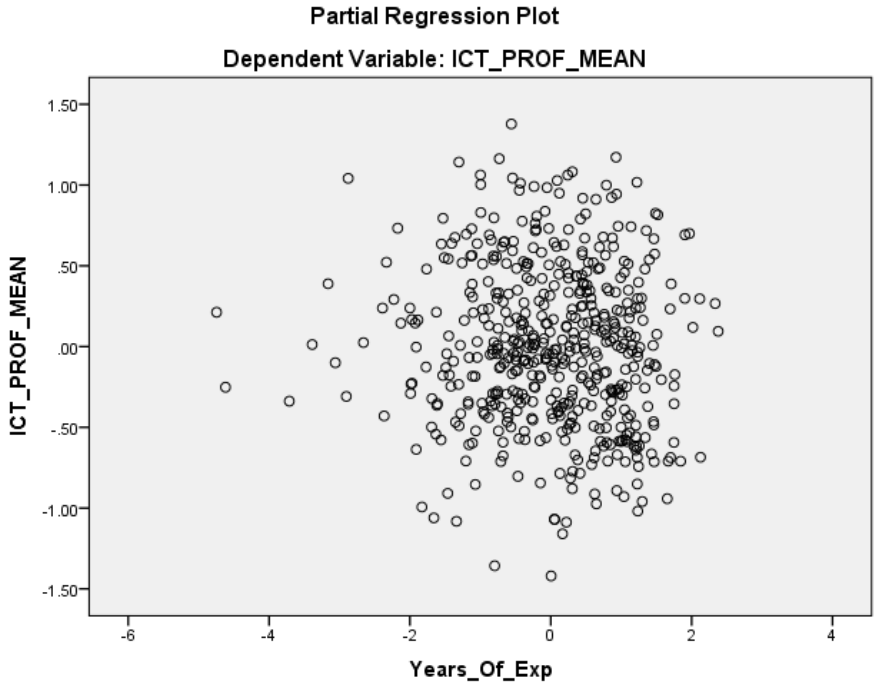

Figure H9. Scatterplot of Teachers' ICT proficiency and teachers' experience relationship

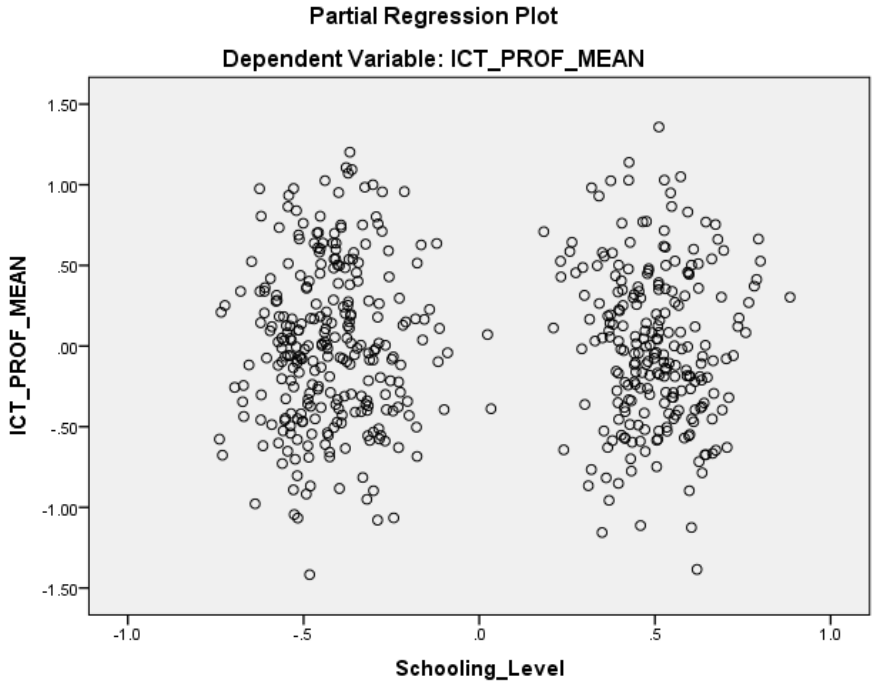

Figure H10. Scatterplot of Teachers' ICT proficiency and teachers' schooling level relationship

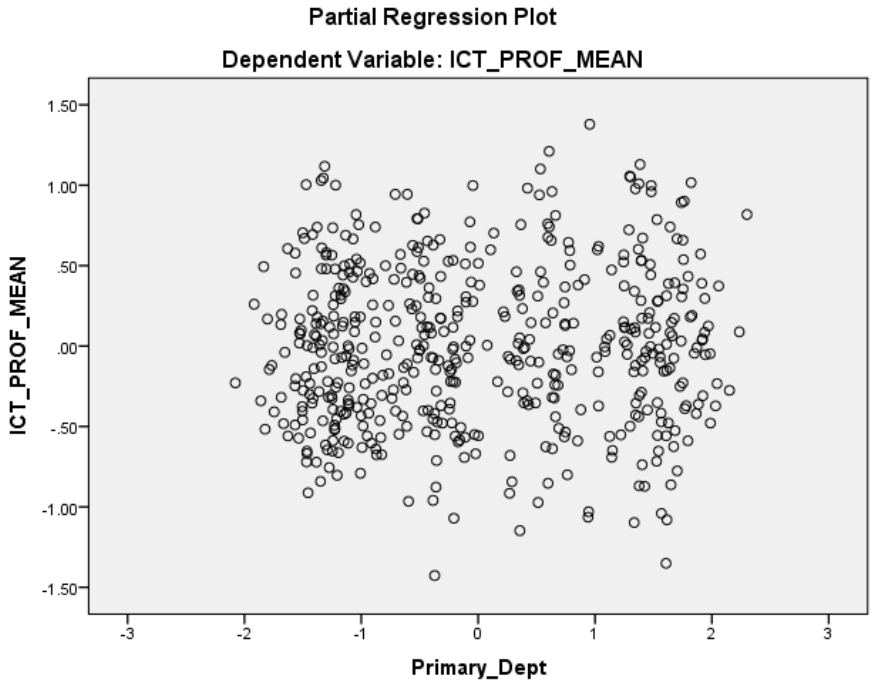

Figure H11. Scatterplot of Teachers' ICT proficiency and teachers' primary core subject relationship

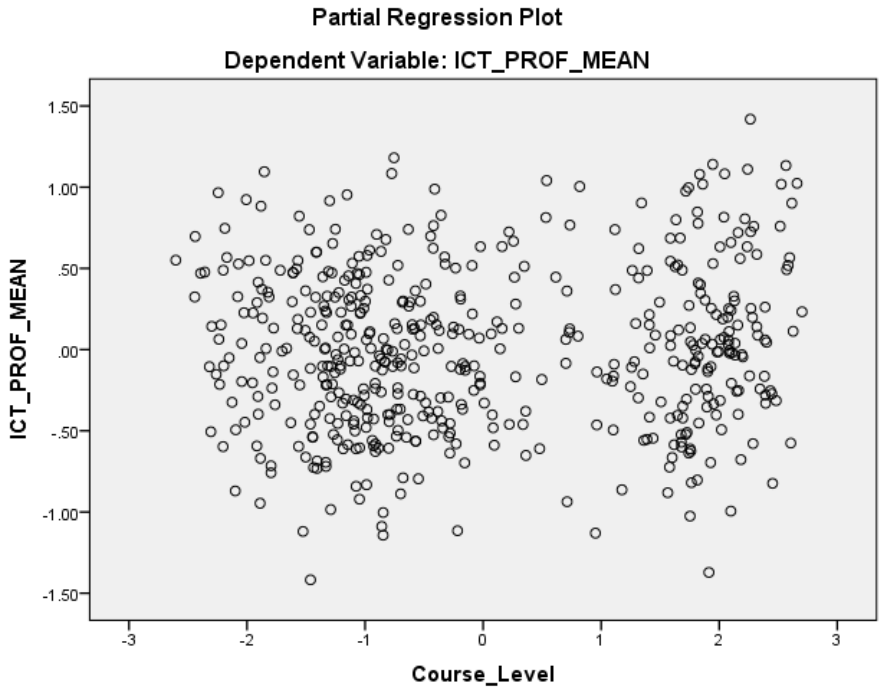

Figure H12. Scatterplot of Teachers' ICT proficiency and teachers' level of course taught relationship

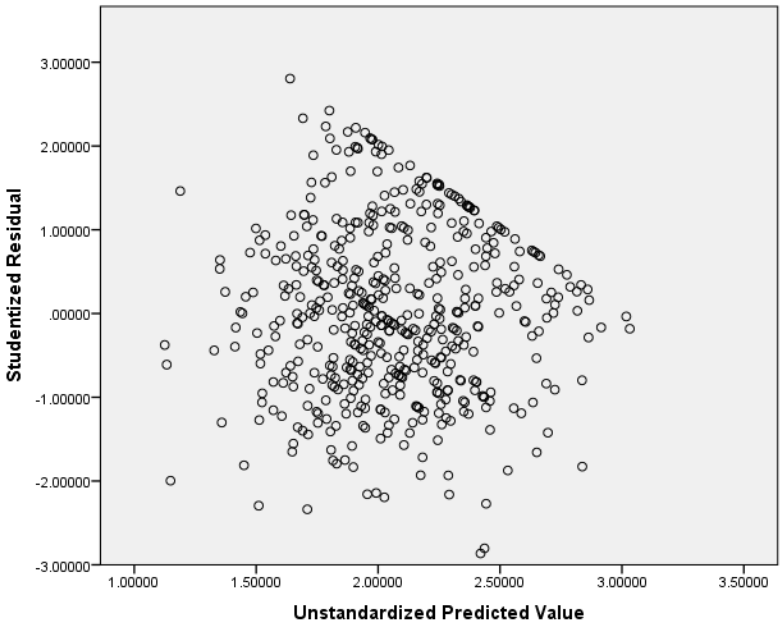

Figure H13. Plot of studentized residuals versus unstandardized predicted values.

Table H1

Multiple Linear Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.562	.316	.299	.49872	1.868

Note: Predictors: (Constant), course level, gender, ICT_ATT, earned Edtech course credits, schooling level, age range, primary core subject dept, hours of professional development, level of technology integration self-assessment, education, SCP_MEAN, & years of experience. Dependent variable: ICT_PROF_MEAN.

Table H2

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	56.931	12	4.744	19.074	.000
	Residual	123.368	496	.249		
	Total	180.299	508			

Note: Predictors: (Constant), course level, gender, ICT_ATT, earned Edtech course credits, schooling level, age range, primary core subject dept, hours of professional development, level of technology integration self-assessment, education, SCP_MEAN, & years of experience. Dependent Variable: ICT_PROF_MEAN.

Table H3

Coefficients

Model	Unstan Coeff.		Standard. Coeff.	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.77	.17		4.68	.000	.447	1.09					
ICT_ATT	.19	.06	.14	3.25	.001	.073	.297	.344	.144	.121	.753	1.327
SCP	.30	.06	.22	5.26	.000	.188	.413	.369	.230	.195	.766	1.306
Prof Dev	.06	.02	.11	2.74	.006	.015	.094	.240	.122	.102	.875	1.143
EdTech Courses	.11	.04	.11	2.91	.004	.036	.185	.192	.129	.108	.937	1.067
Use of Tech	.13	.02	.27	6.77	.000	.094	.171	.402	.291	.251	.877	1.140
Age Range	-.04	.03	-.07	-1.36	.173	-.089	.016	-.11	-.06	-.05	.539	1.855
Gender	-.06	.05	-.05	-1.25	.213	-.151	.034	-.04	-.06	-.05	.977	1.024
Education	.06	.05	.05	1.23	.220	-.033	.143	.061	.055	.046	.813	1.230
Experience	-.03	.02	-.08	-1.42	.158	-.071	.011	-.11	-.06	-.05	.489	2.045
Schooling Level	-.01	.05	-.01	-.14	.888	-.097	.084	-.01	-.01	-.01	.926	1.080
Core Subject Taught	.02	.02	.04	.95	.342	-.020	.056	.044	.043	.035	.947	1.056
Course Level Taught	.03	.02	.07	1.69	.091	-.004	.055	.118			.928	1.077

Note: Dependent variable: ICT_PROF_MEAN

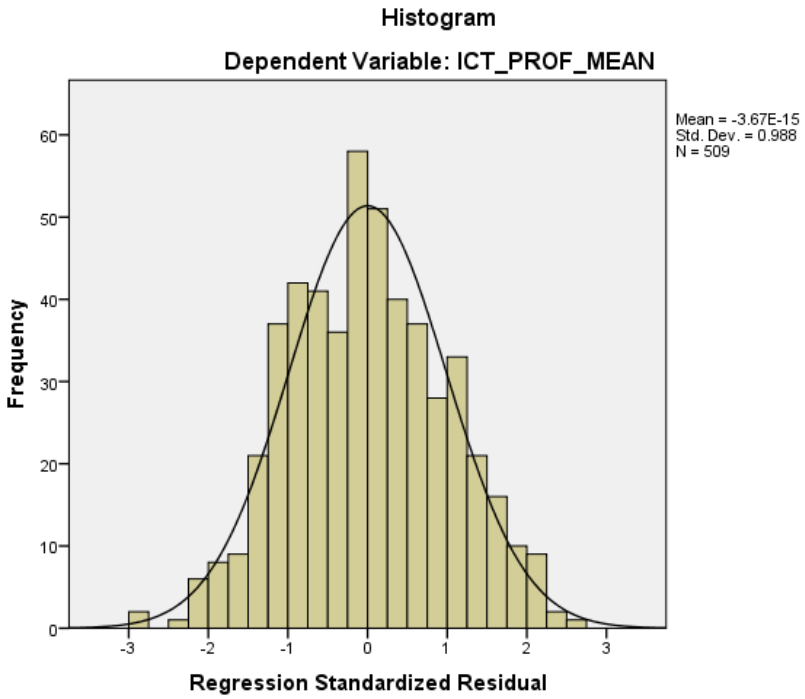

Figure H14. Histogram of standardized residuals that appear to be normally distributed.

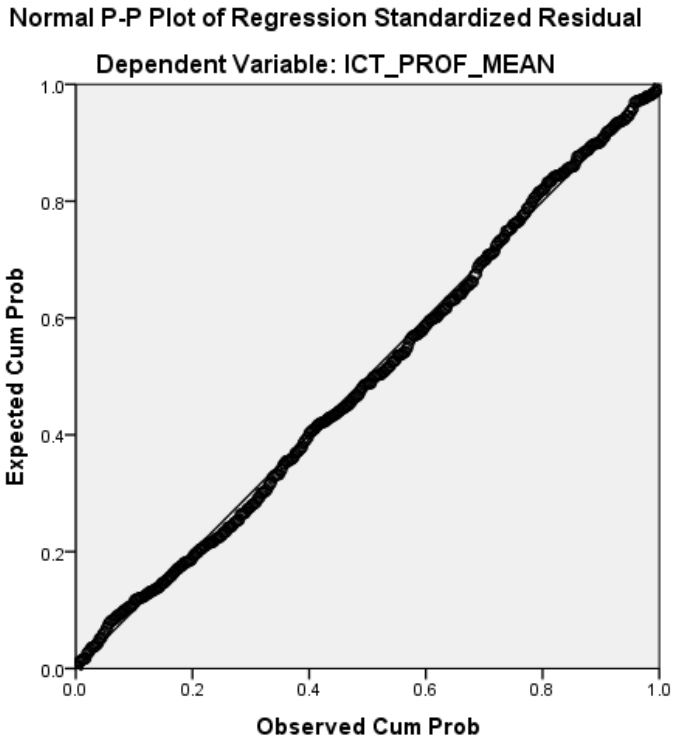

Figure H15. P-P plot that shows standardized residuals as normally distributed.