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Teacher Candidates' Digital Literacy and Their Technology Integration Efficacy

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TEACHER CANDIDATES' DIGITAL LITERACY AND THEIR TECHNOLOGY INTEGRATION EFFICACY

by

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(Under the Direction of Judith Repman)

ABSTRACT

The purpose of this study was to investigate perceived digital literacy levels and technology integration efficacy of preservice teaching (PST) candidates. The sample was comprised of PST candidates from two universities and one college in the southeastern United States that differ in size and culture. The study used a quantitative approach. PST candidates self-rated their digital literacy levels and technology integration efficacy using an online digital literacy survey. The relationship between PST candidates' perceptions of their digital literacy level and their level of technology integration efficacy was investigated. The existence of a digital divide has recently been of concern to educational stakeholders. Because of this concern, several other relationships with digital literacy were analyzed: age, race, financial aid status; laptop/personal computer/Internet accessible device ownership, time of laptop/personal computer/Internet accessible device ownership and Internet access level. The results of this study will be important to both College of Education faculty and P – 12 public school systems because digital literacy and technology integration efficacy within both content and pedagogical knowledge are important requirements necessary for our PST candidates to successfully take the helm of their 21st Century classrooms.

INDEX WORDS: 21st Century classrooms, 21st Century teaching, D-generation, Digital citizen, Digital divide, Digital literacy, Digital natives, Digital pedagogy, Educational technology, Generation M2, LoTi, Preservice teacher education candidates, TICS

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DEDICATION

This dissertation is dedicated to my daughter, Taylor Tyger and my mother, Tricia Henry and my step father, Ed Iannone. Thank you for years of never-ending faith, encouragement and love. Your confidence in me was the catalyst for my drive and perseverance. To the amazing people to whom I have been lucky enough to have in my life throughout this transformative endeavor, you have graciously supported my efforts and rallied with me throughout this journey: Jason Tyger, Roberta Lacefield, Sarah Majdiak, Kelli Senn, Dee Liston, Trina Brown and Michelle Nooney. Your individual support and kindness meant so much along the way. And I thank Laura Cahill who joined me at the end of this journey. Your love, passion, energy, and trust helped spur me on throughout these final opportunities and challenges and toward the finale. I love you all. Thank You.

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INTRODUCTION

A body of research suggests the existence of a digital divide between people born in 1980 or later and those born before. Marc Prensky first coined the term *digital native* to describe those born between 1980 and 1994 because they have grown up with technology and are native speakers of the digital language of computers, video games and the internet (Prensky, 2001, p.1). "As a result of their upbringing and experiences with technology, digital natives have particular learning preferences or styles that differ from earlier generations of students" (Bennett et al., 2008, p. 777). Other researchers agree with this concept to a point believing that some digital natives resemble the characteristics common in Prensky's and Bennett's framework, which includes having inherent techno-capabilities, being savvy with digital tools, games and media, and possessing non-linear, multi-tasking learning styles (VanSlyke, 2003). But these researchers still recognize that much diversity exists within that generation and age alone does not divide the digital native from the digital immigrant (VanSlyke, 2003). Timothy VanSlyke (2003 states that

> *One of the most significant problems I see with Prensky's description of the digital native culture is the g* eneralization that all of today's students fit the stereotype of the kid glued to the computer or the television 20 hours a day. A typical classroom is much more diverse, with students coming from a range of backgrounds. Many do not have computers at home, some have disabilities, and some are simply not interested in computer games. Can a computer game adapt its lessons to this diverse population? (para. 15, italics and spacing in original work).

Another body of research questions if a digital divide even exists or if stakeholders are overreacting tremendously (Bennett, Maton, & Kervin, 2008). Guo, Dobson, and Petrina (2008) found no statistically significant difference in information and communication technology (ICT)

competence among different age groups of preservice teachers. They said that "This study implies that the digital divide thought to exist between "native" and "immigrant" users may be misleading, distracting education researchers from more careful consideration of the diversity of ICT users and the nuances of their ICT competencies" (p. 235).

And yet another study shows the divide exists, but is determined by factors such as societal position, race, and gender, rather than age and educational status (Hargittai, 2010). The value of this body of research can be condensed as follows: we all live in the 21st century where 21st century literacy skills, including digital literacy, are required of everyone who wants to fully participate in society; to live without these new skills and literacies makes you an "other," an unequal member of the digital world. What determines who is digitally literate and who is not? How can this divide be narrowed?

Preservice teacher (PST) teacher education candidates will soon be certified teachers who will be expected to teach 21st century skills in 21st century classrooms. Being digitally literate and understanding how integrating technology into the curriculum taught in their classrooms will be necessary if they are to succeed as innovative teachers in the second decade of the 21st century and be part of the solution to end the digital divide. Many of our new teachers are members of generation Y, sometimes called "digital natives," the N-generation (net) or the D-generation (digital). We should not assume they have high levels of digital literacy or the desire to create digitally connected, interactive, student-oriented learning environments (Guo, Dobson & Petrina, 2008). If PST candidates are not digitally literate and confident about integrating new and emerging digital technologies into their classrooms thus passing on this cultural capital to their P – 12 students, would they actually perpetuate the digital divide? Assessing teacher candidates' working knowledge and understanding of the digital world is important for understanding how

prepared our candidates are for teaching in 21st century classrooms and if those candidates are committed to integrating technology into their curriculums.

Lankshear, Green, and Snyder (2000) assert "Literacy education continues to involve students learning and using old skills, but applying them in new ways via innovative technologies and new media" (p. 25). PST candidates have always been required to be literate and to possess content knowledge. Tests, such as the Regents test and the Georgia Assessment for the Certification of Educators (GACE), are in place to demonstrate this (Regents' Writing and Reading Skills, 2010**;** GACE, 2010). However, there is currently no requirement that candidates demonstrate that they are digitally literate and capable of applying those skills utilizing 21st century technologies. One available assessment*, iSkills*, which has been reintroduced by the Educational Testing Service, is an outcomes based assessment of ICT literacy skills. The *iSkills* assessment is aligned with the Association of Colleges & Research Libraries (ACRL) standards ("Reintroducing the *iSkills*™ Assessment from ETS," 2011). There is no required assessment for candidates that is aligned with the International Society for Technology in Education (ISTE) National Education Technology Standards for Teachers (NETS-T).

Digital literacy as a standalone tenet of education is hard to conceptualize, understand and assess. Some researchers have attempted to meet these challenges by creating a comprehensive framework for digital literacy. Eshet-Alkalai's (2004) generalized digital literacy framework includes five types of literacy skills: photo-visual literacy, reproduction literacy, information literacy, branching literacy, and socio-emotional literacy. Moersch originally created the Levels of Technology Implementation (LoTi) framework used to assess technology integration levels of educators. This has been modified into a new version titled the

LoTi Digital-Age Survey, which is based on the levels of teaching innovation framework. It is used to determine the teaching innovation levels of educators. Moersch's LoTi survey yields results as LoTi level scores and includes measurements on two sub-frameworks: Current Instructional Practices (CIP) and Personal Computer Use (PCU) (LoTi, 2010). The Partnership for 21st Century Skills framework includes an Information, Media, and Technology Skills sub-framework as one of four key elements. The other elements are Core Subjects and 21st Century Themes, Learning and Innovation Skills and Life and Career Skills. Although the Partnership separates the elements for discussion and assessment purposes, it presents all components as fully interconnected and a part of the larger process of teaching and learning in a 21st century environment ("P21 Framework Definitions," 2009, p. 1).

Several Australian researchers have found that both practicing teachers and new teacher graduates have low levels of understanding of digital literacies and low confidence levels in teaching these literacies (Hammond & Macken-Horarik, 2000; Makin & McNaught, 2001). These findings show that both today's and tomorrow's teachers may not be ready for the challenges and expectations of the 21st century teaching and learning environment.

The goal of this study was formed by the underlying idea that PST candidates' digital literacy level; their confidence in technology integration; and their predicted intentions to implement technology could be catalysts for closing the digital gap. The specific goals of this study were to search for evidence of a digital divide within our COE's candidates; to formulate an idea of how important our PST candidates believe technology integration is and to use the study's results to suggest that the new wave of teachers have the potential and are prepared to become change agents by narrowing the digital divide and extending digital agency to more P – 12 students.

Defining Digital Literacy

Defined concisely by Wikipedia, "digital literacy is the ability to locate, organize, understand, evaluate, and create information using digital technology" ("Digital Literacy," para. 1, 2010). Digital literacy has been defined as an umbrella framework for a number of complex and integrated sub-disciplines, or "literacies," comprised of skill, knowledge, ethics and creative outputs in the digital network environment (Calvani, Cartelli, Fini & Ranieri, 2008). Digital literacy incorporates more than possessing the knowledge, skills and abilities to use a computer and access the Internet. It involves an understanding of available components such as hardware, software, the Internet, cell phones, PDAs, digital devices and Web 2.0 tools. A person using these skills to interact with society may be called a digital citizen (Digital Literacy, 2010).

Aviram and Eshet-Alkalai, (2006) explain that the concept of digital literacy extends beyond competent computer use. "Digital literacy is usually conceived of as a combination of technical-procedural, cognitive and emotional-social skills" (Introduction section). Withrow (2004) explains "Literacy in the digital age means that we are informed and logical decision makers. *Literacy* means that we comprehend and analyze the various multimedia sources and, in the context of our own life, make rational decisions. We must be vigilant and even skeptical with respect to the information we use" (p. 32, italics in original work). Stated quite simply by Eshet-Alkalai (2004), "Digital literacy can be defined as survival skill in the digital era" (p. 102).

Context

The overarching theoretical context of this study was based on Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework. The TPACK conception is grounded in Shulman's 1986 analysis of teacher knowledge as both separate and intersecting knowledge of content and pedagogy (p. 11). The TPACK framework extends Shulman's formula by treating technology as a standalone knowledge domain, but also bringing to light that technology is woven throughout the content and pedagogical knowledge domains as well. An understanding of these intersections must be developed by our PST candidates if they are to meet the challenges set forth by the International Society for Technology in Education (ISTE) National Educational Technology Standards – Teachers (NETS-T) and The Partnership for 21st Century skills. TPACK researchers recommend a "learning technology by design" pedagogical approach to help PST candidates develop TPACK skills (pp. 1019-1020). Both NETS-T standards and 21st Century skills are examples of the TPACK theory in practice.

Additionally, this research was shaped by the belief that digital literacy becomes a necessity for PST candidates if they are going to develop knowledge of emerging technology and further, if they will be able to integrate technology into the pedagogy and content they will teach in their classrooms in the near future (Dutt-Doner, Allen & Corcoran, 2005). The T cannot be present in the TPACK analysis framework without digital literacy and the TPACK framework is worthless if our P-12 teachers are not committed to the technology integration necessary to embrace the potential of emerging technologies.

This study used the TICS instrument originally developed and used by Browne's (2009) Assessing Pre-Service Teacher Attitudes and Skills with the Technology Integration Confidence Scale research. Browne's research instrument utilized 28 self-efficacy items about technology

integration. All test items were based on the ISTE NETS-T. The NETS-T, and TPACK share the underlying idea that knowledge of technology, pedagogy and content are interrelated. The TICS instrument is linked to TPACK as well. Research has shown that TPACK improves as the confidence in using technology within content and pedagogy of the preservice teacher improves (Ozgun-Koca, Meagher, & Edwards, 2009/2010).

Lastly, this study was influenced by the Levels of Technology Implementation (LoTi) concept. Chris Moersch conceptualized the Levels of Technology Implementation Framework in 1994. It was meant to be used as a research tool to assess effective classroom technology use. The framework has been updated several times. Recently, LoTi was updated to meet the challenges put for by the Partnership for 21st Century Skills and the International Society for Technology in Education (ISTE) NETS-T. Thus "Technology Implementation" was replaced with "Teaching Innovation" forming the new LoTi framework, emphasizing both powerful learning and teaching and digital tool implementation measured along a continuum that takes into account new ways of teaching, new digital tools and Web 2.0 (Moersch, 2010, p. 20). Effective digital pedagogy can be created and improved upon by using TPACK, TICS and LoTi frameworks as guides.

Many dissertations have been based on the online LoTi Questionnaire and reference the framework ("Dissertation Studies Involving LoTi," 2010). Changes in pedagogical growth, student academic progress and digital-age instruction have been found to be statistically significant in different content areas and grade levels (Research Based Results, 2010). TPACK research, including numerous publications, presentations and TPACK-related dissertations highlighting effective digital pedagogy and its connection with content, technology and pedagogy, has been widely disseminated (Koehler, 2010).

The regional context of this study was the Southeastern United States. Specifically, this study took place in three Colleges of Education (COE) in Georgia. This context is similar to the national context of state universities and many private colleges nationwide in that enrollment numbers and student diversity are increasing dramatically across the board (Fry, 2010). Importantly, all Colleges of Education throughout the United States are being challenged to prepare teachers to be able to meet the International Society for Technology in Education (NETS) standards in their future classrooms.

Statement of the Problem

The digital literacy of our P – 12 teachers needs to be explored and addressed. If teachers beginning their careers in the second decade of the 21st century are not digitally literate they may not have the skills necessary to integrate technology into their classrooms to truly make them 21st century learning environments. PST candidates' efficacy about their technology integration ability also needs to be investigated. Both digital literacy and technology integration confidence levels are important to estimate because both are necessary in order to infuse current and emerging technology throughout the curriculum. It is important to discover if a digital divide, which would separate our future teachers into two groups: digital savvy or digital strangers, exists within the sample of PST candidates. Such a divide could lead to inequitable levels of technology integration in the classrooms they will lead.

Technology integration within classroom settings as a means of improving teaching and learning has been an important dialogue in education throughout the first decade of the twenty-first century (Comer, 2004, Withrow, 2004). Today technology integration is embedded within educational standards and is seen as a way to transform teaching, allowing teachers and students to do completely new things.

According to the experts at Edutopia, "Effective technology integration is achieved when its use supports curricular goals. It must support four key components of learning: active engagement, participation in groups, frequent interaction and feedback, and connection to real-world experts" (Core Concept: Technology Intervention section, 2010). Similarly, The Partnership for 21st Century Skills framework for student learning outcomes includes information, media and technology skills; learning and innovation skills, core subjects and 21st century themes; and life and career skills. This framework explains that 21st century skills for students are achieved through support systems: standards and assessments; curriculum and instruction; professional development and learning environments. Teaching innovation, including technology integration, is called for to achieve these student outcomes and support systems (Framework for 21st Century Learning, 2004). This dissertation study addressed the Edutopia technology intervention strategy and the challenges of the 21st Century Skills framework by investigating PST candidates' perceived literacy and capability with digital technology, and their current technology integration confidence and the value that the PST candidates currently place upon technology integration in the classroom.

This dissertation research was original. According to the LoTi website, many dissertations have used the original Level of Technology Implementation (LoTi) survey to assess current teachers or administrators teaching innovation levels, but few have focused on preservice teacher education majors ("Dissertation Studies Involving LoTi," 2010). At the time this dissertation research was published, no study had investigated the relationship between self-reported digital literacy levels of PST candidates with their current efficacy in technology integration in their future classroom milieu. Abbitt and Kumar recently conducted similar studies. Abbitt (2011) researched the relationship between self efficacy beliefs about technology

integration and preservice teachers' knowledge of TPACK. Kumar (2011) investigated preservice teachers' use of Web 2.0 tools and creation of digital content in both their personal lives and for educational purposes and how the use of digital technology in their personal lives transfers into the educational environment.

Research Questions

Based upon Hargittai's (2005, 2008) research and on Browne's Technology Integration Confidence Scale (TICS) (2009) instrument and relevant literature in the field, prestudent teaching (PST) teacher candidates' perceived digital literacy familiarity, knowledge, understanding and skills were explored. PST candidates perceived confidence in integrating technology into their future classrooms was investigated. A survey, based on several surveys which were previously used by Hargittai (2005, 2008) in her digital literacy research and on Browne's (2009) TICS, was created and modified into a digital format to better fit the needs of this research. It was used to collect information about PST candidates' perceived digital literacy and technology integration efficacy.

Specifically, this study focused on PST candidates who had not yet completed their required student teaching semester. The PST candidates were enrolled in the College of Education at three different Southeastern United States universities: Armstrong Atlantic State University, Brenau University, and Georgia Southern University.

This study was based upon the following overarching research question: "Will the next wave of teachers possess the 21st century skills necessary to become digital pedagogists?" Specifically, the following six research questions directed the study:

- What perceptions do PST candidates have of their own levels of digital literacy?
- What perceptions do PST candidates have of their technology integration efficacy?

- What is the relationship between the PST candidates' perception of their digital literacy and their perception of their technology integration efficacy?
- Is digital literacy or technology integration efficacy associated with laptop/personal computer and/or Internet accessible device ownership, years of ownership, or Internet access?
- Is digital literacy or technology integration efficacy associated with age, race, or financial aid status?
- Do PST candidates project they will use computers, Internet and digital technology in their teaching and in their students' learning process?

Socio-Cultural Perspective

Insight into the predicted intentions PST candidates have of integrating technology is important to gain because technology integration is required and is infused throughout national teaching standards ("NETS for teachers 2008," 2008). P – 12 students want technology integration; students want innovative teaching (Prensky, 2001). The YouTube video "A Vision of K – 12 Students Today," written and produced by Barbara Nesbitt of the School System of Pickens County, South Carolina, features 16 digital natives and is an excellent example of the desire Generation M^2 has for a digitally-infused curriculum. In this short video (2007), today's students seek understanding, recognition and action about how they learn and live today. In the first twenty seconds, text displayed on this multi-media presentation says, "Students will use engaging technologies in collaborative, inquiry-based learning environments with teachers who are willing and able to use technology's power to assist them in transforming knowledge and skills into products, solutions, and new information." The presentation goes on as a visual survey of many different digital tools and technologies embraced by today's students. The

second minute shows video of a string of students holding dry erase signs that summate into this message, "We expect to be able to create, consume, remix and share information with each other." This is followed with "76% of my teachers have never used wiki, blogs, podcasts;" "61% of my reading teachers never use digital story telling;" "But only ½ of us will graduate from high school." The producer wraps up this video by showing digital natives questioning how writing spelling words over and over again will help them in their future and then asking the viewer how digital video cameras, digital audio players, computer technology could teach them to think, create, analyze, evaluate, and apply. The video concludes by showing a string of students asking to be engaged and claiming, "We are digital learners." In 2007, only 54.9% of all students graduated from high school in South Carolina ("Diplomas Count 2010," 2010). Will our PST candidates believe they will be able to meet the demand for innovative teaching that members of Generation M^2 desire?

Of further significance is the fact that the ISTE's NETS have been adopted by 48 states and the District of Columbia (Smith, 2010). The ISTE claims that the updated NETS-T framework helps schools transition from the Industrial Age to Digital Age places of learning ("Nets for Teachers 2008," 2008). The transition to digital age learning is underway. As these NETS – T are being realized by our classroom teachers they will be guiding their P – 12 students to meet the NETS for Students (NETS-S) standards as well. P – 12 students will be expected to apply technology skills in authentic, integrated ways, to solve problems and complete projects using digital tools; to conduct research and use information literacy skills in appropriate ways; to use digital media and digital environments to communicate, collaborate locally and globally; and to develop into responsible digital citizens ("NETS for Students 2007," 2007). The classroom teacher will ultimately be responsible for insuring that all students develop the tools necessary to

achieve the NETS-S. What about those P – 12 students, members of Generation M^2, who are not digitally savvy because of various barriers? The Children's Partnership calls this group the digital divide's new frontier (Lazarus & Mora, 2000).

The digital divide's new frontier is not limited to P – 12 students. South African researchers Brown and Czerniewicz (2010) have studied information and communication technology (ICT) familiarity and access levels of South African university students. They criticize the term digital native because of the dichotomy created when it is used. They explain that adoption of the term creates a situation in which a student is or is not a digital native; is digitally elite or digitally impoverished, does or does not possess digital literacy skills and will or will not have access to the power and opportunity that comes from being on the right side of the divide. They have created their own powerful descriptor for this situation: digital democracy versus digital apartheid (p. 357). Brown and Czerniewicz (2009) call for a reconfiguration of the digital citizen concept. They investigated South African university students who were born in the digital age, but identified as either digital native or digital stranger, and their ICT access and literacy and their efforts to integrate technology into their lives. In this study, Brown and Czerniewicz refer to ICT access and literacy as objectified cultural capital. Bourdieu (1986) explains that cultural capital can be acquired but will always be "marked by its earliest conditions of acquisition" (as cited in Brown & Czerniewicz, 2009, p. 6). Although we cannot reverse the clock and insure that this cultural capital is made available to every student at the same time, educators can be proactive in closing this cultural capital divide and minimizing the effects of having acquired it later, chronologically, than others. COEs can help close the digital gap. Several strong steps COEs can take to help close the digital gap include striving to insure that PST candidates are digitally literate themselves, are prepared to lead P – 12 students to

higher levels of digital understanding and digital citizenship, and are confident using innovative, digital pedagogy throughout their classroom curriculum (Branch, 2003; Dutt-Doner, Allen, & Corcoran, 2005; Lazarus & Mora, 2000). This dissertation research began investigating the underlying, long-term question that asks, "will matriculating P-12 teachers whom are both confident and committed to meeting ISTE NETS-T standards minimize the long term effects that inadequate computer and technology access has caused?".

Monroe (2004) calls for a critical pedagogy for the digital age. She addresses the digital literacy issues facing those non-white poor students on, what she calls "the other side" of the digital divide. Monroe says that "Most of these issues revolve around reconciling writing theory and pedagogy with nonwhite, indigenous rhetorics. As communities on the other side of the digital divide become immersed in electronic media, the impact of technology on the lives, literacies, and learning of students of color must also be taken into account" (p. 1). The Children's Partnership says that most online content lacks cultural diversity and that there is little content about ethnically diverse American communities created by members of those communities themselves (Lazarus & Mora, 2000). This leaves members of ethnically diverse communities without the agency derived from contributing to the online world. This lack of a digital voice in the developing digital spaces marginalizes the ethnically diverse. Particularly for the 26 million foreign-born Americans, having little access to content created by members of their own cultural community is a severe form of disenfranchisement (Besser, 2001).

Some of this responsibility to narrow the digital literacy disparities that lead to digital divides inherently falls on teachers, thus, it falls on College of Education (COE) faculty to teach candidates how to best integrate technology into their learning designs as a means of action-oriented critical pedagogy and as a part of the process of becoming innovative teachers.

Definitions of Key Terms

21st century classrooms and/or 21st century teaching and learning: as defined by The LoTi Framework, characteristics of 21st century classrooms include instruction, assessment, and the effective use of digital tools and resources to promote higher order thinking, engaged student learning, and authentic assessment practices in the classroom ("LoTi heating up 21st century learning," 2010).

Digital citizen: the norms of appropriate, responsible behavior with regard to technology use. nine themes: digital etiquette, digital communication, digital literacy, digital access, digital commerce, digital law, digital rights &responsibilities, digital health and wellness, digital security/self-protection ("Nine Elements," n.d.).

Digital divide: refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communications technologies (ICTs) and to their use of the Internet for a wide variety of activities (Patricia, 2003, p. 32).

Digital literacy: the ability to locate, organize, understand, evaluate, and create information using digital technology ("Digital Literacy," n.d.).

Digital natives: those born between 1980 and 1994 who have grown up with technology and are native speakers of digital language of computers, video games and the internet (Prensky, 2001, p.1).

Digital pedagogy: the art, science or profession of teaching and learning using digital media and technology

D-Generation/ N-Generation/Generation Y/Net-Generation/NetGeners: the generation of students whom have grown up engaged in the digital world, "digital natives" is a

synonym. Members of this generation were born between 1980 and 1994.

Generation M²: the generation who now falls between the ages of 8 and 18; born after 1994; the second generation who have grown up with digital access, tools, and applications in their daily lives (Rideout, 2010).

ICT: information and communication technologies

Pedagogy: the art, science or profession of teaching ("Pedagogy," n.d.).

Pre-Student Teaching Teacher Candidate (PST teacher candidate): students whom have obtained candidacy status in undergraduate education programs and have not yet participated in the required semester-long student teaching experience that culminates their program of study. This requirement is sometimes called Internship II or Preervice; therefore, these candidates are sometimes referred to as preservice teachers or pre-internship teachers in the literature.

Web 2.0: Internet use characterized by high user engagement, intellectual rigor, frequent updating, and collective knowledge sharing based on an underlying technological infrastructure of blogs, wikis, podcasts, photosharing, RSS feeds, social bookmarks, and the like (O'Reilly, 2005; Anderson, 2007).

CHAPTER 2

REVIEW OF LITERATURE

Introduction

A society which is mobile, which is full of channels for the distribution of a change occurring anywhere, must see to it that its members are educated to personal initiative and adaptability. Otherwise, they will be overwhelmed by the changes in which they are caught and whose significance or connections they do not perceive.

John Dewey (1916, p. 88)

But this is not just a joke. It's very serious, because the single biggest problem facing education today is that ***our Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language.***

Marc Prensky (2001)

Technology will change the way we organize and operate our schools. We are no longer constrained by books and on-site teachers. For more than a decade, we dreamed that technology can provide learning at any place and any time.

Frank Withrow (2004, p. 4)

"teachers need to know not just the subject matter they teach but also the manner in which the subject matter can be changed by the application of technology"

Punya Mishra & Matthew J. Koehler (2006, p. 1028)

Overview

This chapter presents literature which situates digital literacy and technology integration, the two broad areas of concern in this study within the field of curriculum studies. Following this, literature connecting the research questions with the need for digital literacy and technological integration in our P – 12 schools and our colleges of education is presented. Literature about the role of 21st century P – 12 teachers and technology integration; the digital divide; and the role digital literacy plays in the theories and practices of critical pedagogy and social justice were examined. Several studies that focused on the perceptions teacher candidates have about their abilities and efficacy to utilize these abilities in the future were also presented because this dissertation study examined the perceptions PST candidates had about their digital literacy and technology integration efficacy.

Positioning this Study in the Field of Curriculum Studies

This study extends from contemporary experientialism and constructivism which have their roots in broader philosophies of education with influences stemming from Socrates, Plato, Kant, Jean Piaget, John Dewey, Lev Vygotsky, and Jerome Bruner.

Connectivism is the learning theory for the Digital Age (Siemens, 2005). Connectivism, brings together Vygotsky's active learning theory, Papert's constructivism and Bandura's social cognitive theory with the addition of the idea that learning involves technology and is a process of creating connections and networks and that learning can lie within and outside of ourselves. Connectivism reflects the underlying social environment of the digital world in which we learn, live and play today. In connectivism, knowledge evolves from the manipulation of technology and the organization of the networks created; connections are valued more than the current state of knowing because connections allow us to learn more (Siemens, 2005).

Educational justice and emancipatory pedagogy, both subsets of critical pedagogy and social justice, are the underlying premise of my research but are not necessarily a part of the framework. Rather, the outcomes derived from the praxis of contemporary experientialism, constructivism, and connectivism theories support these constructs.

Experientialism is a philosophical theory. Epistemologically, experientialists believe that experience is the source of all knowledge. Constructivism can be thought of as a type of experientialism. Constructivists posit that knowledge is not a product, an object, a tangible thing, but it is constructed by an individual through one's own experience of that object. It is based on the premise of successive knowledge-building that increases in depth and complexity from stage to stage (Jean Piaget, n.d.). Socrates, 469 – 399 BC, derived several of the underpinnings of constructivism. He claimed that there are basic conditions for learning that are in the cognition of the individual, that learning was an inner experience and that why we learned was more important that what we learned (Kanuka & Anderson, 1999). Plato, 428 – 348 BC, generated the idea of teacher as a facilitator, which is a pillar of an experiential education model which shares much of the same framework as constructivism, including seeing the engaged student at the center of the learning experience.

Jean Piaget is considered the pioneer of the constructivist theory of knowing. In *Conversations with Jean Piaget,* Bringuier quotes Piaget saying, "Education, for most people, means trying to lead the child to resemble the typical adult of his society . . . but for me and no one else, education means making creators. . . . You have to make inventors, innovators—not conformists" (Piaget, as quoted in Bringuier, 1980, p. 132). Piaget believed the teachers' role was to create spaces and opportunities for exploration, discovery, assimilation and accommodation. He believed in an active, learner-centered educational philosophy where

teachers facilitate the discovery of new learning. Instructional technologies such as multimedia, hypermedia and virtual reality support Piagetian educational philosophy (Ginn, n.d.). "To understand is to discover, or reconstruct by rediscovery, and such conditions must be complied with if in the future individuals are to be formed who are capable of production and creativity and not simply repetition" (Piaget, 1972, p.20)

John Dewey, a late nineteenth and early twentieth century American philosopher and pragmatist as well as an experimentalist, believed real experiences were required for education to commence. He stated that social, cultural, technological, philosophical experimentation could be used as an approximate arbiter of truth (Dewey, Professor John (1859-1952), n.d.). Dewey held experimentation in high regard. Experimentation, sometimes called project-based learning, is a tenet of constructivism. Dewey's philosophy on education focused on learning by doing and not on rote learning and dogmatic instruction. Digital pedagogy shares this focus. Ninety-five years ago, in *Democracy and Education*, Dewey (1916) criticized traditional American schooling, calling for a paradigm shift.

> Why is it, in spite of the fact that teaching by pouring in, learning by a passive absorption, are universally condemned, that they are still so entrenched in practice? That education is not an affair of 'telling' and being told, but an active and constructive process, is a principle almost as generally violated in practice as conceded in theory. It is preached; it is lectured; it is written about. But its enactment into practice requires that the school environment be equipped with agencies for doing, with tools and physical materials, to an extent rarely attained (p. 46).

Digital pedagogists can be the agents for curriculum change. According to the U.S. Department of Education, National Center for Education Statistics, most schools are equipped

with the tools necessary to change the traditional practice of schooling. Unlike the school environment which concerned Dewey nearly 95 years ago, public schools today are equipped with the tools and materials to make education active and constructive. According to a survey conducted in 2009, 99% of public school teachers either had a computer in their classroom everyday or could have computers brought into their classroom. Only 34% of secondary teachers and 44% of elementary teachers reported using computers (themselves or student use) for instructional purposes "often." Interestingly, of all public school teachers, 72% use LCD projectors, 13% use videoconferencing units, 57% use interactive whiteboards, and 35% use classroom response systems, 49% use digital cameras, 36% use MP3players/iPods, 56% use document camera, and 50% use handheld devices "sometimes or often" (Gray, Thomas & Lewis, 2010). Dewey noted the need for a curriculum change nearly a century ago; the time has come to put experientialist and constructivist theory into practice in our new digital landscape ("Introduction – Education in the 21st Century," 2010).

James Neill (2005) explained that Dewey believed knowledge "delivery" to students needed to be balanced with a much greater concern with the students' actual experiences and active learning. Neill wrote

> Dewey said that an educator must take into account the unique differences between each student. Each person is different genetically and in terms of past experiences. Even when a standard curricula is presented using established pedagogical methods, each student will have a different quality of experience. Thus, teaching and curriculum must be designed in ways that allow for such individual differences (para. 5).

Digital pedagogy recognizes multiple intelligences and differences between individual learners; places great importance on active, engaged, inquiry-based learning using digital tools and

technology; and focuses on deep, meaningful and authentic learning for all students (Beetham & Sharpe, 2007).

Inquiry is a key component of the learning process as perceived from the experientialist as well as constructivist viewpoint. Dewey has been thought of as the grandfather of experiential education and the first advocate of project based learning which can be a form of inquiry. Piaget (1972) and Papert (1999) believed students should be investigators of their own scientific projects. Papert believed this form of inquiry would lead students to love learning because it became such a personal affair. Curriculum designed for active inquiry and project-based learning, accommodating varied learning styles, are tenets of instructional technology and digital pedagogy (LoTi Heating Up 21st Century Learning, 2010). Inquiry based learning is often collaborative in nature, providing opportunities for teams of students to investigate problems that are real to them. Digital pedagogy and digital-based curriculum are driven by these ideas: constructivism, experientialism, inquiry and project-based learning, collaboration, and individual differences (Fawcett & Juliana, 2002).

Influenced by Piaget, Lev Vygotsky (1962), the father of social constructivism, introduced the social aspect of learning into constructivism. Vygotsky's stress of the importance of a student's cultural background put him at odds with Piaget's theory that presumes learning developed in successive order for all. Vygotsky realized that different cultures stressed different social interactions. He defined the "zone of proximal development," according to which students solve problems beyond their actual developmental level (but within their level of potential development) under adult guidance or in collaboration with more capable peers leading to self-confidence and motivation (1962, p. 108).

Influenced by Piaget and Vygotsky, their contemporary Jerome Bruner (1960) initiated a new child development theory based on the notion that learning is an active, social process in which students construct new ideas or concepts based on their current knowledge. In 1960, Bruner identified four significant aspects of effective teaching and learning: (1) attitude towards learning, (2) knowledge presented in a way that accommodates the student's learning ability, (3) material presented in effective sequences, and (4) carefully considered and paced rewards and punishments. He held that knowledge instruction should progress from simple concepts to formulating new propositions and the manipulation of information ("Bruner," n.d.).

Papert (1999), who often collaborated with Piaget, is considered to be among the world's foremost experts on how technology can improve teaching and learning. He originated the idea of integrating technology with the constructivist philosophy. In an interview Dan Shwartz (1999) explained what drives Papert:

> It's one thing for a child to play a computer game; it's another thing altogether for a child to build his or her own game. And this, according to Papert, is where the computer's true power as an educational medium lies -- in the ability to facilitate and extend children's awesome natural ability and drive to construct, hypothesize, explore, experiment, evaluate, draw conclusions -- in short to learn -- all by themselves. It is this very drive, Papert contends, that is squelched by our current educational system (para. 3).

The educational theory of connectivism, which incorporates tenets of experientialism and constructivism, is the conceptual framework for this study. This research embraces the potential power of digital pedagogy and was conducted under the assumption that digital pedagogy can be a powerful tool used to change an educational system that strangles so many students' eagerness to learn. This idea is aligned with Papert's beliefs. Papert believed that computer technology

could be a platform for both knowledge discovery and creation, thus facilitating student learning on an individual basis (Schwartz, 1999). Similarly, the connectivist theory posits that knowledge evolves from the manipulation of technology. Grounded in these connectivist beliefs about knowledge, this study analyzed the preparedness of PST candidates to address the unique needs of learners by using digital pedagogy, which is interactive, project-based, collaborative, and student-centered.

Digital Literacy and Technology Integration in Colleges of Education

Michele Knobel (2011) discussed the need for a paradigm shift in teacher education programs so the next generation of teachers will be digitally literate and will become digital technology leaders. Knobel (2011) explained that "digital literacy is key to this new way of thinking. It is a catalyst and an enabler of the kind of collaborative, participatory learning we all need to embrace. Enormous numbers of people are already seamlessly practicing a range of digital literacies in their personal and professional lives. We as teachers -- and those who train teachers -- must weave such practices into what we do as well" (para 5.). COEs must begin addressing digital literacy and technology integration within the program of study (Knobel, 2011). It is imperative that COEs understand what digital literacy is as it pertains to education and that COEs investigate the current digital literacy levels of PST candidates and develop educational experiences that afford PST candidates opportunities to incorporate digital literacy and technology as a part of teaching practices (Dutt-Doner, Allen & Corcoran, 2005; Knobel, 2011). Several frameworks have been developed to address these needs including NETS-T and TPACK.

Digital Literacies

Calvani, Fini and Ranieri (2009) explain that digital literacy can be both tangible and intangible. They say that digital literacy

> is being able to explore and face new technological situations in a flexible way, to analyze, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one's own personal responsibilities and the respect of reciprocal rights/obligations (p. 60-61).

The broad concept of digital literacy includes various literacies. Information literacy and Web 2.0 literacy are two specific literacies that fall under the umbrella term of digital literacy. Information literacy involves recognizing the need for information, the ability to locate information, the critical thinking skills necessary to evaluate information and the efficacy and competence to use the information. The nature of Web 2.0 literacy includes high levels of user interactivity and engagement, intellectual rigor, collaboration and collective knowledge. Web 2.0 literacy requires understanding of and competence using Web 2.0 tools and technologies and the ability to frequently update content within. Web 2.0 tools include blogs, wikis, podcasts, photosharing, RSS feeds, and social bookmarking. Individuals who are literate in Web 2.0 will be able to actively participate within the World Wide Web by creating and sharing digital information and artifacts using these tools (Anderson, 2007; O'Reilly, 2005). Calvani, Fini and Ranieri (2009), Anderson, (2007), and O'Reilly's, (2005) definitions of digital literacy includes both information and Web 2.0 literacies.

PST candidates need Web 2.0 literacy ("NETS for teachers 2008," 2008). Fahser-Herro and Steinkuehler (2009) explain that while colleges and universities are infusing Web 2.0

literacy practices in faculty training, no real definitive body of research has been published detailing teacher preparation programs and Web 2.0 technologies. “The nonexistent corpus of research detailing teacher preparation programs or current practices with digital literacies makes it difficult to measure their existence or success” (Fahser-Herro & Steinkuehler, 2009-10, p. 57). They say that “teacher inservice programs have not been formally charged with including digital literacy in coursework to critically explore Web 2.0 tools on the Internet or investigate implications for practice” (p. 57).

Many PST candidates are members of the Net Generation. Oblinger and Oblinger (2005) found that members of the Net Generation typically lack information literacy skills, and their critical thinking skills are often weak. Digital literacy, which by several definitions includes information literacy skills, critical thinking skills, and Web 2.0 competence, should be achieved by all PST candidates. The International Society for Technology in Education (ISTE) created the National Educational Technology Standards for Teachers (NETS-T) in 2000 and refreshed the standards in 2007 and again in 2008. The NETS-T define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings (“NETS for Teachers 2008,” 2008). The NETS-T requires technology integration throughout the P – 12 curriculums; however, technology integration cannot be achieved without digital literacy. PST candidates may not have the skills needed to design technology-rich, interactive activities for their content areas, many of which are optimized using Web 2.0 tools (Fahser-Herro & Steinkuehler, 2009-2010). PST candidates may not be learning these skills in their undergraduate curriculum. Insuring that PST candidates achieve digital literacy and value the need to continuously learn emerging digital tools and technologies is a challenge for COEs.

This research investigated the digital literacy and technology integration efficacy of PST candidates as well as the intentions PST candidates have in integrating technology in the classroom. COEs must prepare PST candidates to meet the NETS-T standards. Several frameworks and technology integration methods were investigated.

Technology Integration into the COE: TPACK

Researchers (Mishra & Koehler, 2005; Niess, 2005) have been taking notice of the need for exploring new ways teacher education programs can include digital tools and pedagogy as a part of the teacher education curriculum. Mishra and Koehler (2005) and Niess (2005) developed an integrated framework to be used to prepare PST candidates to be competent with content, pedagogy and technology in technology-rich environments, calling the assessment Technological Pedagogical and Content Knowledge (TPACK). TPACK gives the field of teacher preparation "an analytic lens for studying the development of teacher knowledge about educational technology" (Mishra & Koehler, 2006, p. 1041). TPACK is based upon Shulman's (1986) pedagogical content knowledge (PCK) framework which addressed the fact that teachers know content, and they know pedagogy and that their intersection becomes pedagogical content knowledge. TPACK adds technological knowledge (TK) as a third dimension to this framework which creates three intersections of two knowledge areas: TPK, TCK, PCK and one intersection of all three knowledge areas referred to as TPACK.

Ozgun- Koca, Meagher, and Edwards (2009/2010) demonstrated that COE faculty should not assume their students are competent to infuse digital technology within their content area. Ozgun-Koca, Meagher, and Edwards' (2009/2010) study showed that only 40% of the secondary mathematics PST teachers in the study group perceived themselves to be fairly capable of having their future students use technology to learn mathematics. After completing a semester long

technology-rich mathematics methods course focusing on technology integration, 84% felt fairly capable of having their future students use technology to learn secondary mathematics. This shows that teacher candidates need to be taught how to use technology with pedagogy in innovative ways within the content area they will be teaching.

Currently, there is no test being utilized to demonstrate that PST candidates have a TPACK skill set even though they will be required to meet the ISTE NETS-T standards in their future classrooms. Cox and Graham (2009) investigated a new framework that can be used to analyze teacher knowledge of TPACK. Cox and Graham (2009) found relationships between what grade level in-service teachers taught and their level of TCK and TPK. Cox and Graham believe this finding to be useful for structuring the teaching of technology (TK) in teacher education programs. For example, Cox and Graham (2009) found that elementary teachers had stronger TPK and less TCK and college professors have stronger TCK. Cox and Graham (2009) say, "Findings regarding the composition of TPACK in elementary and secondary teachers would impact the structure of teacher education technology training" (p.69). Cox and Graham's (2009) framework could be used as a basis for an instrument to evaluate PST candidates' TPACK.

Both COE faculty and PST candidates could benefit from having the PST candidates' current TPACK perceptions evaluated (Chai, Koh & Tsai1, 2010). Chai, Koh and Tsai (2010) used stepwise regression models of their pre and post TPACK survey results and found pedagogical knowledge (PK) to have the largest impact on PST candidates' TPACK. They believed this was because technology integration was presented in a pedagogical manner. PST candidates need to be taught TPACK within their subject area and given opportunities to

demonstrate their acquisition of TPACK (Cox & Graham, 2009; Ozgun-Koca, Meagher, & Edwards, 2009/2010).

In further effort to help PST candidates develop TPACK competence, they need to witness the effective use of digital tools and information and communication technologies (ICT) by in-service teachers (Larose, Grenon, Morin & Hasni, 2009). Larose, Grenon, Morin, and Hasni (2009) studied the effect field training sessions had on preservice teachers' probability of using ICT in their school. In a longitudinal study, they analyzed the computer skills of preservice teachers and the attitudes the preservice teachers had toward the integration of ICT in teaching in primary and secondary teacher education programs at the University of Sherbrooke. This research concluded that it was important for in-service teachers mentoring preservice teachers in the field to demonstrate successful use of ICT in their classrooms, thus modeling innovation. Preservice teachers who experienced this type of positive ICT use in the classrooms they trained in were more likely to plan to implement it in their future classrooms. Larose, Grenon, Morin, and Hasni (2009) believe that for preservice teachers to have this positive classroom experience with ICT, intervention in the form of continuing education is needed for in-service teachers. They see conflict in the use of ICT in teacher education programs and the often limited use of ICT in in-service teacher classrooms. Larose, Grenon, Morin, and Hasni (2009) concluded that, "The development of continuing education in relation to the pedagogical integration of ICT from an epistemological perspective that fits with the new curriculum perspective is therefore the main condition for the evolution of students' representations and attitudes toward computer technology in school during preservice teacher education" (p. 300).

PST candidates can also benefit from collaboration with faculty in learning to effectively use technology in meaningful ways, which helps develop TPACK. Dutt-Doner, Allen, and

Corcoran (2005) discuss teacher preparation as it pertains to Type II technology, not traditional Type I technology. Type I technologies are those that help teachers teach the same things in the same ways they have been being taught, such as drill and practice software (Maddux & Cummings, 1987). Type II technology allows computers to create new ways of teaching; it places the student at the center of the interaction. Students can construct knowledge. Type II technologies often include simulations, programming and word processing (Maddux & Cummings, 1987). Web 2.0 tools can be considered Type II technologies based on this definition. Muir (2001) explained that Type II technologies empower students to do levels of work they could not do before or, at least, to do it easier. Muir explains that the right technologies enrich and accelerate basic skills and that students find them motivating and engaging. Web 2.0 tools can be considered Type II technologies because they prescribe to the original definition. They include simulations, programming and word processing, among many other applications.

Dutt-Doner, Allen and Corcoran's (2005) case study focused on PST candidates learning to integrate digitized primary source documents, a Type II technology, into curriculum. Digitized primary sources are abundantly available through the Library of Congress which works with P – 12 schools, universities and libraries to help teachers learn to use their vast collection for instructional purposes. In this study, PST candidates were introduced to the role the school library media specialist could play in collaborating with them as PST candidates and in the future, as in-service teachers, on issues such as technology integration and information literacy skills. Dutt-Doner, Allen and Corcoran (2005) emphasize the collaborate nature of teaching and need for multiple resources to succeed. Their case study modeled this approach. Their goal was to improve PST candidates' library and information technology skills in order to transform

pedagogy. Dutt-Doner, Allen, and Corcoran (2005) concluded that "the development, execution, and assessment of successful Type II technology applications must be taught, modeled, exercised and assessed as embedded curriculum within the teacher preparation program" (p. 67).

Technology Integration into the COE: Faculty Collaboration

In an effort to help the COEs prepare PST candidates to achieve high levels of TPACK, meet the NETS-T standards, and improve digital literacy skills, researchers have investigated innovative ways to integrate digital literacy and information literacy into COE curriculum (Branch, 2003; Dutt-Doner, Allen & Corcoran, 2005; Witt & Dickinson, 2003).

The Education Department at Illinois Wesleyan University explored collaboration between education faculty and library faculty as a means to improve the skills in information literacy pedagogy of PST candidates. Witt and Dickinson (2003), Information Services Librarian and Public Services Librarian respectively, attempted to meet the new Core Technology Standards on information literacy skills instruction, adopted by the Illinois State Board of Education in 2000. Witt and Dickinson's (2003) case study showed that librarian-teacher cooperation and collaboration was a successful method of teaching the required standards-based information literacy skills. They also found it to be an effective approach "to mentor preservice teachers in practical methods of integrating information literacy instruction in both their student teaching and their future professional lives" (p. 76).

In a similar case study involving the partnership of COEs and library faculty to improve information literacy skills and technology infused pedagogical methods , Dutt-Doner of the Department of Education, Niagara University, New York collaborated with Allen, the Director of Libraries and Academic Technologies, Nichols School, Williamsville, New York and Corcoran, Educational Consultant at the Nichols School to improve the preservice graduate

teacher education program curriculum regarding technical literacy, Web resources, and teaching experiences involving the integration of technology. Specifically, they focused on improving and practicing collaboration as a strategy for technology integration, using digitized primary source documents for problem solving and knowledge construction, and leveraging technology to encourage active learning (Dutt-Doner, Allen & Corcoran, 2005).

In a similar effort that involved the joint efforts of the COE and library faculty, The University of Alberta has had success using a Teacher-Librarianship by Distance Learning Program, coordinated by Jennifer Branch. Branch's (2003) case study focused on PST candidates developing knowledge of on teaching, learning and information literacy. Branch's (2003) results showed the need to help PST candidates understand how to integrate information literacy skills into their own future teaching practices, rather than merely teaching PST candidates' information literacy alone.

Fahser-Herro and Steinkuehler (2009-2010) warn "Truly preparing students for life in the 21st century will require a restructuring of teacher training programs, a redefinition of literacy practices, and a reworking of traditional print-based curricula" (p. 60). The Common Sense Media (2009) organization says "Teachers must understand the basic technologies and applications, as well as what their students are doing with them, if they are to teach 21st-century skills and ethics successfully," (p. 9). The role of the 21st century teacher is challenging.

Digital Literacy and Technology Integration in P – 12: 21st Century Teacher

The United Sates National Education Technology Plan (NETP) has developed a model of 21st century learning "powered by technology, with goals and recommendations in five essential areas: learning, assessment, teaching, infrastructure, and productivity" ("Executive Summary," 2010). The role of the 21st century teacher varies greatly from that of the 20th

century teacher where literacy and numeracy were the cornerstones of curriculum ("Secondary Education in the United States," 2007). 21st century teachers need to be wise architects of a new digital pedagogy and confident navigators of our digital society (21st Century Schools, 2010). They need to be able to pass along this cultural capital to their students, teaching them not only to be literate, but to be digitally literate, responsible digital citizens of our digital society. They need not assume their students arrive in their classrooms with these skills (Withrow, 2004). Former Senior Learning Technologist for the U.S. Department of Education Frank Withrow forecasted the effects digital society would have on our schools in the year 2010 first in 1999. In *Literacy in the Digital Age: Reading, Writing, Viewing, and Computing*, Withrow (2004) questions whether educators can provide an educational model for learners to have anytime/anyplace access to learning. Withrow (2004) warns that "The teacher who fails to bring technology to the desk of the learner is failing to practice the high calling of teaching. Teachers must become accountable" (p. 53).

Opportunities and Challenges

Several opportunities and challenges for P – 12 teachers have emerged: Opportunities and challenges one - Digital literacy; Opportunities and challenges two - Digital pedagogy; and Opportunities and challenges three - NETS - T. A brief summary of the opportunities and challenges follows: Opportunities and challenges one: 21st century P -12 teachers must be digitally literate, digital citizens. We live in a digital world. To have agency and power and control over one's own situation requires digital literacy and engagement as digital citizens (Brown & Czerniewicz, 2010; Fahser-Herro & Steinkuehler, 2009-2010, "Digital Literacy and Citizenship in the 21st Century," 2009). Opportunities and challenges two: 21st century P -12 teachers must become digital pedagogists whom understand the art, science and profession of

teaching and learning using digital media and technology (Prensky, 2001). This challenge requires not only the knowledge of how to use technologies, but how to integrate technology within pedagogical and content knowledge contexts (Mishra & Koehler, 2006). And, Opportunities and challenges three: 21st century P – 12 teachers must be able to meet the high standards The International Society for Technology in Education (ISTE) has established, which support the NETP.

These challenges have brought about a curricular shift which is evident in literature and on the internet. Michael Fisher recently coined the term "DigiGogy" and formed the "Digigogy Collaborative." Fisher explains that, DigiGogy represents a paradigm shift in education and the rise of a digital pedagogy. Fisher (2011) says "The Digigogy Collaborative is dedicated to the development of 21st Century Fluencies within a strong pedagogical framework to enhance professional practice and to ultimately do what is in the best interest of students. This certainly includes a multitude of cutting edge technologies, with an emphasis on collaboration, conversation, critical thinking, and global connectivity" (Fisher, 2011).

Opportunities and Challenges One: 21st Century P – 12 Teachers - Digitally Literate

Opportunities and challenges one: P – 12 teachers must become digitally literate (Fawcett & Juliana, 2002). Much of the responsibility of insuring future P – 12 teachers become digitally literate will inherently fall upon the COE; however, in-service teachers must be given opportunities to gain digital literacy and stay current in emerging digital technologies (Knobel, 2011). COEs may find it difficult to insure their candidates are digitally literate. Knobel (2011) says teacher education programs are still teaching traditional skills in traditional ways and that digital literacies, which are marked by collaboration, engagement and trial and error are not the

norm. Knobel says that "traditional skills still get all the respect, and the teacher still has all the answers" (para. 3.). Knobel warns that this approach must change. Knobel says,

> If we need a paradigm shift in how we teach K-12 students (and we do), we need to rethink how we prepare teachers. At all levels, up-and-coming teachers and their instructors need to know the potential of the digital practices they can tinker with and explore. And they should tinker with them in the same way school students do -- regularly and imaginatively. They need to think of themselves as learners, seeking out learning partners, improvising, and exploring with the confidence to experiment with what they don't know.
>
> Digital literacy is key to this new way of thinking. It is a catalyst and an enabler of the kind of collaborative, participatory learning we all need to embrace. Enormous numbers of people are already seamlessly practicing a range of digital literacies in their personal and professional lives. We as teachers -- and those who train teachers -- must weave such practices into what we do as well." (para. 4-5).

Knobel (2011) explains that professors of education need support and training if they are going to be able to transform teaching practices in the COE thereby transforming teaching practices in the P – 12 schools.

Opportunities and Challenges Two: 21st Century P – 12 Teachers - Digital Pedagogy

Opportunities and challenges two: P – 12 teachers cannot opt out of digital pedagogy (Withrow, 2004). Digital pedagogy is a learning theory for today's digital society and it reflects the way much of Generation Y, and now, Generation M^2, has grown up. The challenge is how to bring teachers into this fairly new digital age (Withrow, 2004). Withrow (2004) explains this new role saying that teachers will need to re-learn how to teach so that the student becomes the

focus. Withrow (2004) further explains that "Technology does that; it concentrates the learning and teaching partnership on the learner rather than the teacher" (p. 53).

For example, Pickens County South Carolina requires their teachers to demonstrate technology proficiency. Developing teachers must create an e-portfolio that shows competence making a Student-Centered 21st Century Learning lesson aligned with ISTE NETS-Student standards. A student population and an assessment tool must be included. Professional development education units follow initial certification. Examples of self-directed study that counts as a part of professional development includes learning Web 2.0 tools such as Animoto, learning software packages such as PhotoStory, learning to blog and use digital document camera ("Teacher Tech Proficiency 2010-11," 2010).

The State of Queensland, Department of Education and Training, Queensland, Australia acknowledges digital pedagogy and the importance of using digital technology to improve teaching and learning ("Digital Pedagogy Licence Indicators," 2011). They offer their teachers ICT Certificates, Digital Pedagogy Licences, and Digital Pedagogy Licence Advanced. Teachers seeking their license create their own digital portfolio. Their website lists 12 indicators which teachers must value and demonstrate. Among these are:

> "I understand how ICT can support and enhance what students learn, how they learn, and when and where their learning takes place;"
>
> "I proved opportunities for students to purposefully use online environments to communicate or collaborate with others in their learning, including participation in projects in local, national or global communities;"

> "I plan learning experiences within units of work where ICT is used through all stages of the learning process to achieve curriculum goals based on students' diverse learning needs;"
>
> "I provide opportunities for students to construct deepen and demonstrate knowledge using digital resources and technologies in inquiry processes;'
>
> "I provide opportunities for students to use digital resources, technologies and online environments to enhance the learning of concepts and processes;"
>
> "I promote students' reflective learning, critical thinking skills and creativity through the use of digital resources and technologies;"
>
> "I develop students' digital literacies including the ability to authenticate, critically evaluate and select relevant information and resources" ("Digital Pedagogy Licence Indicators," 2011).

Opportunities and Challenges Three: 21st Century P – 12 Teachers - NETS - T

Opportunities and challenges three: 21st century P – 12 teachers must be able to meet the high standards The International Society for Technology in Education (ISTE) has established, which support the NETP. These standards are titled the National Education Technology Standards for Teachers, or NETS-T. NETS-T includes five specific indicators for digital literacy which are intended to serve as benchmarks and can be used to mark progress and achievement (Table 2.1). NETS-T are in place to insure all students, in all classrooms are given appropriate opportunities to achieve the newest version of literacy. The ISTE explains, in the Standards of Global Learning in the Digital Age section of their web site, that the NETS –T serve to guide

today's educators in providing a learning environment that takes students beyond the walls of their classrooms and into a world of endless opportunities. The NETS-T "technology standards promote this classroom transformation by ensuring that digital-age students are empowered to learn, live, and work successfully today and tomorrow" ("Transforming Learning Environments with Technology," para. 1**).**

Table 2.1

NETS – T

NETS#	Standard
1	**Facilitate and Inspire Student Learning and Creativity** "Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments."
2	**Design and Develop Digital-Age Learning Experiences and Assessments** "Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS•S. Teachers:"
3	**Model Digital-Age Work and Learning** "Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society. Teachers: a. demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations; b. collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation; c. communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats; d. model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning."
4	**Promote and Model Digital Citizenship and Responsibility** **"**Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices."
5	**Engage in Professional Growth and Leadership** "Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. Teachers:"

(*NETS for teachers 2008*)

Discourse on the Digital Divide

The concept of the existence of a digital divide creates a dichotomy based upon digital competence and confidence: you have it or you don't; you are or you are not; you have digital agency or you do not (Brown & Czerniewicz, 2010). The digital divide as defined by some researchers, is formed by age; while for other researchers, it is formed by variables such as access, circumstance, etc. The following sections highlight the major research on the digital divide; criticism of this digital divide dichotomy; and present ways in which the digital divide directly relates to curriculum theory.

Digital Divide: Age-Related

Many researchers believe that a digital divide exists and that it is formed by age (Oblinger & Oblinger, 2005; Palfrey & Gasser, 2008; Prensky, 2001a; Tapscott, 1998). All of these authors have published on the digital divide; naming the two sides and giving parameters and characteristics that define them.

Tapscott (1998) first coined the term "Net Generation" in a bestselling book that detailed this generation's differences from previous generations. Tapscott (1998) sees the digital divide created by generational or age differences. He says that because of Net Gen's access to digital media they learn, work, think, shop and create differently than their parents. Tapscott (1998) coined another new term to name this condition "Generational Lap," instead of gap. Tapscott (1998) says that "When it comes to understanding and using the new media and technology, many parents are falling woefully behind their children. We've shifted from a generation gap to a generation lap - kids "lapping" adults on the technology track" (p. 452). Tapscott (1998) explains that accepting the "Generation Lap" will bring us closer to closing it and that children are the authorities and we should learn with them.

Oblinger and Oblinger (2005) use the term Net Generation or Net Gen for students born between 1982 and 1991. The categories for those born prior to 1982 are either Generation X (1965-1982), Baby Boomers (1946-1965), or Matures (1900-1946). Oblinger and Oblinger (2005) claim that Net Gen students are digitally literate. Net Gen students are also characterized using the following terms and concepts: connected; immediate; experiential; social; teams; structure; engagement and experience; visual and kinesthetic; and things that matter. Oblinger and Oblinger (2005) offer an example of a typical Net Genner, Eric.

> Eric wakes up and peers at his PC to see how many instant messages (IMs) arrived while he slept. Several attempts to reach him are visible on the screen, along with various postings to the blog he's been following. After a quick trip to the shower, he pulls up an eclectic mix of news, weather, and sports on the home page he customized using Yahoo. He then logs on to his campus account. A reminder pops up indicating that there will be a quiz in sociology today; another reminder lets him know that a lab report needs to be e-mailed to his chemistry professor by midnight. After a few quick IMs with friends he pulls up a wiki to review progress a teammate has made on a project they're doing for their computer science class. He downloads yesterday's chemistry lecture to his laptop; he'll review it while he sits with a group of students in the student union working on other projects. After classes are over he has to go to the library because he can't find an online resource he needs for a project. He rarely goes to the library to check out books; usually he uses Google or Wikipedia. Late that night as he's working on his term paper, he switches back and forth between the paper and the Internet-based multiplayer game he's trying to win.[1]

Information technology is woven throughout Eric's life, but he probably doesn't think of it as technology. One generation's technology is taken for granted by the next.

> Computers, the Internet, online resources, and instantaneous access are simply the way things are done. Eric is a member of the Net Generation; he's never known life without the Internet (p.20).

Similar to the "Net Generation" terminology, Prensky (2001a) coined the dichotomous terminology "Digital Natives" and "Digital Immigrants." Digital natives are those born in 1980 or thereafter; anyone born prior to 1980 is a digital immigrant. Prensky (2001a) said of the N-gen or D-gen that, "the most useful designation I have found for them is *Digital Natives*. Our students today are all "native speakers' of the digital language of computers, video games and the Internet" (p. 1). Prensky (2001a) explains that everyone else who was not born into a digital world but has adopted the new technologies will always be digital immigrants in comparison to the digital natives. Prensky (2001b) believes that "Digital Natives brains are *physically different* as a result of the digital input they received growing up (p. 1, italics in original work). Prensky (2005) warns digital immigrants that "Our students are no longer 'little versions of us,' as they may have been in the past. In fact, they are so different from us that we can no longer use either our 20th century knowledge or our training as a guide to what is best for them educationally" (p. 9).

Prensky (2009) goes on to explain that in this digital age, thinking and wisdom have become "a symbiosis of the human brain and its digital enhancements" (p. 7). Digital natives experience life differently than any other generation before. They are digitally enhanced beings and accept this status (Prensky, 2009). Prensky (2009) explains that digital natives deal with ethical issues, such as truth and wisdom differently. Prensky (2009) coined a new term naming this new existence "Homo Sapiens Digital."

Palfrey and Gasser (2008) have adopted Prensky's (2001a) terminology of "Digital Native" or "Digital Immigrant" to name the divide. Palfrey and Gasser (2008) see the generation of digital natives as very unique. They have written a guidebook, *Born digital: Understanding the first generation of digital natives* to help explain the digital present and prepare stakeholders, whom are digital immigrants, for the digital future.

No matter what terminology is adopted, many researchers agree that those born in 1980/1982 or after are comfortable with technology and use it constantly (Foehr, 2006; Oblinger & Oblinger, 2005; Palfrey & Gasser, 2008; Prensky 2001a, 2005, 2009; Tapscott, 1998). Other researchers realize that many, but not all, of this generation are comfortable with technology and that it is infused into their daily lives; the generation is not digitally homogenous. What causes the division between those who live digitally connected and those who do not?

Digital Divide: Non-Age-Related

Research has shown that the digital divide can be created by factors other than age. Access to digital technology and digital tools and experience using both is often the root cause of why someone is not digitally literate. Research has also shown that although there may be differences in how younger and older generations use technology, there is also variation within generation (Bennett, Maton, & Kervin, 2008).

Brown and Czerniewicz's (2010) study with South African university students found that age was not a factor that determined if one was a 'digital native' or not. Brown and Czerniewicz (2010) do not approve of the term 'digital native' and state that it is both empirically and conceptually problematic and quite possibly offensive (p. 357). They explained that the digitally undeveloped should not be considered 'immigrants.' Brown and Czerniewicz (2010) said, "A serious problem with the idea of 'digital native' is that it is an 'othering' concept. It sets up a

binary opposition between those who are 'natives' and those who are not, the so-called 'digital immigrants' (p. 357). Brown and Czerniewicz (2010) found that 93% of the 'digital strangers' identified in their study said that off campus access to ICT was difficult, 28% had very poor access and 49% had no access at all (p. 363). 57% of the students with no off campus ICT access and 44% of the group, who had to rely on a third party, such as an Internet café, for ICT access were from the low socio economic group. These findings support the concept that access and experience are strong indicators of how digitally literate one would perceive themselves to be.

Henderson and Honan's (2008) study of how technology was used in two middle-years classrooms in Australia focused on the connection between teaching pedagogy, access to digital technologies both at home and at school and the teacher's recognition of digital skills students bring with them into the classrooms (p. 85). This ethnographic study showed that there were differences in digital literacy within generation due to access to digital tools at home and school and that the digital divide within this group of middle age students may not be closed if teachers' pedagogical approaches to digital literacy did not take students' prior experience with digital tools in mind. Henderson and Honan (2008) found the need for "teachers to be cognisant of the diversity in understandings about digital technologies that students bring to school. Such understandings are important if teachers want to ensure that school engagement with digital literacies is indeed preparing students to cope with the literacy demands of a rapidly changing and increasingly technological and globalised world" (p, 95).

Hawisher and Selfe (2004) studied the different ways two women, a generation apart, became literate with ICT. These researchers, however, did not focus merely on the age of these two women. They focused on a complex concept called the *cultural ecology* of electronic

literacy. Hawisher and Selfe (2004) discussed how the acquisition of electronic literacy is effected by *cultural ecology*, which includes: "social contexts; educational practices, values, and expectations; cultural and ideological formations like race, class, and gender; political and economic trends and events; family practices and experiences; and historical and material conditions" (p. 644).

Tapscott (1998) has researched the diversity of the Net Gen quite extensively and discusses the digital divide and believes that it is widening. He says, "What we know for certain is that children without access to the new media will be developmentally disadvantaged" (p. 7). Tapscott (1998) warns that "The most widely feared prediction surrounding the digital revolution is that it will splinter society into a race of information haves and have-nots, knowers and know-nots, doers and do-nots -- a digital divide." (p. 255).

Digital Divide Criticism

Many researchers do not support the idea of the existence of a digital divide; especially when the term, digital divide, is interpreted as intended by Prensky delineated by those born before 1983 and those born after (2001a).

Garcia and Qin (2007) studied the generational gap for technical ability, by surveying four different age groups of students about their perceptions of their comfort level with technology based learning tools and skills. The age groups were divided as follows: group 1 members were less than 21 years old; group 2 was called the Millennials and members were between 21 and 25 years old; group 3 members were between 26 and 35 years old; and group 4 members represented the older students and were 36 years old and older. Garcia and Qin (2007) found somewhat of a technical divide. ANOVA results showed significant differences among the four groups in 13 out of 22 questionnaire items (Garcia & Qin, 2007, p.3). Post hoc analyses

showed that group 2 –Millenials were significantly more comfortable than group 4 – older students in performing following digital tasks:

1. participating in an online asynchronous discussion;
2. participating in an online synchronous discussion;
3. uploading a webpage to a server;
4. creating a presentation using PowerPoint or a similar software program;
5. inserting graphics, tables, or charts into a word processing document;
6. inserting graphics, tables, or charts into a Web page;
7. inserting graphics, tables, or charts into a PowerPoint presentation;
8. using an electronic spreadsheet, such as Excel, to organize, analyze, and calculate data;
9. using an electronic spreadsheet, such as Excel, to perform mathematical calculation;
10. navigating a Web site or course that is online;
11. looking up professors' or fellow students' e-mail addresses using the university's online directory;
12. logging on to a university computer to find personal documents and settings; and
13. learning new tools and techniques independently (Garcia & Qin, 2007, p.3).

Jones, Ramanau, Cross, and Healing, (2010) were critical of the idea that Digital Natives are a distinct generation. They studied first year students, born after 1983, at five universities in England and found the group not homogenous in their digital knowledge, skills and understandings. They surveyed the use of several Web 2.0 tools, blogs, wikis and virtual worlds, and found that 21.5%, 12.1%, and 2% respectively had ever added content to one of these tools.

Jones, Ramanau, Cross, and Healing, (2010) found age-related variations among the population but claim that it was too simplistic to describe the group as one generation called Net Generation or digital natives. They caution academia about changing to accommodate a new generation.

In critique of the concept of the digital divide, Guo, Dobson, and Petrina (2008) studied the intersection of age and ICT competence. They studied 2000 preservice teachers enrolled at the University of British Columbia, Cananda. Guo, Dobson and Petrina (2004) found no statistical significance in ICT competence between these four age groups: 20-25, 26-29, 30-40, over 40. They conclude their research saying that in practice, rather than theory, the digital divide is not evident and they warn that the assumption that a digital divide exists, "may be misleading, distracting education researchers from more careful consideration of the diversity of ICT users and the nuances of their ICT competencies" (p. 236).

Digital Literacy, Critical Pedagogy and Social Justice Constructs

Connection with Curriculum Studies

Critical pedagogy and social justice are the powerful, yet subdued guides of this dissertation research. Critical pedagogy and social justice are philosophies of education rooted in critical theory ("Critical Pedagogy on the Web," n.d.).

Henry Giroux (2010) defined critical pedagogy as an "educational movement, guided by passion and principle, to help students develop consciousness of freedom, recognize authoritarian tendencies, and connect knowledge to power and the ability to take constructive action" ("Critical Pedagogy,"). The Critical Pedagogy on the Web (2011) site explains that "critical educators attempt to disrupt the effects of oppressive regimes of power both in the classroom and in the larger society. Critical pedagogy is particularly concerned with reconfiguring the traditional student/teacher relationship, where the teacher is the active agent,

the one who knows, and the students are the passive recipients of the teacher's knowledge" ("What is Critical Pedagogy section," para. 1). Liberatory educator Paulo Freire is the most well known critical pedagogist. Freire's emancipatory educational efforts exemplify the essence of critical pedagogy. Freire encouraged students to think critically about their education situation which would lead them to recognize the interconnectedness between their individual experiences and problems and the social context in which they lie within ("Critical Pedagogy on the Web," n.d.). According to Critical Pedagogy on the Web (n.d.), many critical pedagogues have retained the Freirean emphasis on critique, disrupting oppressive regimes of power/knowledge, and social change while embracing postmodern, anti-essentialist perspectives of the individual, of language, and of power.

Social justice, as an action-oriented educational philosophy, is designed to promote educational equality throughout the learning milieu and to establish these values within the student consciousness ("Teaching for Social Justice," 2011). Renowned twentieth century philosophers and theorists associated with their work in critical pedagogy and social justice include John Dewey, W.E. B. Du Bois, Henry Giroux, Michael Apple, Ira Shor, Peter McLaren, Gloria Ladson Billings, Geneva Gay, Lisa Delpit, bell hooks, Donaldo Macedo, and William Ayers. For example, in *Democracy and Education*, John Dewey wrote the first theories about technical education and student engagement in the classroom making him quite possibly the first advocate for teaching for social justice (Teaching for Social Justice, 2011). In chapter one of *The Souls of Black Folk*, W.E.B. Du Bois (1903) discussed the need for equality and social justice for blacks of the South explaining that they need the right to vote and a good education.

Hudson (1999) explains that since the 1980s, educational reformist/theorist Henry Giroux, as well Michael Apple, Ira Shor, and Peter McLaren, has been in the forefront of efforts

to develop a critical theory and practice of education applicable to conditions in the contemporary United States. The condition Hudson is referencing is capitalistic society. The main critique these theorists have is that schools are reproducing class systems through sorting and tracking and hidden curriculums including the injustices of capitalism, sexism and racism (Hudson, 1999). In *Culture and the Process of Schooling,* Giroux (1981) offered a theory and practice for education that would be critical of institutions and practices as well as being able to transform the current institutions and practices, thus transforming society itself. Establishing educational equality within institutions and practices is part of this transformative theory (Hudson, 1999). Giroux (1988) stated that teachers should be "transformative intellectuals" who can "educate students to be active, critical citizens" and "speak out against economic, political, and social injustices both within and outside of schools" (pp. 124 – 128).

Gloria Ladson-Billings, Geneva Gay, Lisa Delpit, bell hooks, Donaldo Macedo, and William Ayers, have been affiliated with Culturally Relevant Teaching (CRT). CRT uses cultural referents to impart knowledge, skills and attitudes thus empowering students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes. For example, one of the tenets of CRT is that "Teachers and students participate in a broad conception of literacy that incorporates both literature and oratory." Digital web authoring tools, such as iMovie, Windows Movie Maker, Posterous, Dreamweaver and Story can be useful in this area (Nuñez-Janes, M. & Re Cruz. A., 2008). One of the characteristics of CRT is to help students make connections between community, national, and global identities (Culturally Relevant Teaching, 2011). According to The Center for Culturally Responsive Teaching and Learning, Culturally Responsive Pedagogy includes 21st

century teaching and learning and embraces technology integration as a key role in CRT praxis (n.d.).

Emancipatory Pedagogy and Educational Justice

Emancipatory pedagogy and educational justice praxes are two action-oriented components of the critical pedagogy and social justice philosophies of education. Both praxes directly influence this study in digital literacy and the digital divide.

Emancipatory pedagogy

Schwartz (1999) explains that emancipatory pedagogy is an approach to education that teaches students how to think, not what to think. Emancipatory pedagogy is a process of teaching and learning that involves the use of multiple ways of knowing that centers students and teachers, who are also considered learners, in ways of teaching and learning that are based on asking and solving problems rather than on transmission and reproduction of information (Freire, 1993) . Critical pedagogists believe that education should be designed to be emancipatory. Emancipatory pedagogy is a subset of critical pedagogy and social justice theories. Education theorists and curriculum theory researchers have long written on the subject of literacy and agency which directly pertains to emancipatory pedagogy. The traditional concept of literacy is associated with power and agency which are tenets of emancipatory pedagogy. Degener (2007) discusses critical theory in literacy in "Making Sense of Critical Pedagogy in Adult Education." Degener concisely explains the beliefs many prominent critical theorists have about literacy. In sum, Degener (2007) says that critical theorists believe that "a person's level of literacy, the role the nature of the printed material that this person reads and writes, and the role that literacy plays in his or her community all contribute to how that person is perceived by him- or herself and by society. Critical theorists believe that becoming literate involves not just learning how to read

and write but also learning how to use literacy to examine critically one's position in life in terms of socioeconomic status, gender, educational background, and race (Freire, 1993; Freire & Macedo, 1987; Giroux & McLaren, 1992)."

Literacy has been defined for the global population by The United Nations Educational, Scientific and Cultural Organization (UNESCO). UNESCO (2009) defines literacy as the "ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society" ("Literacy Assessment and Monitory Programme (LAMP) – UNESCO").

The definition of literacy has had to be updated to reflect the Information Age. Literacy has been redefined and it incorporates information and communication technology (ICT). Lankshear and Knobel (2006) explain that information access in the 21st century changes the meaning of literacy. Decoding and encoding text is no longer sufficient. The aspect of literacy has changed because we are transitioning into a society that communicates on the level of "many-to-many," to one which formerly could not. Digital literacy is one of these new literacies, incorporating the ability to digitally decode, encode and communicate with the masses in digital spaces. If education in the Information Age will reach the emancipatory goals critical pedagogists strive for, then digital literacy will become a necessity (Gail, 2004).

Educational justice

The goal of educational justice is to equalize opportunities for achieving essential educational outcomes. Waltenberg (2006) labeled this as the "educational optimum;" where

opportunities for achieving essential educational outcomes are to be equalized. Digital literacy and digital pedagogy play an important role in teaching for educational justice (McBride, 2011).

Teaching for social justice means that you first recognize the multiple forms of oppression, understand that oppression is cyclic, and that you take action in the classroom to disrupt the cycle of oppression (Russo, 2004). Social justice educators work for educational justice at the grass-roots level. They may attempt to promote unity throughout their student body and diminish boundaries that infiltrate the general curriculum and accommodate the continuation of the cycle of oppression. These boundaries are often determined by race, class, ability, language, appearance, sexuality, and gender. Researchers have shown that these boundaries can be made less finite when digital pedagogy practices are successfully used within the curriculum (McBride, 2011).

Melanie McBride, a Canadian educator and researcher, wrote about situated emergent learning, transmedia and affinity culture in virtual environments. In McBridge's (2011) blog "Putting the social (justice) in social media pedagogy," five interesting question that challenge educators to recognize and to critically think about the intersection of digital spaces in education and social justice are presented. McBride's questions can help guide classroom teachers in bridging the theory of teaching for social justice with praxis in the digitally-rich 21st century classroom. They are:

1) **Privacy, data-mining and the ethics of teaching in corporate social space**

Are corporately datamined and surveilled commercial social networks (like Facebook) the same as community-developed, open source spaces for learning and teaching? What does it mean to use commercial spaces versus community spaces?

2) **Open Pedagogy and the need for safe spaces**

With the increasing emphasis on openness and transparency online – the open sharing of our work, identities, interests and associations – what are the hidden risks for marginalised, exploited, oppressed or politically active users? How can those who promote Open models and spaces ensure that our privacy rights are both respected and protected? Do youth, kids and at-risk groups face different challenges and consequences for "sharing" than power holders?

3) Personal technology, classism and brand bullying

How could the use of personal technology in the classroom reinforce classism, brand bullying and inequity? How are educators and educational institutions going to avoid reinforcing classist inequity while staying current by allowing "personal" tech? Who pays for the "personal" tech (dataplans, etc)?

4) Assessing equity and diversity in web2.0 social spaces and technologies

What are the primary questions we have to ask when assessing the use of a new technology in relation to anti-oppression and differentiated learning? For example, if we promote the use of a blog have we properly scaffolded the various hidden curriculum pre requisites that blogging requires (i.e., entitlement to a "voice," confidence to speak and have an opinion, traditional literacies and communications skills – that might be assumed but not present in all learners, awareness of the social and behavioural codes that mediate online community spaces, etc). Aside from access or ownership of technology, are we using tools that privilege a particular class, cultural bias or cognitive learning style (at the expense of differentiated instruction)?

5) Beyond "ed tech" skills: Equity2.0 as professional development

> Aside from "technical" knowledge, what kinds of social justice, equity and diversity "competencies" should 21st Century educators have? How can we facilitate a greater alignment towards equity and social justice pedagogy among the next generation of wired educators – who may be more excited by the media than the social (of social media) (McBride, 2011).

The research questions about digital literacy, technology integration efficacy, and the digital divide asked in this dissertation study are easily linked with McBride's (2011) presentation. McBride's questions extend the concept of digital literacy, technology integration and the digital divide into the praxis of teaching for educational justice. McBride's questions raise the awareness teachers have of the relationship between educational justice and Web 2.0 technologies.

Other researchers have linked educational justice and emancipatory pedagogy theory and practice with digital literacy, the digital divide and digital pedagogy. Brown and Czerniewicz's (2010), Henderson and Honan's (2008), Tapscott's (1998), and Hawisher and Selfe's (2004) research findings about the student diversity of access to and experience with digital tools and technology and digital literacy acquisition can be considered educational justice research and are easily linked to the curriculum theory of Paulo Freire. For example, the idea of cognizance of diversity (although not specific to the diversity of understanding of digital technologies) and the idea of the diversity of the prior knowledge students arrive in the classrooms with is not a new idea in educational theory (Huber-Warring & Warring, 2005). Freire often discusses the importance of cognizance of diversity of students' prior knowledge and life experiences twenty-five years ago (Freire & Macedo, 1987).

Freire's educational theory is relevant to the discourse of digital literacy, the digital divide and digital pedagogy. Freire's theory includes several underlying theories. Freire's theory of learning and theory of value are two of these underlying theories. Freire's theory of learning explains how skills and knowledge are acquired as a part of a process where knowledge is presented to the learner who then shapes is through her understanding, discussion and reflection (Freire, 1998). Freire's theory of value is rooted in valuing not only what knowledge and skills are worth learning, but, on a larger scale, valuing the overarching goal of education. Freire believes the overarching goal of education should be to raise the awareness of students so they become subjects, not objects, of the world. Freire believed this is done by teaching students to think democratically and to continually question and to use critical thinking as a tool to make meaning from what they learn (Freire, 1993). Digital literacy is linked with Freire's theory of value because digital literacy involves not only reading and writing "text" (digitally), but analyzing, critiquing and using digital technology for empowerment and agency ("Literacy assessment and monitory programme (LAMP) – UNESCO," 2009).

Digital literacy and digital pedagogy can also be connected to Freire's theory of learning. For example, Freire believes that students have to construct new knowledge from knowledge they already possess; digital pedagogy is influenced by constructivism and places great value on students developing and using critical thinking skills. Freire (1998) challenges teachers to learn how the student understands the world so that the teacher understands how the student can learn; digital pedagogy acknowledges collaboration between student, embraces the idea of student-as-teacher and it is rooted in connectivism. Freire has spoken on the globally-interconnected nature of community. Freire (1973) said

To be human is to engage in relationships with others and with the world.... Men relate to

> their world in a critical way. They apprehend the objective data of their reality (as well as the ties that link one datum to another) through reflection--not by reflex, as do animals.... Transcending a single dimension, they reach back to yesterday, recognize today, and come upon tomorrow (p. 3).

Freire (1998) said that educators need to know the world in which their students reside. He challenged educators saying that, "They need to get to know their dreams, the language with which they skillfully defend themselves from the aggressiveness of their world, what they know independently of the school, and how they know it" (p. 72). 21st century students reside in a digital culture where they are digitally-connected to the world (Rideout, Foehr, & Roberts, 2010; Rideout & Vandewater, 2003; Salaway & Caruso, 2008). 21st century teachers need to understand this digital culture, too (Prensky, 2001a). 21st century citizens need to become digitally literate ("Literacy assessment and monitory programme (LAMP) – UNESCO," 2009).. Digital literacy is defined concisely as the ability to locate, organize, understand, evaluate and analyze information using digital technology ("Digital Literacy," n.d.). The United Nations Global Alliance for ICT and Development (GAID), (2008) states that digital literacy is required for students to make the transition from objects to subjects of the world.

Critical Pedagogy and Social Justice Constructs: Critique

This dissertation research embraces both critical pedagogy and social justice as educational theories; however, both have been criticized. Critics of critical pedagogy attack the methodology, the affect and the effect of the theory and practice. Three contrary views of critical pedagogy follow:

- When an individual attains the interest to find out the validity of the statements they inherently must consider themselves separate from the rest of society. Critics

will describe such a self-image as being elitist in a way which excludes the bulk of society thus preventing progress.

- The goal exceeds the desire to instill creativity and exploration by encouraging detrimental disdain for tradition, hierarchy (such as parental control over children), and self-isolation.
- Such a high degree of distrust in generally accepted truths will create or perpetuate conspiracy theories ("Critical Pedagogy – Definition," 2010).

Critics of social justice education have two main arguments. The first argument claims that there is a lack of evidence supporting the philosophy's effectiveness as either a behavioral or instructional strategy while the second argument says that values cannot be explicitly taught, nor should they be taught (Russo, 1994; Stern, 2009).

Curriculum Studies Connections

The roles of digital literacy, technology integration and the digital divide, which are the broad areas of concern in this study, have been positioned in the field of curriculum studies. Experientialism, constructivism and connectivist theories were reviewed relating theory tenets to this dissertation study's research questions. Current literature relating to the specific research questions addressed in this study was explored as well. A review of literature connecting the need for digital literacy and technological integration techniques in our P – 12 schools and our COEs was presented. Literature about the role of 21st century P – 12 teacher and technology integration; the digital divide; and the role digital literacy plays in the theories and practices of critical pedagogy and social justice were examined.

The educational theory of connectivism, which incorporates tenets of experientialism and constructivism, was outlined as the conceptual framework for this study. This research embraces

the potential power of digital pedagogy and was conducted under the assumption that digital pedagogy can help promote educational equality and justice and lead to emancipation and agency for the Net-Generation and Generation M^2.

Research Examining Future Intentions of Preservice Teachers

This research was based on the perceptions PST candidates currently had about their own digital competence and intentions for digital praxis. Other researchers have successfully examined the future intentions of preservice teachers (Abbitt, 2011; Gialamas & Nikolopoulou 2009; Hagger & Malmberg, 2011; Kumar & Vigil, 2011; Larose, Grenon, Morin, & Hasni, 2009).

Of the research on the future intentions of preservice teachers presented here, Abbitt's (2011) study and Gialamas and Nikolopoulou (2009) study most closely resembles this dissertation study. Abbitt studied the self –efficacy beliefs about technology integration and technology pedagogical content knowledge (TPACK) among preservice teachers. This dissertation examined technology integration and digital literacy knowledge. Abbitt's study focused on following three research questions:

- How are self-efficacy beliefs about technology integration related to the components of the TPACK model?
- To what extent are measures of perceived knowledge in the TPACK domains able to predict self-efficacy beliefs about technology integration?
- How does the predictive relationship among perceived knowledge in the TPACK domains and self-efficacy beliefs change over time? (p. 135).

Abbitt's studied 45 preservice teachers using a pre-post test design. Using one web-based survey, Abbitt measured TPACK using the Survey of Preservice Teachers' Knowledge of

Teaching and Technology. Self-efficacy beliefs about technology were measured using the Computer Technology Integration Survey (CTIS) developed by Wang et al in 2004. Abbitt's findings suggest that TPACK knowledge may be predictive of self-efficacy beliefs about technology integration. Abbitt found the relationship to be dynamic and that it changed within one semester of a teacher preparation program.

Gialamas and Nikolopoulou (2009) conducted a comparative study of both in-service and preservice Greek early childhood teachers' views and intentions about ICT use in early childhood settings. The purpose of Gialamas and Nikolopoulou's (2009) study was to compare the two populations in regard to the degree of adopting positive views and intentions about the integration and use of computers in early childhood settings and the level of computer self-efficacy and to investigate the relationship between computer self-efficacy and views and intentions for integrating and using computers in early childhood settings. Gialamas and Nikolopoulou's (2009) study used a questionnaire completed by 240 in-service and 428 preserviceearly childhood teachers. Findings showed that the preservice teachers had higher computer self-efficacy and the in-service teachers had more positive views/intentions about integrating technology into the early childhood education setting.

Hagger and Malmberg's (2011) study of preservice teachers' goals and future-time extension, concerns, and well-being is another example of research conducted on the projections of preservice teachers. Hagger and Malmberg's (2011) research questions were as follows:

- What are the contents of pre-service teachers' professional goals and concerns?
- Within which future-time perspective do pre-service teachers expect to realise their goals?

- How are goals, future-time extension and concerns associated with individual characteristics (self-esteem and depression)? (p. 600).

Hagger and Malmberg (2011) identified thirteen goal and fifteen concern categories common among preservice teachers. They found a strong relationship between the number of goals and the number of concerns preservice teachers had ($r = 0.72$). Relationships between preservice teachers' perceived well-being and goals and depression and concerns were also identified. Preservice teachers projected that they would reach 2/3 of the identified goals in the second and third terms of the one year teacher education program and the remaining goals being reached by the middle of the second year of in-service teaching. In summary, Hagger and Malmberg (2011) found that preservice teachers' future goals and concerns reflect several things: the "self," which included the health and career progression of the preservice teacher; the teaching tasks, including the skills and techniques they perceive they will use; and the students, including the relationships they perceive they will have with students.

Larose, Grenon, Morin, and Hasni (2009) studied the impact field training had on pre-service teachers predicted probability of using ICT in school in their future. This longitudinal study examined preservice teachers' computer skills and attitudes toward technology integration in the classroom. Larose, Grenon, Morin, and Hasni's (2009) study focused a contradictory relationship between the University of Sherbrooke's College of Education's effort to support the use of digital technology in the schools and the preservice teacher education students' experiences during their practicum where they observed in service teachers and they way they utilized digital technology. Larose, Grenon, Morin, and Hasni (2009) found that improving the pedagogical integration of ICT throughout current teaching practices will most likely require that

in-service teachers, especially those who have preservice teacher education students in their classrooms, amplify their ICT continuing education.

This dissertation study's methods are similar to the methods used by the researchers discussed in the previous section. Information about the participants, the instrumentation and the procedure used to investigate PST candidates' perceptions about their own levels of digital literacy and their projections about technology integration are presented in the following chapter.

CHAPTER 3

> The obvious fact is that our social life has undergone a thorough and radical change. If our education is to have any meaning for life," he counseled, "it must pass through an equally complete transformation."
>
> John Dewey, 1899, (Dworkin, 1959, p. 49).

> "technological pedagogical knowledge (TPK) is knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using particular technologies."
>
> Punya Mishra & Matthew J. Koehler, (2006, p. 1028).

METHOD

Overview

This chapter presents the method which was designed to examine PST candidates' perceptions of their own digital literacy, their current technology integration efficacy and to determine if there was a relationship between the two. Methods that were used to investigate the presence of a digital divide within PST candidate groups are also presented.

Participants

The sample for the study was chosen from several universities for several reasons: size, diversity, and public/private status. The sample consisted of PST candidates from the COEs of three differing universities. All three institutions are currently accredited by the Commission on

Colleges of the Southern Association of Colleges and Schools (SACS) and the National Council for Accreditation of Teacher Education (NCATE) (Commission on Colleges Southern Association of Colleges and Schools, 2010; NCATE, 2011).

Table 3.1

Sample Universities Student Characteristics

Student Characteristic	**Georgia Southern University**	**Armstrong Atlantic State University**	**Brenau University**	**Brenau University Online College (OC); Evening and Weekend College (EW)**
Statistics Year	Fall 2009	Fall 2009	Fall 2010	Fall 2010
# Undergraduate F Time	14,799	4, 623	829	n/a
# Undergraduate P Time	1,687	1,964	n/a	n/a
Average Age	21	25	20	34 OC; 32 EW
% Age 25 yrs+	8	34	n/a	n/a
% Men	52	35	0	17% OC pop; 17% EW pop
% Women	48	65	100	83% OC pop; 83% EW pop
% African American/Black	22	21	21.1	31.2% OC pop; 21.4% EW pop
% Hispanic	3	4	6.	4.4% OC pop; 1.9% EW pop
% White	70	67	49.6	46.1% OC pop; 62.1% EW pop

% A I/A N *	<1	1	0.4	0.8% OC pop; 0.0% EW pop
% Asian/P I/N H **	1	2	1.7	1.4% OC pop; 2.4% EW pop
% International	1	4	5.0	0.0% OC pop; 0.0% EW pop
% Multi Racial	n/a	<1	4.0	1.7% OC pop; 1.5% EW pop
% "not reported"	2	<1	11.9	14.2% OC pop; 10.7% EW pop

Note: * = American Indian/Alaskan Native; ** = Asian/Pacific Islander/Native Hawaiian

Georgia Southern University is part of the University System of Georgia and one of two large regional universities in Georgia having an enrollment of 14,799 full time and 1,687 part time undergraduate students in fall 2009 ("Georgia Southern University College Portrait," 2010).

Armstrong Atlantic State University is also a part of the University System of Georgia and one of the 13 state universities in the system. 4,623 full time and 1,964 part time undergraduate students were enrolled in fall of 2009. The average age was 25 with 34% of undergraduate population 25 years old or older ("Armstrong Atlantic State University College Portrait," 2010).

Brenau University was chosen because it is a small private, non-sectarian, liberal arts-oriented university in the Southeastern United States with an undergraduate enrollment of about 1,800 students, which includes both full and part time students enrolled at the Women's College and outreach campuses, the Online College, and the Evening and Weekend College. Brenau University had 829 full time undergraduate students in the fall of 2010 in the residential Women's College. Brenau's cornerstone is its residential Women's College located in

Gainesville, Georgia; however, both the Online College and Evening and Weekend College offer bachelor's degrees in teacher education for males as well. Brenau University began offering coeducational programs in 1969 and established the Evening and Weekend College in the fall of 2003. LMN College became a university in March 26, 1992 (Brenau University, 2010).

A summary of the sample's characteristics is presented in Table 3.2.

Table 3.2

Characteristics of Sample (N = 115)

	Number	Percent
Female	96	83.5
Male	19	16.5
Birth year 1946-1964	5	4.3
Birth year 1965-1981	16	13.9
Birth year 1982-1990	83	72.2
Birth year 1991+	11	9.6
Asian American/Pacific Islander	1	.9
Black/African American	19	16.5
Latino/a or Mexican American	1	.9
Other	2	1.7
White	92	80
%College Paid for with Financial Aid 100%	40	34.8
%College Paid for with Financial Aid 75%	32	27.8
%College Paid for with Financial Aid 50%	8	7.0
%College Paid for with Financial Aid 0%	19	16.5

It is estimated that about 1000 Summer session students received a request to participate. The digital survey was open from May 29, 2011 to June 15, 2011 resulting in 115 PST candidates completing the surveys.

Subjects from two of the institutions, Armstrong Atlantic State University and Georgia Southern University, should be considered convenience samples. The researcher was a temporary faculty member of one of the institutions and a graduate student at a different institution that was surveyed.

Instrumentation

This study used a survey instrument to collect data about PST candidates' digital literacy perceptions and technology integration efficacy (see Appendices). Survey instruments are used in educational research "to collect data about phenomena that are not directly observable: inner experience, opinions, values, interests, and the like" (Gall, Gall & Borg, 2007, p. 228). The first part of the instrument was designed to measure participants' perceptions of their digital literacy familiarity, knowledge, skills, participation and abilities. It was based on Hargittai's (2005) study on web oriented digital literacy and influenced by Hargittai's (2008) update to her original study. This digital literacy instrument included 10 original items directly related to education and Web 2.0 tools which are often used in 21st century curriculum. Hargittai's (2005) study showed that digital literacy measurement using a survey instrument correlated well with actual digital literacy ability. Hargittai's (2005) instrument included three different self-reported measures: four yes or no questions, 38 five-point scale ratings of degree of understanding, and one overall rating of Internet skill. The yes or no questions were: Do you know how to download a file from the World Wide Web to your computer? Do you know how to send a file that is on your computer's hard drive to someone using another computer? Do you know how to

open an attachment someone sent you via email? And do you know the name of any search engines? She asked this question about the 38 items below in Table 3.3: "How familiar are you with the following Internet-related items? Please choose a number between 1and 5 where 1 represents having 'no understanding' and 5 represents having 'a full understanding' of the item. [*none*, *little*, *some*, *good*, *full*]." The self-reported items shown in bold highly correlated with actual skill tests and total time searching tests with correlation coefficients of .53 (p = .000) and -.540 (p = .000) respectively (Hargittai, 2005).

Table 3.3

Hargittai's 2005 web-oriented digital literacy survey items

2005 ITEMS	**2005 ITEMS**	**2005 ITEMS**
PDF	**Refresh/Reload**	**MP3**
Upload	E-zine	Banner ad
.gov	HTML	Search engine
JPEG	Shareware	Browser
Frames	Remote login	Spam
Bolean expression	ISP	**Bcc option in email**
Cookie	Natural language	Mirror site
Flaming	Message thread	XML
Meta-search engine	Usenet	Server
Open attachment	Click-through	Image map
Proximity operators	Meta-tag	**Weblog**
DNS parking	Modem	P3P
Filtering software	Spider	

Note. Items in bold comprise the Hargittai seven-item best index

Hargittai's (2005) instrument also contained an item on perceived Internet skill: "In terms of your Internet skills, do you consider yourself to be . . . ." The answers, based on a five

point scale, were *not at all skilled*, *not very skilled*, *fairly skilled*, *very skilled*, *and expert* (Hargittai, 2005, p. 377).

Hargittai (2005) has shown evidence that responses to the instrument behave in a predictable manner. Data collected from the instrument has been shown to be valid. Validity is used to insure that the inferences, that will be made as a result of the instrument scores, are appropriate, meaningful and useful (Gall, Gall, & Borg, 2007, p. 657). Hargittai (2005) collected evidence showing the consistency between the web-oriented digital literacy construct measured in the 5-point instrument and the same web-oriented digital literacy construct measured in a slightly different way, using a multiple choice questionnaire which mirrored the instrument items. The multiple choice questions were given to a subset of participants. The evidence indicated that survey participants were familiar with the digital literacy terms used in the instrument. There were statistically significant correlations between 35 of the 38 variables. Hargittai (2005) reported that measures for 3 variables, browser, weblog and modem, could not be calculated because there was no difference between the multiple choice item and the self reported item. Hargittai (2005) used both Pearson's correlation coefficient and the polychoric correlation to examine relationship between the two different methods of measuring the same web-oriented digital literacy construct (p. 373). Hargittai indicated that "the Pearson's correlation coefficient has been shown to underestimate the relationship of variables when used for ordinal-level data" (2005). Pearson's correlation coefficients ranged from .2366 to .8224; Polychoric correlation coefficients ranged from .210150 to .99986. For example, the Pearson's correlation and Polychoric correlation for PDF are .6866 and .855970 respectively. Refresh or Reload had .6912 and .762428.

Hargittai's (2005) study included an ability test that corresponded with each of the self-reported items in the survey. The ability test actually required participants to perform web-oriented digital literacy tasks. The ability test involved two separate measurements: percentage of tasks successfully completed (effectiveness) and amount of time spent on the eight tasks (efficiency). Pearson's correlations were calculated for both self-reported items and successful task completion, and for self-reported items and time spent on tasks; results were positive correlations and negative correlations respectively. The task completion correlations ranged from .0903 for Spider to .5272 for Download and the time spent on task correlations ranged from .0277 for Proximity Operators to .4739 for Refresh or Reload. These correlations indicate that there was a strong relationship between self-reported familiarity and task completion, and between self-reported familiarity and time spent to complete task. Most often the correlations were significant (Appendix D). Hargittai's (2005) results showed that self-reported items can be "used as proxy for actual skill measures" (p. 375).

Hargittai's (2005) study also determined that the best possible index for digital literacy is comprised of the seven most highly correlating items from the Hargittai's (2005) self-perceived skill instrument. The seven-item best index includes MP3, preference setting, refresh or reload, newsgroup, PDF, advanced search, and download. These seven self-reported survey items correlated highly with actual skill and time spent to complete task. She calls these the "seven-item best index" and references them as composite variables for measuring web-oriented digital literacy. "This new index variable yields correlation coefficients of .573 (p=.000) and -.540 (p=000) for successful completion of all tasks and for total time searching, respectively" (p.375). The index has a Cronbach's α of .89. Cronbach's alpha coefficient is a measure of internal consistency of a test that includes non-dichotomous items (Gall, Gall & Borg, 2007, p. 202).

Hargittai's (2005) results showed that self-reported items can be "used as proxy for actual skill measures" (p. 375).

Hargittai (2005) compared her seven-item best composite variable measure of web-oriented digital literacy with similar self-perceived skill instruments: the General Social Survey (GSS) 2002 index, the General Social Survey 2000 index, her own self-perceived skill instrument, years using the internet and time spent on the web weekly. Hargittai's seven-item best index had the highest predictive power of actual web skill. It was .321 (actual skill adjusted R^2), whereas GSS 2002 index, the GSS 2000 index, self-perceived skill, years using the Internet and time spent on the web (weekly) were .304, .297, .239, .114, and .048 respectively. Hargittai's (2005) study concluded with the recommendation that future studies use the seven-item best index, which is a composite variable for measuring web-oriented digital literacy using survey questions.

Hargittai's (2008) updated study on internet skill included 20 new items presented in the Table 3.4 below and the seven-items best index items determined from the original 2005 study (shown in bold) and three bogus items (shown in italics) which were used to test if participants make up their responses.

Table 3.4

Hargittai's 2008 updated web-oriented digital literacy survey items.

2008 Items	2008 Items	2008 Items
PDF	preference settings	malware
refresh/reload	newsgroups	social bookmarking
MP3	advanced search	podcasting
JPEG	bookmark	phishing
frames	spyware	Web feeds
BCC in email	blog	firewall
weblog	tagging	cache
proxypod	tabbed browsing	widget
JFW	RSS	favorites
filtibly	wiki	torrents

Note. Items in bold comprise the Hargittai seven-item best index

The research on digital literacy and technology integration efficacy described here was partially based on both of Hargittai's surveys. This dissertation study's digital literacy instrument (See Appendix A) included the seven-item best index, two items from Hargittai's (2005) survey, the 20 items from Hargittai's (2008) updated survey and 10 new Web 2.0-oriented items developed for this dissertation study and one attentiveness question which was modeled after Hargittai's (2008) survey bringing the total to 40 items. The attentiveness question read, "The purpose of this question is to assess your attentiveness. Please mark the *full* response." The attentiveness question was used to see if participants were paying attention as they responded to the instrument in general.

Item wording for the 10 items developed for this dissertation study matched Hargittai's (2008) study. The ten original Web 2.0-oriented items were listed in their generic form and followed by an example of the tool, application or technology, which was placed within

parentheses. Participants were asked *how familiar* they are with the following Web 2.0 digital literacy-related tools, applications and technologies:

1. interactive white board (ACTIVBoard, SMART Board)
2. webquests (Questgarden, Zunal, WebQuest, Fur.ly)
3. digital storytelling (iMovie, Windows Movie Maker, Posterous, Dreamweaver)
4. digital video sharing tools (TeacherTube, Videoegg, Selfcast)
5. web-based word processor/spreadsheet/ presentation/form/book/data storage services (Buzzword, Book Goo, BookRix, Etherpad, Peepel, OpenGoo, ZOHO, Google Docs, Google Apps)
6. web-based photo sharing/uploading/managing (Flickr, Shutterfly, PhotoPeach Dropshots),
7. digital mapping (Google Maps, Community Walk, ZeeMaps, Wayfaring, MapBuzz)
8. audience response systems/audience clickers (iRespond, Qwizdom, TurningPoint)
9. social networking (Facebook, MySpace, LinkedIn)
10. online learning systems (Blackboard/Moodle/Vista/WebCT)

The ten additional items focused on the interactive, collaborative nature of the Internet and 21st century skills. The first seven of these ten items were selected because they are all tools or applications discussed by 21st century curriculum leader and educator McLeod who has been identified as one of the nation's leading academic experts on K-12 school technology leadership issues (McCrae, 2008). Each of these seven tools or applications was also presented on one or more of "The Best Web 2.0 for Education 2007," "The Best Web 2.0 for Education 2008," "The Best Web 2.0 for Education 2009" lists compiled by Larry Ferlazzo, a teacher, an active blogger

and well-known advocate for Web 2.0 applications in education. In order for a tool or application to make Ferlazzo's list, it had to be:

* accessible to English Language Learners and non-tech savvy users;
* free-of-charge;
* appropriate for classroom use; and
* completely browser-based with no download required (Ferlazzo, 2009).

Blogs, wikis and podcasting, all items on the Hargittai's (2008) survey, were included in Ferlazzo's (2007, 2008, 2009) lists of Web 2.0 bests as well.

The eighth additional item concerned audience response systems. This question was seen as appropriate because audience response systems are interactive. "Interactive assessment is a construct not limited to summative evaluation. It permits important course improvements, made in conjunction with the collaboration of the students themselves, while the course is ongoing" (Byers, 2001, p. 359). Audience response systems are used for authentic assessment, instant feedback, and student engagement, all of which are tenets of the 21st century curriculum (NETS for teachers 2008, 2008, and Possibilities for 21st century education, 2010).

The last two additional items were about social networking applications and online course management tools. These were considered appropriate questions because they pertain to interactive and collaborative digital experiences some college students may have had throughout their college career. The level to which PST candidates believe they are familiar with these tools and applications was important to assess because it may relate to the candidate's efficacy and intention to integrate technology into their own classrooms. Wesch, a member of the Advisory Board for 21st Century Schools, included social networking application Twitter as a part of his demonstration about how media production and Web 2.0 applications are important tools in education. Wesch (2008) also included many of the first ten tools and applications in his

educational video lecture *"*An Anthropological Introduction to YouTube" where he discussed social communities and classroom uses of Web 2.0 tools (Wesch, 2008).

The two items which were included in the digital literacy instrument used by this study, which were also on Hargittai's (2005) survey, were Boolean expression and HTML. Hargittai (2005) reported that the self-reported item Boolean expression had a Pearson's correlation of .3512 and - .2058 with successful completion of tasks and total time spent on tasks respectively. Boolean expression was included because of its important role in successful retrieval of specific information from search engines and databases. "Much database searching is based on the principles of Boolean logic. Boolean logic refers to the logical relationship among search terms ("Boolean Searching on the Internet," 2010). HTML was included because HTML familiarity is required for successful writing, editing and publishing of web pages. Hargittai (2005) reported that HTML, which was a self-reported item, had a Pearson's correlation of .4227 and - .4334 with successful completion of tasks and total time spent on eight tasks respectively.

The second part of the survey instrument (see Appendix A), the Technology Integration Confidence Scale (TICS), was used to assess the level of technology integration efficacy (TIE) the participants believed they currently possessed and how they projected they will utilize technology in their own classrooms. The TICS measures self-efficacy. Bandura (1997) contends that self-efficacy plays an important role in human functioning. Bandura (1997) said that "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true" (p. 2). People's belief about their potential capability can be a better predictor about how they will perform and what they will accomplish than a measure of their actual knowledge and skills can predict (Pajares, 2002).

This research used self-efficacy interchangeably with the term "confidence." Self-efficacy is task-specific, meaning that a person may exhibit high self-efficacy on one task, and low self-efficacy on another. The tasks presented in the TICS concern effective technology integration (students and teachers using technology during instruction) (Browne, n.d.). Jeremy Browne, the originator of the TICS, developed the survey in alignment with the International Society for Technology in Education NETS-T. It is scored using six subscales which are aligned with each of the NETS-T. Subscale alignment is as follows: I - Technology Operations and Concepts, items 1-8; II - Planning and Designing Learning Environments and Experiences, items 9-15; III - Teaching, Learning, and the Curriculum, items 16-20; IV - Assessment and Evaluation, items 21-24; V - Productivity and Professional Practice, items 25-29; and VI - Social, Ethical, Legal, and Human Issues, items 30-33. Browne (n.d.) initially scored the TICS by converting the Likert scale responses, 0 – 6, for each subscale and averaging the numeric responses which indicate the participant's self-efficacy level. Browne (n.d.) also scored the TICS using the Rating Scale Model; however, the resulting scores correlated highly ($r > .90$) with average subscale scores. Therefore, Browne (n.d.) deemed the more complex scoring system unnecessary.

Scale consistency, reliability and validity

All six research questions were investigated using the scales previously discussed. These scales were analyzed for internal consistency, reliability and validity. Specifically, research question one was addressed using the perceived digital literacy scale which, as previously discussed, was based on Hargittai's (2005, 2008) perceived digital literacy surveys. Cronbach's alpha coeficients were calculated for the PDL instrument as a comprehensive 40-item PDL survey and as two sub-surveys that combined to make the comprehensive PDL survey. The sub-

surveys consisted of 30 PDL items excluding the 10 new Web 2.0 tool items (PDL no Web 2.0) and the 10 PDL items that addressed Web 2.0 tools specifically (Web 2.0 only).

Specifically, research question 2 was investigated using Browne's (2006) Technology Integration Confidence Scale (TICS). TICS was used to assess perceptions of technology integration efficacy (TIE) or confidence in using technology. The TICS digital divide sub-scale was identified and used specifically to address research question 6.

To provide evidence for reliability of scores from the instrument designed for this dissertation study, the Cronbach's *a* measure of consistency was conducted to show the scales' internal consistency. Table 3.5 shows the Cronbach's α for these instruments: the 40-quesiton comprehensive perceived digital literacy survey, the 30-item perceived digital literacy survey without the ten additional Web 2.0 literacy items; the perceived digital literacy survey of the ten Web 2.0 items only; the Technology Integration Confidence Scale; the three digital divide-related items from the Technology Integration Confidence Scale and two items about technology use intentions. The results from the Cronbach's *a* analysis show that scores from scale items demonstrated consistent behavior. Alpha coefficient values range from 0 – 1. Data from the scales appears to show internally consistent responses according to Cronbach's *a*. Alpha values of .70 or greater are considered acceptable levels of consistency in educational research situations ("Essentials of a Good Psychological Test," 2004, Nunnally, 1978).

Table 3.5

Scale internal consistency and reliability

	Cronbach's Alpha	Inter-item variability	*N* of items
PDL Survey	.964	.962	40
PDL no Web 2.0 Survey	.957	.955	30
Web 2.0 only Survey	.888	.867	10
4-Item Analysis	.824	.740	4
TICS	.965	.962	19
TICS (9, 10 and 11)	.863	.724	3
Technology Intentions	.653	.653	2

An inter-item variability test was performed to determine if a specific set of questions which was designed to measure a single concept within the survey instruments, such as Web 2.0 digital literacy, were associated with each other. Table 3.4, shows the lowest Cronbach's *a* for inter-item variability if an item were deleted for all scales and sub-scales. Appendix B shows the SPSS results of those analyses. As previously noted, this dissertation study's PDL scale was based on Hargittai's (2005, 2008) perceived digital literacy surveys. This study's technology confidence scale was based on Browne's (2006) TICS. Both of these scales have previously been shown to be valid and reliable. However, the Web 2.0 digital literacy, the TICS 9, 10, 11 digital divide and the technology use intentions sub-scales are new, created for this study. This study's Web 2.0 digital literacy sub-scale should perform as expected having a Cronbach's *a* of .888 and the lowest Cronbach's *a* for inter-item reliability was .867 if an item were deleted. According to Cronbach's *a*, data from the Web 2.0 digital literacy sub-scale

appears to show internally consistent responses. The TICS digital divide sub-scale also shows evidence of internal consistency and validity. The results from a Cronbach's alpha analysis demonstrate that TICS 9, TICS 10 and TICS 11 show internal consistency, $a = .863$ (Table 3.4). Data from the TICS 9, 10, 11 digital divide sub-scale appears to show internally consistent responses A Pearson correlation test was performed to investigate the relationship between mean responses from TICS 9, 10, and 11. TICS 9 and 10 were strongly correlated $r = .716$, $p < 0.01$. TICS 9 and 11 were strongly correlated $r = .756$, $p < 0.01$; as were TICS 10 and 11 were $r = .572$, $p < 0.01$. The results from a Cronbach's alpha analysis of the two questions used to predict technology use intentions demonstrated that the two questions, one about predicted technology use as a teacher (TechProj – T) and the other about projected technology use for student learning (TechProj – S) do not show strong internal consistency, $a = .653$. Acceptable alpha coefficients are $a = .70$ or higher. A Pearson correlation test was performed to investigate the relationship between mean responses from TechProj – T and TechProj - S. These variables were moderately correlated, $r = .485$, $p < 0.01$.

To provide evidence for validity, the PDL instrument and the two sub-surveys "PDL no Web 2.0" and "Web 2.0 only" were tested for evidence of a linear relationship between the three instruments based on the samples' scores. Pearson correlation coefficients were calculated from composite mean scores all three PDL surveys using SPSS statistical data analysis software (see Chapter 4, Table 4.8). Pearson correlation coefficients range from -1 to 1, where + 1 represents a perfect positive relationship between variables and visa versa. This type of validity determination is referred to as concurrent validity which shows positive correlation between two measures of the same construct (Gall, Gall, & Borg, 2007).

A 4-item analysis was used to show construct validity and to test item performance of the overall PDL survey. "Malware," "phishing," "cache," and "digital storytelling" were selected for the analysis because they were perceived to be items that most of the sample may not have been familiar with. The composite mean scores of those four items and composite mean comprehensive PDL score were strongly related, $r = .866$, $p < 0.01$. The *r*-value indicates an acceptable measure of internal consistency. The Cronbach's *a* for the 4-items used on the item performance test was .824 and inter-item variability was .740. The PDL scale is reliable and should yield consistent scores.

Browne (n.d.) offers evidence of the reliability and validity of the TICS as follows: The response categories function properly as shown by a rating scale model analysis. It is reliable; all subscales demonstrated acceptable levels of reliability with *a* between .80 and .90. TICS test items were rated relevant and representative of the NETS-T by a panel of in-practice teachers, administrators and teacher educators. TICS, released under the Creative Commons Attribution, Share Alike license, is available for reproduction.

Procedure

The perceived digital literacy instrument used in this study was pretested in a pilot study by a convenience sample of 30 PST candidates from the same sample used in the full study. The pilot test was used to test the study's procedure and to determine if the instrument was received by the participants as intended; if the items were easily understood by the participants; and to test the measures that were to be used in the study. It was the researcher's final opportunity to see if the survey was clear, easy to read and follow, and could be accessed and completed easily online. Participants provided feedback about the instrument by entering comments in the participant feedback area at the end of the instrument. Additionally, the pilot enabled the

researcher to determine if the Survey Monkey survey tool was easy to download into Microsoft Excel for further analysis.

Descriptive statistics were used to organize data from the pilot study. Overall and group-specific descriptive statistics were used. Correlational statistics were used to investigate relationships between perception of digital literacy (PDL) level and technology integration efficacy (TIE); PDL level and laptop/personal computer and/or Internet accessible device ownership status, years of computer ownership and level of internet access. An item analysis on 4 items was run to test item performance. Items were selected because they were perceived to be items that subjects may not be that familiar with. They included: malware, phishing, cache, and digital storytelling. r-value, a measure of internal consistency, was calculated by comparing the difficulty of the mean of the four test items with the sample groups' overall performance on the test. A high r-value shows that test takers who scored well overall generally got the difficult items correct and test takers who scored poorly overall generally got the difficult items incorrect. The 4 item analysis and PDL instrument were strongly correlated, $r = .866$, $p < 0.01$.

This study did not alter the TICS survey; a pilot study was not deemed necessary.

The procedure used to conduct this research included the completion of required training for IRB approval and applying for and being granted IRB approval from both Georgia Southern University and Armstrong Atlantic State University. IRB approval from both institutions was necessary because the researcher represented both institutions as a student and as faculty, respectively. The digital literacy survey and technology integration efficacy scale instrument used in this study were created within the SurveyMonkey digital survey tool ("SurveyMonkey," 2011). A wiki page titled Teacher Candidates Digital Literacy and Their Technology Integration

Efficacy was created using wikispaces.com. This study's abstract was embedded within that wiki. The digital survey was link to the wiki for data collection convenience.

Collaborative faculty members from Armstrong Atlantic State University, Brenau University and Georgia Southern University introduced the study to preservice teacher education candidates during the first part of the Summer 2011 semester. Collaborative faculty requested that the students volunteer to participate in the survey. The survey was also posted on the Armstrong Atlantic State University College of Education blog where voluntary request for participation was announced. It is estimated that about 1000 students received a request to participate. The digital survey was open from May 29, 2011 to June 15, 2011 resulting in115 PST candidates completing the surveys. Due to institution guidelines and Family Educational Rights and Privacy Act (FERPA), no students were directly e mailed a request to participate in this study by the researcher.

Delimitations and Limitations

The sample was reassured that their survey results would not be connected to them individually and that every safeguard would be taken to assure confidentiality. This served to increase the potential for participants to be truthful in their digital literacy perceptions and technology integration efficacy projections.

This study was exploratory in nature and limited in scope because the digital literacy survey was based on Hargittai's 2005 and 2008 surveys instead of other research on digital literacy or information, communication and technology, such as that of Eshet-Alkalai, and Amichai-Hamburger (2004). The selection of the TICS instrument and framework, as opposed to one of the other instructional technology and teaching innovation surveys available, such as LoTI, could also be a limitation.

Several limitations were inherent in this study including:

- Candidates may not be have been honest when answering survey items. The researcher assumes that items answered were answered honestly.
- Candidates self-assessed their digital literacy level. They may have perceived high levels of digital literacy yet not have been able to demonstrate that digital knowledge, skill and ability. This study did not compare participant perceptions of digital literacy level with an actual demonstration of specific digital knowledge, skills and abilities.
- A Likert scale was used. Likert scales are considered to be attitude scales. Attitude scales are three-part: affective, cognitive and behavioral, meaning participants had to decide how they felt, what they knew, and how they had acted toward each individual item (Gall, Gall, & Borg, 2007, p. 220). If one or more of these components were unknown to the participant, the rating of that item may not be useful.
- The return rate was low thus the sample size was small.
- This research was completed within one college semester. At this time, no follow up research is planned to see if participants' intentions to and efficacy to integrate technology into their classrooms will become reality.
- Participants may not have fully understood all pedagogical terminology and inferences used within the TICS survey tool as they were not yet certified teachers.
- Participants may not been equipped to adequately predict future teaching behaviors, including the integration of technology, because they lacked an understanding of classroom conditions.

All the institutions selected are located within the Southeastern United States, are accredited by SACS, and all participants were PST level teacher candidates. These

characteristics are delimitations of this study. The regional and cultural differences of these institutions may limit the applicability of these finding to other institutions. Thus, arguments could be made that participants who were in this study did not represent all PST candidates throughout the USA. However, arguments are made that inferences can be made about other institutions with similar student demographic characteristics.

Researcher Role and Bias

The researcher entered this study having recognized bias. The researcher expected to find relationships among the various independent variables and the two dependent variables. It was presumed that no evidence supporting the idea of a digital divide would be found. It was expected that older participants would score similarly on the perceived digital literacy instrument as younger participants. Older participants were those 31 or older and are referred to as digital immigrants in the literature (Prensky, 2001). Finding evidence to reject the null hypotheses was also expected.

Because the researcher was employed by one of the COEs investigated, she was an internal evaluator. This role was considered acceptable because the results will be used to guide and improve the curriculum in the COE (Gall, Gall, & Borg, 2007, p. 566).

CHAPTER 4

FINDINGS AND ANALYSIS

Introduction

This study investigated Pre-service teacher candidates' perceptions of their digital literacy and their perceptions of their confidence to integrate technology into their classroom curricula when they become certified employed P – 12 teachers. Perceived digital literacy (PDL) and technology integration efficacy (TIE) were the dependent variables and were measured using a perceived digital literacy survey and the Technology Integration Confidence Scale (TICS) (Browne, 2006). Self-reported age; race; percentage of education paid with financial aid; computer/laptop ownership and years of ownership; iPad, iPhone, Android or other Internet capable device ownership and years of ownership; and Internet connectivity status and convenience were the independent variables. Demographic information and responses to questions about the independent variables were collected via questionnaire.

The following research questions are addressed in this chapter:

1. What perceptions do PST candidates have of their own levels of digital literacy?
2. What perceptions do PST candidates have of their technology integration efficacy?
3. What is the relationship between the PST candidates' perception of their digital literacy and their perception of their technology integration efficacy?
4. Is digital literacy or technology integration efficacy associated with laptop/personal computer and/or Internet accessible device ownership, years of ownership, or Internet access?
5. Is digital literacy or technology integration efficacy associated with age, race, or financial aid status?

6. Do PST candidates believe they have the skills and understanding necessary to address the digital divide in their future classrooms?

For the purposes of data analysis and reporting of findings, the research questions were clustered as follows: research questions 1, 2, and 3; research questions 4 and 5; and research question 6.

Sample Demographics

As previously noted in the previous chapter, 115 PST candidates made up the sample who participated in this study by completing the Teacher Candidates' Digital Literacy Survey and Technology Integration Efficacy Scale instrument. Descriptive statistics are used to describe data about the participants. Table 4.1, 4.2 and 4.3 describe the group and Internet-capable technology.

Table 4.1

Participants and Internet-Capable Technology (N = 115)

	N =Yes	% Yes	*N* = No	% No	N/A
Computer/Laptop (CoO) Ownership Status	113	98.3	2	1.7	
iPad; iPhone; Internet capable device (iiDO) Ownership Status	81	70.4	34	29.6	
Constantly Connected to the Internet (CCI)	83	72.2	32	27.8	
Required Instructional Technology/Computer Course in Program of Study (RComC)	91	79.1	19	16.5	5

Table 4.2

Years Participants Owned Internet-Capable Technology (N = 115)

	Years of Computer/Laptop Ownership (YoO)		Years of iPad, iPhone, Android, Internet capable device ownership (YiiDO)	
	N	%	*N*	%
0	3	2.6	32	27.8
1	5	4.3	37	32.2
2	5	4.3	18	15.7
3	22	19.1	10	8.1
4+	80	69.6	18	15.7

Note. 0, 1, 2, 3, 4+ = years of ownership.

Table 4.3

Participants' Perception of Internet Connectivity Convenience (N = 115)

	N	%
Very Easy (1)	79	68.7
Easy (2)	24	20.9
Somewhat Easy (3)	11	9.6
Somewhat Difficult (4)	1	.9
Difficult (5)		
Very Difficult (6)		

Table 4.4

Age and Race Groups as Dummy Variables (N = 115)

		Number	Percent
Age Group	Digital Natives (0)	94	81.7
	Digital Immigrants (1)	21	18.3
Race Group	Non White (1)	23	20
	White (0)	92	80

Tables 4.1 – 4.4 represent the samples' demographics. The sample lacked diversity. For example, 83.5% were female; 81.7% of the sample were digital natives; 80% of the sample were White; 98.3% owned a computer or a laptop and 80% of them had owned the computer or laptop for 4 years or longer; 72.2% owned an Internet-capable device such as an iPhone or iPad or Android; 89.6% claimed that connecting to the Internet was either very easy or easy; and 79.1% had already taken the technology course that is required in their program of study. The level of financial aid and the years of owning an Internet-capable device were two independent variables that exhibited variability based on the results of the survey instrument. Financial aid funding levels were divided into 5 categories: 0%, 25%, 50%, 75% and 100%. PST candidates selected the category they felt best described the role of financial aid in funding their education.

Table 4.4 describes the binary grouping of the sample's age and race. Binary grouping was used because the sampled participants lacked much diversity in terms of age and race. In statistics, binary grouping is also known as dummy grouping. Dummy grouping uses dummy variables to represent two groups. The dummy variables take on the value of either 1 or 0 where 1 represents one group and 0 represents the second group. The use of dummy age groups was appropriate because this study investigated the digital divide which, according to some research, is determined by birth year where 1982 creates the division separating the digital immigrant from the younger digital native (Prensky, 2001a). The dichotomous age groups were formed based on this definition. In this study, 1 represented that the subject was a digital native, born after 1982; all subjects who were born prior to 1982, who are digital immigrants, were coded as 0. Subjects who identified as White were coded as 1; subjects who identified as any other race were coded as 0. An advantage of the 0, 1 dummy-coded variable is that statistically it can be treated as an interval-level variable even though it is a nominal-level variable.

Research Questions 1, 2, and 3

Research questions 1, 2 and 3 were clustered for ease of presentation and readability. The research questions were

1. What perceptions do PST candidates have of their own levels of digital literacy?
2. What perceptions do PST candidates have of their technology integration efficacy?
3. What is the relationship between the PST candidates' perception of their digital literacy and their perception of their technology integration efficacy?

Research questions 1, 2 and 3 were addressed using the four surveys and scales discussed in Chapter 3. PST candidates' perception of their digital literacy and technology integration confidence was investigated as were relationships between those two variables. Table 4.5

presents the results of those assessments, including all subscales. Table 4.6 illustrates the frequency distribution of the participants' PDL, TIE and Technology Use Projections. The results of these scales have been used to address research questions 1, 2 and 3. Appendix C contains the SPSS ungrouped frequency distribution tables for both of the dependent variables, PDL and TIE, and the two technology intention items.

Table 4.5

Characteristics of Participants' PDL, TIE and Technology Use Projections

	N	Minimum Observed	Maximum Observed	Mean	SD
PDL	114	1.36	4.78	3.13	.80
PDL No Web2.0	114	1.18	4.79	3.05	.87
Web2.0 only	114	1.40	5	3.23	.84
TIE (TICS Scale)	111	1.95	6	4.97	.83
TIE (TICS 9, 10 and 11)	112	1.97	5.31	4.21	.68
Technology Teacher Use	109	1	5	3.99	1.0
Technology Student Use	111	0	5	3.49	.97

Note. The number of the participants varies; some of the participants did not complete the entire survey. TICS 9, 10 and 11 created a sub-scale specific to addressing the digital divide.

The scales used to assess perceived digital literacy levels and technology integration efficacy are presented in the following sections.

Table 4.6

Frequency Distribution of Participants' PDL, TIE and Technology Use Projections

PDL Scale	Freq.	%	TIE (TICS) Scale	Freq.	%	Tech Use Scale	Teacher Use Freq.	%	Student Use Freq.	%
N = 114			*N = 111*				*N = 109*		*N* = 111	
0			0			0	0		1	.9
1	9	7	1	1	.9	1	1	.9	2	1.8
2	40	36	2	1	.9	2	8	7.3	13	11.7
3	46	40.4	3	12	10.8	3	24	22.0	34	30.6
4	19	16.6	4	28	25.2	4	34	31.2	48	43.7
5	0	0	5	63	56.7	5	42	38.5	13	11.7
n/a	n/a	n/a	6	6	5.4	n/a	n/a	n/a	n/a	n/a
M	3.13		4.97			3.99			3.49	
SD	.80		.83			1.0			.97	

Research Question 1

Research question 1 was, "What perceptions do PST candidates have of their own levels of digital literacy?" Each item on the PDL instrument, including sub-scales, had a minimum score of 1 and a maximum score of 5. The PDL scale was based on levels of understanding of specific digital literacy items and was presented as follows:

Perceived Digital Literacy (PDL) Scale

1 = "no understanding"

2 = "little"

3 = "some"

4 = "good"

5 = “full”

PST candidates reported moderate levels of overall PDL (*M* = 3.13, *SD* =.80). They reported similar moderate levels of PDL on the subscale that excluded Web 2.0 literacies (*M* = 3.05, *SD* = .87) and, notably, the highest composite mean, which still represents only having “some” or “good” understanding was for the subscale specific to Web 2.0 literacies (*M* = 3.23, *SD* = .84) (Table 4.5).

The survey results found that PST candidates do not perceive themselves to have high levels of digital literacy.

Research Question 2

Research question 2 was “What perceptions do PST candidates have of their technology integration efficacy?” Technology integration efficacy (TIE) was addressed using the TICS instrument. Each item on the TICS scale had a minimum score of 1 and a maximum score of 6. The TICS scale was based on levels of confidence of specific technology integration tasks and was presented as follows:

Technology Integration Confidence Scale (TICS)

1 = “not confident at all”

2 = “slightly confident”

3 = “somewhat confident”

4 = “fairly confident”

5 = “quite confident”

6 = “completely confident”

PST candidates reported high levels of overall TIE (*M* = 4.97, *SD* =.83). They reported similar high levels of TIE on the three-item subscale that was specific to addressing the digital divide in

their classrooms ($M = 4.21$, $SD = .68$). These findings indicate that this sample was "quite" confident ($M = 4.97$, $SD = .83$) (actually they rated themselves right below the were the level of "quite" confident. "Quite" was represented by 5 on the 1 – 6 point scale)

The data analyzed in this study from this sample suggests that PST candidates perceive themselves as having high levels of technology integration confidence for their future classrooms.

Findings Summary for Research Questions 1 and 2

The survey shows that most PST candidates did not perceive themselves to have a "good understanding" of digital literacy and most PST candidates believed they were at least fairly confident to integrate technology into their classrooms. The survey showed, using composite means, that only16.6% of PST candidates had PDL scores of 4 or higher meaning that only 16.6% perceived themselves to have "good" or "full understanding" of the digital literacy items on the survey leaving 83.4% who thought they had only "some," "little," or "no understanding" of the digital literacy test items (Table 4.6). In what seems to be contrasting findings, 85.6% of PST candidates perceived themselves as being "fairly confident," "quite confident," or "completely confident" to integrate technology into their classrooms while the remaining 14.4% were "somewhat," or "slightly confident" to integrate technology into their classrooms. These results lead this discussion to the third research question which investigates the relationships between PDL and TIE.

Research Question 3

Research question three asked, "What is the relationship between the PST candidates' perception of their digital literacy and their perception of their technology integration efficacy?" This question was addressed using correlational statistics to investigate linear relationships

between PDL and TIE. A Pearson product-moment correlation coefficient was computed to assess the relationships between the means of PST candidates self-rated PDL scores, TICS mean scores and scores on all sub-scales. Table 4.7 shows the Pearson correlations between these variables. PDL and TICS were moderately correlated at the 0.01 confidence level, r =.516. Mean scores from the Web 2.0 literacy sub-scale of the PDL survey also correlated with TICS, r = .512. The relationships between all subscales were significant, $p < 0.01$. In conclusion, as PDL mean scores increased, so did TICS. The strongest relationship was found between PDL and the PDL subscale that excluded Web 2.0 items, r = .984, $p < 0.01$; and, although significant, the weakest correlation was found between TICS and that same subscale – the PDL subscale that excluded Web 2.0 items, r = .478, p <0.01.

The data analyzed in this study from this sample suggests there is a relationship between mean PDL scores and mean TICS scores. In conclusion, this study has shown that PDL and TICS scores positively correlate, meaning that as PST candidates' perception of digital literacy increases so does the PST candidates' confidence to integrate technology into their classrooms and schools.

Table 4.7

Pearson Correlation Matrix among PDL Scale Means and TICS Scale Means

	PDL Mean	Web 2.0 Mean	PDL no Web 2.0 Mean	TICS Mean
PDL Mean	--			
Web 2.0 Mean	.864**	--		
PDL no Web 2.0 Mean	.984**	.738**	--	
TICS Mean	.516**	.512**	.478**	--

**$p < 0.01$

Figure 4.1 and 4.2 display scatterplots showing the positive linear relationship between mean PDL scores and mean TICS scores and the positive linear relationship between mean Web 2.0 digital literacy scores and mean TICS scores, respectively. Increases in PDL, including Web 2.0-specific digital literacy, are associated with increases in TIE, meaning that as PST candidates' perceptions of their digital literacy increase, including perceptions of their Web 2.0-specific digital literacy, so does their confidence to integrate technology into their future classroom milieu.

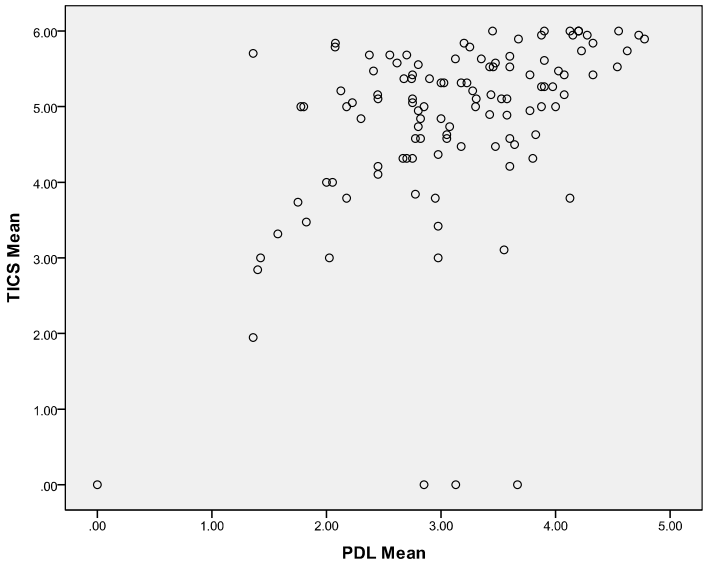


Figure 4.1 Scatterplot of mean PDL scores and mean TICS scores (N = 115)

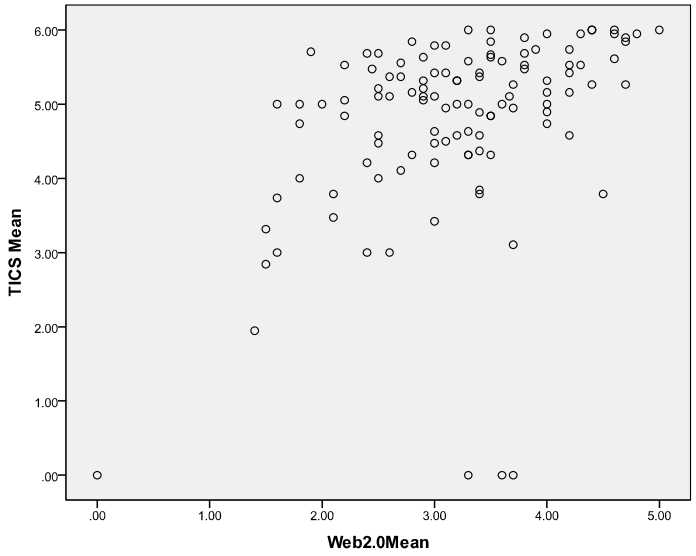


Figure 4.2 Scatterplot of mean Web 2.0 Digital Literacy scores and mean TICS scores (N = 115)

Research Questions 4 and 5

Research questions 4 and 5 investigated which independent variables may relate to PDL and TIE. Research questions 4 and 5 were clustered allowing for the presentation of one correlation matrix which illustrates the relationships among all independent variables and the two dependent variables. Eight independent variables were examined for relationships with the dependent variables: PDL and TIE. The independent variables were: age, race, financial aid status (FinAid), personal computer/laptop/Internet accessible ownership (CoO), device ownership (iiDO), years of ownership of each (YoO and YiiDO), or Internet access convenience (CCI). PST candidates were asked if they had taken the required educational technology course found in their program of study. These results were not analyzed because course content would have varied across the sample. The independent variables were used to search for evidence of a digital divide based upon PDL and TIE perceptions. Tables 4.2, 4.3 and 4.4 presented information about the samples' responses to questions about the independent variables and Table 4.4 presented information about the conversion of the various age and race groups into two larger dummy groups for statistical analysis purposes. Table 4.8 shows the Pearson correlation matrix that was used to investigate relationships among the variables.

Table 4.8

Correlation Matrix among PDL Scale Means and TICS Scale Means and all IVs (N=115)

	PDL Mean	TICS Mean	CoO Mean	YoO Mean	iiDO Mean	YiiDO Mean	CCI Mean	Age Mean	Race Mean	FinAid Mean
PDL Mean	--									
TICS Mean	.516**	--								
CoO Mean	.032	.089	--							
YoO Mean	.236*	-.105	-.486**	--						
iiDO Mean	-.234*	-.069	.205*	-.231*	--					
YiiDO Mean	.402**	.101	-.146	.275**	-.629**	--				
CCI Mean	-.217*	-.189	.214*	-.114	.448**	-.360**	--			
Age Mean	-.070	.036	-.063	-.053	.039	.049	.058	--		
Race Mean	-.226**	-.194*	.266**	-.346**	.152	-.110	-.068	.214*	--	
FinAid Mean	-.238*	-.142	-.039	.058	.007	-.090	.126	.063	-.148*	--
M	3.132	4.968	.02	3.49	.300	1.520	1.280	1.826	.200	2.430
SD	.804	.834	.131	.958	.458	1.391	.450	.388	.402	1.445

Note: Binary grouping, or dummy categories, was used because the sampled participants lacked much diversity in terms of age and race so two larger groups were formed for both variables. Computer and Internet-capable device ownership was a yes/no item. CoO and iiDO were coded as 0 for "yes" and 1 for "no." Age and Race Group *M* and *SD* are reported from the dummy categories (Table 4.1). *$p < 0.05$. **$p < 0.01$

Findings from this study's sample do not show significant relationships between PDL and age; meaning that this study did not find evidence of a digital divide based upon age within this sample. This study did find significant relationships between perceived digital literacy and

various IVs. PDL and years of computer ownership are positively and significantly correlated, $r = .236$, $p < 0.05$ PDL and years of owning an iPhone, iPad, Android or other Internet-accessible device (YiiDO) are also positively and significantly correlated, $r = .402$, $p < 0.01$. PDL and owning an iPphone, iPad, Android or other Internet-accessible device (iiDO) are negatively and significantly correlated, $r = - 234$, $p < 0.01$. PDL and convenience to connect to the Internet (CCI) are negatively and significantly correlated, $r = - .217$, $p < 0.05$; interpreted, this means that as Internet connectivity becomes easier, PDL increases or visa versa. The data are interpreted this way because the Likert scale used to analyze samples' opinion about Internet connectivity ease was presented where 1 represented "very easy" and 6 represented "very difficult."

Results showed that financial aid status (FinAid) was negatively correlated with PDL, $r = -.238$, $p < 0.05$. This indicates that members of the sample who reported that they received no financial aid had lower PDL and that those who received a higher percentage of their education funding from financial aid had higher perceptions of their digital literacy. The age of the sample in this study was not diversified which limited the statistical analyses that could be performed, For example, if more of the sample were from the older age categories, ANCOVA could be used to determine if financial aid status and PDL have a positive correlation when age is controlled for.

Technology integration efficacy was not significantly correlated with any of the independent variables other than race, $r = -.194$, $p < 0.05$. However, TIE was positively correlated with PDL, $r = .516$, $p < 0.01$. PDL was significantly correlated with 5 of the independent variables which could be mean that those 5 independent variables are indirectly related to TIE when PDL is considered a moderating or intervening variable.

Race, interpreted as binary data, was significantly correlated with computer ownership,

$r = .266$, $p < 0.01$ and with years of computer ownership, $r = -.346$, $p < 0.01$.

Research Question 6

Research questions 1 and 2 investigated PST candidates' perceptions of their digital literacy and their confidence in integrating technology into the curriculum. Research questions 4 and 5 sought to determine if the variables age, race and computer technology ownership and access and financial aid status were related to these perceptions. These questions lead to research question 6, which asks, "Do PST candidates believe they have the skills and understanding necessary to address the digital divide in their future classrooms?" Statistical analysis was used to identify relationships between PDL, sub-sets of PDL, overall TICS, a sub-set of TICS that specifically addresses the digital divide, and the intention to use technology in the classroom. Table 4.9 presents these findings and correlations between these variables that directly relate to the ability of PST candidates to address the digital divide in their future classrooms.

Table 4.9

Correlations and Descriptive Statistics for PDL, TICS, TICS 9, 10, &11, and Technology Intentions Related to Addressing the Digital Divide

	PDL	PDL no Web 2.0	Web 2.0	TICS	TICS 9 10,11	TechP-T	TechP-S
1. PDL	---						
2. PDLnoWeb 2.0	.984**	---					
3. Web 2.0	.846**	.738**	---				
4. TICS	.516**	.478**	.512**	---			
5. TICS 9,10, 11	.602**	.564**	.585**	.962**	---		
6. TechProj - T	.277**	.265**	.258**	.310**	.413**	---	
7. TechProj - S	.056	.032	.116	.153	.263**	.485**	---
M	3.13	3.05	3.23	4.97	4.96	3.99	3.49
SD	.80	.87	.84	.833	1.06	1.0	.97
Scale Min/Max Values	1 to 5	1 to 5	1 to 5	0 to 6	0 to 6	0 to 5	0 to 5
Cronbach's α	.964	.957	.888	.965	n/a	n/a	n/a

Note. TICS 9, 10, 11 = digital divide sub-scale; TechProj – T and – S = Technology use projections for Teacher Use and Student Use respectively. *$p < 0.05$. **$p < 0.01$

The findings from research questions 1, 2, 4 and 5 are used to address research question 6. In summary, PST candidates, as a whole, believe

- They have "some" understanding of digital literacy
- They are "fairly" confident in their ability to integrate technology into their classrooms
- They are "fairly" confident in their ability to use technology to address the digital divide in their classrooms

As a whole, PST candidates perceive themselves to have some understanding of the digital literacy items on the PDL survey ($M = 3.13$, $SD = .80$). Choice "3" on the PDL survey stood for "some" understanding of the digital literacy item. This suggests that PST candidates believe they have some of the skills and understanding necessary to address the digital divide in their future classrooms. The results of the TICS scale showed that PST candidates indicated a high level of TIE or confidence in their ability to integrate technology in their classrooms ($M = 4.97$, $SD = .834$). Choice "4" on the TICS represented "fairly confident." The TICS findings suggest that PST candidates have a fair amount of confidence to use technology in their classroom. It does not indicate that they will choose to do so.

Research Question 6 Newly Presented Data

Research question 6 asked if PST candidates believe they have the skills and understanding necessary to address the digital divide in their future classrooms. Three questions embedded within The Technology Integration Confidence Scale, TICS 9, TICS 10 and TICS 11, form the digital divide sub-scale. The questions are

9. "Not all of your students will have equal access to technology out of the classroom. How confident are you that you can identify situations where access to technology might be an issue for one or more of your students?"

10. "When some of your students do not have access to technology outside the classroom, how confident are you that you can appropriately, legally, and ethically lessen the effects of such unequal access?"

11. "Your district is focusing on the integration of diversity into the curriculum. The Internet has been suggested as a way to expose students to a wide range of cultures and viewpoints. How confident are you that you can use technology (such as the Internet) to affirm diversity in your classrooms?"

This TICS sub-scale and two additional questions that ask PST candidates to predict their future technology use directly relate to addressing the digital divide in the classroom. The results of the TICS digital literacy sub-scale showed that PST candidates indicated a high level of TIE or confidence in their ability to integrate technology in their classrooms to specifically address the digital divide ($M = 4.21$, $SD = .68$). Choice "4" on the TICS represented "fairly confident." The TICS findings suggest that PST candidates have a fair amount of confidence to use technology to address the digital divide in their classroom. It does not indicate that they will choose to do so.

The two questions about PST candidates' projections to use technology and projected frequency of technology use in their classroom for teaching purposes and for student learning purposes were presented as follows:

- "When you become a classroom teacher, how often do you project you will use computers, Internet and digital technology in your teaching?" (TechProj – T)
- "When you become a classroom teacher, how often do you project your students will use computers, Internet and digital technology as a part of the learning process?" (TechProj – S)

The 0 – 5 point Likert scale used for these two questions was based on levels of frequency; the scale was presented as follows:

0 = “never”

1 = “once a year”

2 = ”once a month”

3 = “once a week”

4 = “once a day”

5 = “multiple times each day”

Results of the technology use prediction questions were previously presented in Tables 4.7 and 4.8. This group of PST candidates, as a whole, projected that they will use technology in their classroom once a day as teachers ($M = 3.99$, $SD = 1.00$) and their students will use technology once a week as well ($M = 3.49$, $SD = .97$) (Table 4.6). Table 4.6 displays the item analysis which shows that only 38.5% of PST candidates projected that they will use computers, Internet and digital technology in their teaching multiple times per day and 11.7% projected that students will use computers, Internet and digital technology as a part of the learning process multiple times per day.

Table 4.9 shows the relationship between projected technology use and the various dependent variables. The projected use of technology for teaching purposes significantly relates to each of the dependent variables, $p < 0.01$. However, significant relationships between the projected use of technology for student learning purposes and the various dependent variables were not found. The projected use of technology for student learning purposes had a positive linear relationship with the projected us to technology for teaching purposes, $r = .485$, $p < 0.01$.

The mean scores on the PDL scales, TICS, TICS 9, 10 and 11 subscale, and technology integration projection findings suggest that, on the whole, PST candidates believe they understand digital technology, are confident in using that technology and plan to use technology in their classrooms, but a high percentage do not see themselves using technology multiple times per day or having their students use it as part of the learning process.

Summary

In summary, this dissertation research found evidence addressing each of the research questions. Research questions one and two asked PST candidates to self-rate their perceptions of digital literacy and confidence to integrate technology into the curriculum. Interestingly, this study found that 83.4% of PST candidates perceived themselves as having "some," "little," or "no understanding" of the digital literacy test items yet, in what appears to be contrasting findings, 85.6% of PST candidates perceived themselves as being "fairly confident," "quite confident," or "completely confident" to integrate technology into their classrooms. Research question three asked if there may be a relationship between PDL and TIE. This dissertation research found mean PDL and TICS scores, $r = .516$, $p < 0.01$, and mean Web 2.0 literacy sub-scale and TICS scores, $r = .512$, $p < 0.01$, to be moderately correlated. Research questions four and five were concerned with eight different independent variables and their relationship with PDL and TIE. Results from the survey instrument results showed significant relationships between several of the variables and PDL. PDL and years of computer ownership status, $r = .236$, $p < 0.05$ and PDL and years of owning an Internet-capable device, $r = .402$, $p < 0.01$ were positively correlated, possibly demonstrating that ownership, which allows one to gain experience with technology, is an important variable influencing digital literacy. Interestingly, no significant correlations were found between the independent variables and TICS except race,

which was significantly related to both PDL and TICS. However, the sample was not very diversified and this finding may not be generalizable. Research question six asked PST candidates if they thought they had the skills and understanding necessary to address the digital divide. Findings indicated that the sample believed they had the confidence to integrate technology into the classroom, yet the majority of the sample, 64.5%, did not believe they would use technology multiple times per day in the classroom. Nearly 89% of the sample did not believe their students would use technology in the classroom multiple times per day. These findings may indicate that PST candidates have not yet made the connection between technology integration confidence and the incorporation of technology into teaching and learning throughout the day within the classroom.

CHAPTER 5

SUMMARY, CONCLUSIONS, DISCUSSION AND RECOMMENDATIONS

Summary

This chapter summarizes the specific research findings from this quantitative, exploratory study that address the overarching inquiry: "Will the next wave of teachers possess the 21st century skills necessary to become digital pedagogists?" The Perceived Digital Literacy Survey and Technology Integration Confidence Scale were used to explore the perceptions 115 PST candidates have of their digital literacy, technology integration efficacy and projected use of technology in the classroom for teaching and learning. This chapter is organized by five general sections: Purpose of the Study, Discussions, Implications and Recommendations for Practice, Suggestions for Future Research and Conclusions. The discussion section summarizes the study's findings, and connects the research questions and conclusions to the review of literature. Based on the findings from this study, the implications and recommendations section offers suggestions for future research that could improve the equitable use of technology in teaching and learning in the P – 12 systems.

Purpose of the Study

The purpose of this study was to investigate PST candidates' potential to become digital pedagogists. Both PST candidates and COE faculty should realize that digital pedagogy practices are liberating for digital natives. These practices have educational justice and emancipatory curriculum underpinnings (Brown & Czerniewicz, 2010; Lazarus & Mora, 2000). Certain groups of PST candidates may struggle with digital literacy issues just as groups of P – 12 students also find themselves on "the other side" of the digital divide. By addressing these issues, specifically by graduating digitally literate, innovative 21st century skills-ready teacher

candidates, COE faculty will be helping to close achievement gaps, strengthen a weakening American democracy and cultivate community and global minded citizens ready to restructure the socially constructed status quo (Comer, 2004).

Potential to become digital pedagogists was investigated by having PST candidates self-assess their digital literacy familiarity, knowledge, understanding and skills and their current confidence to integrate technology within their content areas, pedagogy and general teaching milieu when they become certified, employed teachers. The digital divide is an educational justice issue. It is an "othering" dichotomy defined by those who have digital agency and those who do not. This educational justice issue was investigated by examining digital literacy levels of PST candidates and by asking these candidates if they believe they will integrate technology into their future classrooms. PST candidates' digital literacy level, confidence in technology integration, and predicted intentions to implement technology could serve as a catalyst to close the digital cap were the underlying ideas that guided the study.

Discussion

To address the overarching research question, "Will the next wave of teachers possess the 21st century skills necessary to become digital pedagogists?" this dissertation study was framed by six research questions. Each conclusion was formed from the analysis of one or more of the six research questions. The results from this study of PST candidates are discussed below. The digital divide in COE is presented and supported by the findings from the applicable research question(s) listed below.

1. What perceptions do PST candidates have of their own levels of digital literacy?
2. What perceptions do PST candidates have of their technology integration efficacy?

3. What is the relationship between the PST candidates' perception of their digital literacy and their perception of their technology integration efficacy?
4. Is digital literacy or technology integration efficacy associated with laptop/personal computer and/or Internet accessible device ownership, years of ownership, or Internet access?
5. Is digital literacy or technology integration efficacy associated with age, race, or financial aid status?
6. Do PST candidates believe they have the skills and understanding necessary to address the digital divide in their future classrooms?

The Digital Divide in PST Candidates in COEs

The digital divide is defined as the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communications technologies (ICTs) and to their use of the Internet for a wide variety of activities (Patricia, 2003). The findings from research question 1 suggest that there is a digital divide between our PST candidates**.**

Discussion: research question 1

The first research question asked PST candidates to self-rate their current levels of digital literacy. PST candidates' perceived familiarity with both computer and web-oriented digital literacy skills were assessed because digital literacy requires information and computer literacy skills. Both skills are necessary for one to be a competent 21st century digital citizen. Wikipedia user Michael Boyce (2008) commented on Wikipedia's Digital Literacy discussion board that "Computer literacy refers to a competency with respect to a tool. Digital literacy refers to a competency with respect to the production and organization of data and knowledge (i.e.,

learning) systems, which may include an examination of computers and other tools used in that enterprise." I posit that both are required for PST candidates to integrate technology into their classrooms; therefore both were assessed.

PST candidates' perceptions of their computer and web-oriented digital literacy skills have been referenced as perceived digital literacy (PDL) and Web 2.0 digital literacy (Web 2.0) levels throughout this study. PDL was scored with a Likert scale ranging from 1-5. The means scores and frequency distribution of the samples' self-ratings were presented in Chapter 4, Table 4.5 and Table 4.6. PST candidates reported moderate levels of overall PDL (M = 3.13, SD =.80); of PDL on the subscale that excludes Web 2.0 literacies (M = 3.05, SD = .87); and, the highest composite mean was found for the specific to Web 2.0 literacies (M = 3.23, SD = .84) (Table 4.5). Roughly 16% believed they had good or full understanding of the items on the digital literacy scale.

The observations made in this study show that PST candidates do not perceive themselves to have high levels of digital literacy or Web 2.0 digital literacy. Digital literacy is required if these PST candidates, our future P – 12 classroom teachers, are going to be able to teach their students, those members of Generation M^2, in the second decade of the constantly-updating 21st century classroom. Generation M^2 represents the second wave of the Net-Generation or the D-Generation. They have grown up with digital technology; today's PST candidates could be the first wave of classroom teachers that are native to digital literacies and technologies. Some research shows that this new wave of classroom teachers may not have the digital literacy it is presumed that those native to the digital world would naturally have developed. Oblinger and Oblinger (2005) found that members of the Net Generation typically lack information literacy skills. Guo, Dobson and Petrina (2004) found no statistical significance

in ICT competence between the digital natives and digital immigrants suggesting that the Net Generation is no more or less digitally competent than are members of the older generation. Results from this dissertation indicate the existence of a digital divide, or at least the existence of a perceived digital divide since an actual demonstration of digital skills tests was not a requirement for this study.

Discussion: research questions 4 and 5

There is a digital divide within the PST candidates from the COEs represented in this study. What factors may be causing that divide? As a method of investigating what variables may relate to the concept of a digital divide, research questions 4 and 5 investigated the association between perceived digital literacy and technology integration efficacy and several independent variables (IVs). Relationships between the variables and PDL are relevant to this discussion on the digital divide within our sample. The IVs were laptop/personal computer (CoO), years of laptop/personal computer ownership (YoO), Internet accessible device ownership such as an iPad, iPhone, or Android (iiDO) and years of ownership (YiiDO), perceived convenience of convenience of Internet access (CCI), age, race, or financial aid status (FinAid). Specific findings were presented in Table 4.8. Findings from this study's sample do not show significant relationships between PDL and age suggesting that there is no relationship between age and digital literacy in this sample. Variables other than age, such as owning an iPad, iPhone, Android or other Internet capable device, the number of years a PST candidate has owned a computer or laptop or other Internet capable device, and how easy they believe it is to connect to the Internet were found to be significantly related to the PST candidates' PDL.

This study's findings suggest that a digital divide may be related to access and experience rather than age. Previous research supports the idea that experience and access are more

important factors in developing digital literacy than is age (Guo, Dobson, and Petrina, 2008; Hargittai, 2010).

It should be noted that significant relationships between PDL and race and financial aid were found. But, to reiterate, this study's sample was not very diversified (Table 4.5). No conclusions will be drawn about these two variables and PDL.

Digital immigrants and digital natives (age)

Many of the variables from research questions 4 and 5 characterize digital access and experience. It is often presumed that younger adults have more experience and access with digital technology than older adults. Foehr (2006), Oblinger and Oblinger (2005), Palfrey and Gasser (2008), Prensky (2001a, 2005, 2009) and Tapscott (1998) believe that digital natives are comfortable with technology. Digital native is defined loosely as those born between 1980 and 1994 who have grown up with technology and are native speakers of the digital language of computers, video games and the Internet (Prensky, 2001a, p.1). This term creates a dichotomy, those other than digital natives are called the digital immigrants. Digital immigrant refers to those born previous to 1980 (Prensky, 2001a).

As mentioned numerous times throughout this study, the sample was not very diversified. 81.7% of the sample were digital natives based upon age. Prensky (2001) writes that digital natives have grown up digital and speak, think and process information differently than digital immigrants. In sum, Foehr, (2006) Oblinger and Oblinger (2005), Palfrey and Gasser (2008), Prensky (2001a, 2005, 2009) and Tapscott, (1998) also believe that digital natives, or members of the NetGen, are native speakers of the digital language they grew up with. This should mean they are digitally literate. This study', who was mostly made up of young adults, did not

perceive themselves as having very high levels of basic digital literacy or of Web 2.0-specific literacy.

This study, similar to other larger studies, shows that the notion that digital natives (based on age) are digitally savvy may be misleading. For example, a 2008 research study conducted by the EDUCAUSE Center for Applied Research (ECAR) on students and information technology reports an undergraduate student, a digital native, saying that "We are a tech-savvy generation. But technology is moving too fast – even for us" (Salawa & Caruso, 2008, p. 39).

Other researchers believe there is a digital divide; however, they believe that factors other than age, such as access to ICT and *cultural ecology*, determine on which side of the digital divide an individual resides. Henderson and Honan's (2008) studied middle-years students and found differences in digital literacy levels associated with access to digital tools at home and school.

Hawisher and Selfe (2004) found that the *cultural ecology* of electronic, or digital, literacy was the determining factor in the acquisition of electronic, or digital, literacy. *Cultural ecology* includes a variety of variables that can interrelate and be a factor in digital literacy acquisition. Hawisher and Selfe (2004) say that *cultural ecology* variables include "social contexts; educational practices, values, and expectations; cultural and ideological formations like race, class, and gender; political and economic trends and events; family practices and experiences; and historical and material conditions" (p. 644). Brown and Czerniewicz's (2010) research on South African university students who were part of the digital native generation showed similar findings. They examined the cultural ecology of their South African university student population and also found that age, being a "digital native" by birth year, did not mean they experienced digital culture. Brown and Czerniewicz said "We demonstrate the notion of a

generation of 'digital natives' is inaccurate: those with such attributes are effectively a digital elite….there is a deepening digital divide in South Africa characterized not by age but by access and opportunity" (p. 357). Tapscott (1998) also wrote that the digital divide is caused by access. The findings from this study support the literature that defines the digital divide by access and experience, not age.

Jones, Ramanau, Cross, and Healing (2010) studied digital native university students digital knowledge, skills and understanding in England and found that many digital natives had never added content to several Web 2.0 tools such as blogs, wikis, and virtual worlds. They concluded their research saying that regarding digital technology knowledge and skills, the Net Generation in their study were not found to be homogenous. They, too, believe that being a digital native by birth (age) does not equal having digital literacy and digital technology skills.

Salawa and Caruso's (2008) ECAR study on undergraduate students and information technology showed that respondents who rated their technology skills higher also said they had higher technology usage, meaning they engaged more often in computer and internet activities, spent more hours per week online and identified themselves as early adopters of technology (p. 52). These ECAR (2008) results relate to the findings of this study. Both support the idea that access and experience are important factors in perceptions of digital and information literacy. The ECAR study also showed that other cultural ecology variables such as gender, age, and major did not affect response patters to overall ratings about information literacy.

This dissertation study's findings were similar to prior research specific to pre-service teachers. Bennett, Maton and Kervin (2008) and Guo, Dobson, and Petrina (2008) found no statistical significant difference in information and communication technology (ICT) competence

among different age groups of preservice teachers. Although there were very small numbers of participants in the older, digital immigrant age group, this study's results were the same.

Digital immigrants and digital natives (access and experience)

The theme that emerged from a review of the aforementioned literature is that access and experience lead to digital knowledge, skills, understanding and competence for PST candidates as well as for other university students and P – 12 students.

The findings from this study support this theme. Strong correlations were found between several independent variables that are directly associated with digital technology access and experience. PDL was found to have a strong relationship with iPad, iPhone, Android or alternative Internet-capable device ownership, $r = -.199$, $p < 0.05$; years of owning a computer/laptop, $r = .204$, $p < 0.05$, years of owning an iPad, iPhone, Android or alternative Internet-capable device, $r = .341$, $p < 0.01$ and convenience of Internet connectivity, $r = -.183$, $p < 0.05$. This indicates that owning digital devices that can connect to the Internet and having relatively convenient connectivity with the Internet may lead to higher levels of PDL.

The financial aid status variable investigated in this study could fall under Hawisher and Selfe's (2004) definition of *cultural ecology*. This study used financial aid status as an indicator of socioeconomic status, which is part of cultural ecology. PST candidates were asked what percentage of their education was funded with financial aid. Interestingly, data showed that the level of financial aid was significantly, negatively related to PDL, $r = -.190$, $p < 0.05$. As the level of financial aid decreased, so, did PDL. However, future studies that include larger and more diversified samples should investigate this relationship.

Implications and Recommendations for Practice

Research presented in the literature review shows that technology must be integrated effectively, meaningfully, and frequently into the curriculum for teacher candidates at the COE level and for students at the P – 12 level. This can be a part of an action-oriented emancipatory pedagogy leading toward educational justice. Along these lines, the following implications and recommendations are explored and connections with this dissertation study's research questions are made.

Addressing the Digital Divide in P – 12 Schools

According to 21st century schools (2010), the seven Critical Attributes of 21st Century Education should be Technologies and Multimedia; Integrated and Interdisciplinary; Global Classrooms; 21st Century Skills; Relevant, Rigorous and Real-world; Adapting to and Creating Constant Personal and Social Change; Lifelong Learning; Project-Based & Research-Driven; and Student-Centered. The eight Multiple Literacies required for 21st century education are Financial Literacy; The Arts and Creativity; Ecoliteracy; Cyberliteracy; Physical Fitness and Health Literacies; Globalization and Multicultural Literacy; Social/Emotional Literacies; and Media Literacy ("Introduction – Education in the 21st Century"). In order to have a 21st century curriculum as outlined by 21st Century Schools (2010), a new digital pedagogy needs to evolve to incorporate the various attributes and literacies. That evolution requires teachers with high levels of digital literacy who want to become agents for change, acting as creators, facilitators, and models of this new digital pedagogy. Each attribute and literacy requires digital competence and technology integration. For example, global classrooms cannot be realized without digital technology; digital competence is a 21st century skill; being a digital citizen is part of the "real-

world" attributes and cyberliteracy is one of the multiple literacies desired for our 21st century students.

Research questions 2, 3, 4, 5 and 6 were analyzed and interpreted to determine if PST candidates could become a part of an action-oriented emancipatory digital pedagogy in their careers as teachers in 21st century education. These questions were used to learn if PST candidates have the confidence to integrate technology in their classrooms, to discover what skills and variables may relate to that confidence, to learn about projected frequency of technology use in the classroom and to unveil if they believe they can address some of the digital inequalities that cause digital divides.

Discussion: research question 2

The second research question asked PST candidates to self-rate their current levels of confidence to integrate technology into their teaching. The data analyzed in this study from this sample suggests that PST candidates perceive themselves as having high levels of technology integration confidence for their future classrooms. The scale used is referenced as the Technology Integration Confidence Scale (TICS). The TICS was scored with a Likert scale ranging from 1- 6. Findings were presented in Tables 4.5 and 4.6. PST candidates reported relatively high levels of overall TICS (M = 4.97, SD =.83) and relatively high levels of TIE on the three-item that was specific to addressing the digital divide in their classrooms (M = 4.21, SD = .68). Both mean scores indicated that PST candidates perceived themselves to be "somewhat" confident to integrate technology in general and to integrate technology to address digital literacy inequalities and diversities. Interestingly, six PST candidates were "completely" confident to integrate technology in their future school and classroom. In contrast, one candidate

rated herself/himself "not confident at all" and one candidate rated herself/himself as only "slightly" confident to integrate technology into the classroom.

Discussion: research questions 4 and 5

The existence of a digital divide has recently been of concern to educational stakeholders. Because of this concern, several other relationships with digital literacy and technology integration efficacy were analyzed: age, race, financial aid status; laptop/personal computer/Internet accessible device ownership, time of laptop/personal computer/Internet accessible device ownership and Internet access level. The relationship between PST candidates' perception their level of technology integration efficacy and these variables was investigated as a means of determining both the ability and confidence that this group may have to address the digital divide in the P – 12 classrooms of their future.

A significant relationship was found between TICS and race, but this study sample was not diversified. None of the other variables were found to have significant relationships with PST candidates' TIE suggesting that confidence/efficacy to integrate technology into the classroom is not related to those variables.

Discussion: research question 3

The third research question asked if there is a relationship between the PST candidates' perception of their digital literacy and their perception of their technology integration efficacy. The relationships between all PDL s and TICS were significant, at the 0.01 confidence level. The findings, which were significant, show that as comprehensive PDL mean scores increased, so did TICS, $r = .516$, $p < 0.01$ and as PDL scores for both subscales increased, so did TICS. The strongest relationship was found between the overall PDL and the PDL subscale that excluded Web 2.0 items; and the weakest correlation, which was still significant at the 0.01

confidence level, was found between the subscale that excluded Web 2.0 digital literacy items and TICS, $r = .478$, $p < 0.01$. In conclusion, this study has shown that PDL and TICS scores significantly and positively correlate meaning that as PST candidates' perception of digital literacy, including Web 2.0 digital literacy, increases so does the PST candidates' confidence to integrate technology into their classrooms and schools.

Noted previously, five of eight other variables (years of computer/laptop ownership, iPad, iPhone, Anroid or other Internet capable device ownership and years of ownership, and convenience to connect to the Internet, and financial aid status) were significantly related to PDL. Relationships between TIE and these eight variables were not found to be significant; however, if PDL is considered a moderating or intervening variable, then this study's findings suggest that those five variables have an indirect relationship with TIE.

On a whole, PST candidates in this study did perceive they are confident to integrate technology into the classrooms of their future yet they did not perceive themselves as having high levels of digital literacy, although, as PDL levels increased so did TIE. These PST candidates did not project that they, on a whole, would use technology multiple times per day for teaching purposes and even fewer thought they would use technology multiple times per day for student learning. Ironically, they were "fairly" and "quite" confident they could integrate technology into the curriculum. The inconsistencies of the findings about mean PDL and TICS scores and technology use projections sparks a further discussion.

Dutt-Doner, Allen, and Corcoran's (2005) findings were contrary to this study's findings. Their study of preservice graduate students, which included those who considered themselves to be digitally savvy, found that most had fairly good technology skills but were not comfortable or prepared to integrate technology into their classroom lesson plans.

Branch's (2003) results from her study on the information literacy were also different than this dissertation research's. She studied both understanding of information literacy and perceptions of how education majors would use information literacy in their teaching careers. The broad concept of digital literacy includes information literacy. Information literacy involves recognizing the need for information, the ability to locate information, the critical thinking skills necessary to evaluate information and the efficacy and competence to use the information. Branch (2003) found that all participants understood the concept of information literacy but only 40% of the students perceived it important to help their students become information literate.

This dissertation study's findings were similar except that these PST candidates did not think they had a good understanding of digital literacy and digital technology, but they did think they had a lot of confidence to integrate technology into the classroom. In general, they also did not think they would use technology in the classroom multiple times per day indicating that, like the results from Branch's (2003), they did not perceive technology use to be important to help their students become digitally literate.

The results of this study will be important to both College of Education faculty and P – 12 public school systems because digital literacy and technology integration efficacy within both content and pedagogy knowledge are important requirements necessary for our PST candidates to successfully take the helm of their 21st Century classrooms. Research supports this. This study's results, specifically those conclusions drawn about research question 6, also support this concept.

Discussion: research question 6:

The first five research questions are directly affiliated with the sixth and final, overarching research question which asks if PST candidates believe they have the skills and

understanding necessary to address the digital divide in their future classrooms. Findings do not suggest that there is a conclusive answer. Research question 6 was addressed in three different ways.

First, findings from research questions 1 and 2, which evaluated PST candidates' perceptions of their digital skills and confidence in integrating technology into their classrooms, were examined. Appendix C shows frequency tables for PDL means. This scale was presented to the sample as follows:

Perceived Digital Literacy (PDL) Scale

1 = "no understanding"

2 = "little"

3 = "some"

4 = "good"

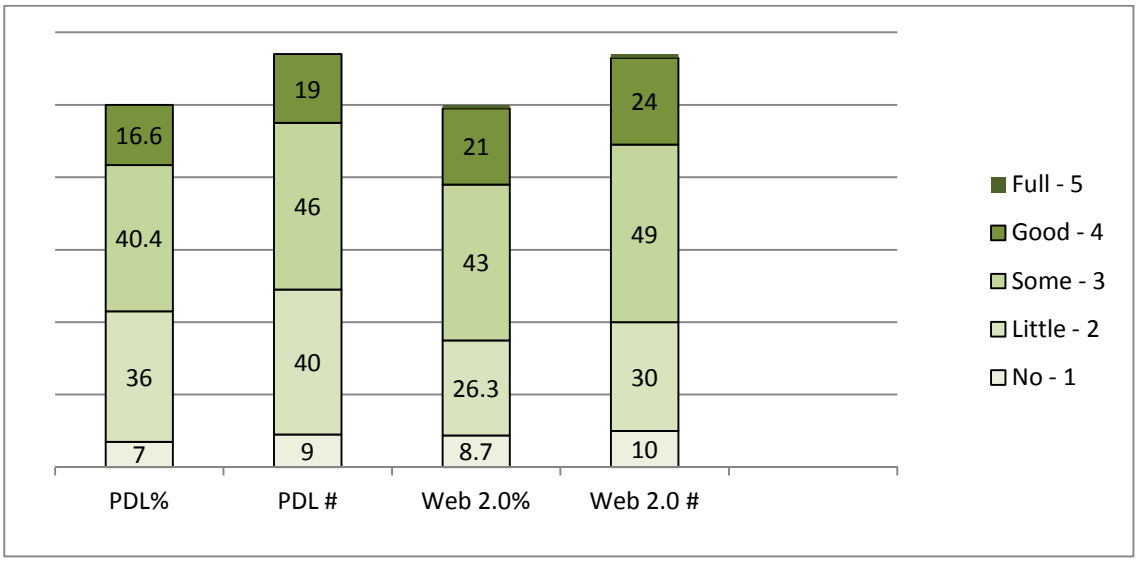
5 = "full"

Notably, most of the sample (83.4%) of PST candidates had mean scores of 3.0 or less (Figure 5.1) meaning they have only "some" or less than some understanding of the items on the PDL survey. Only 16.6% have "good" understanding of the same items. Loosely interpreted, most of these PST candidates believe they do not have good digital literacy according to results from this study's digital literacy survey instrument. To clarify, only 19 of 114 candidates who completed this sub-scale have a "good" understanding of digital literacy. Digital literacy is required if classroom teachers are going to have the skills and understanding necessary to address the digital divide in their classrooms (Jones-Kavalier & Flannigan, 2006). Today's P – 12 teachers teach in 21st Century Schools where the NETS – T are enforced. Findings of concern which are specific to Web 2.0 literacy and the NETS - T show that 78% have "some" or less than some

understanding of the Web 2.0 - specific literacy items; and only 21% have a "good" understanding of the Web 2.0 – specific literacy items on the Web 2.0 sub-scale. To clarify, only 24 of 114 candidates who completed this sub-scale have a "good" understanding of Web 2.0 – specific digital literacy and technologies. Notably, no one claimed to have a "full" understanding of digital literacy and only 1 candidate perceived herself/himself to have "full" understanding of the Web 2.0 - specific items.

Figure 5.1

Distribution and Frequency of Level of Understanding of PDL and Web 2.0 Literacies



Note: PDL# and Web 2.0# are adjacent to the column representing the percentage of candidates who selected the coinciding level of understanding

These results imply that the PST candidates in this study had only moderate perceptions of their digital literacy levels. This is concerning to the field of teacher education because Web 2.0 tools and technologies have recently become important tools for teaching and learning in P – 12 schools (Kumar & Cigil, 2011; "LoTi heating up 21st century learning," 2010; "NETS for teachers 2008," 2008). These findings suggest that this group of PST candidates is not skillful or knowledgeable about most Web 2.0 tools and technologies. In what appears to be reflective of

the social interactions of the Net Generation, 71.1% of PST candidates report having "full" understanding of social networking, such as Facebook and MySpace. Similarly, reflective of course offerings in today's college undergraduate programs, 50.9% have "full" understanding of online learning systems (Appendix C - Web 2.0 item analysis: social networking and online learning systems). This may indicate that "full" understanding of Web 2.0 items is related to experience. Many college students use social networking and many college courses use online learning systems to manage and archive course content. These two factors could mean that many college students have experience with those two specific Web 2.0 tools.

The second method of addressing research question 6 was the analysis of three specific items from the TICS: items 9, 10, and 11. As noted in previous chapters, the TICS scale was based on levels of confidence of specific technology integration tasks and was presented as follows:

Technology Integration Confidence Scale (TICS)

1 = "not confident at all"

2 = "slightly confident"

3 = "somewhat confident"

4 = "fairly confident"

5 = "quite confident"

6 = "completely confident"

TICS question 9 asks, "Not all of your students will have equal access to technology out of the classroom. How confident are you that you can identify situations where access to technology might be an issue for one or more of your students?" Results from this item show

that this group of PST candidates as a whole believed they had a fair amount of confidence in their ability to identify inequalities in technology access ($M = 4.96$, $SD = 1.07$).

TICS question 10 asks "When some of your students do not have access to technology outside the classroom, how confident are you that you can appropriately, legally, and ethically lessen the effects of such unequal access?" Results from this item show that they also felt confident that they could lessen the effects this unequal access causes ($M = 4.73$, $SD = 1.12$).

TICS question 11 asks "Your district is focusing on the integration of diversity into the curriculum. The Internet has been suggested as a way to expose students to a wide range of cultures and viewpoints. How confident are you that you can use technology (such as the Internet) to affirm diversity in your classrooms?" Results from this item show that this group of PST candidates as a whole believed they had high levels of confidence in their ability to use technology, such as the Internet, to integrate and affirm diversity into the curriculum ($M = 5.15$, $SD = 1.0$).

Data from the 112 PST candidates who answered the three-item digital divide sub-scale discussed in the previous paragraphs, showed that, as a whole, the results show they believe themselves to be "fairly" competent to integrate technology that will specifically address the digital divide ($M = 4.21$, $SD = .68$).

The final way this research sought to determine an answer for research question 6 was through the analysis of the results of the last two questions on the survey which asked PST candidates to project their use of technology and frequency of technology use in their classroom for teaching purposes and for student learning purposes. The 0 – 5 point Likert scale used for

these two questions was based on levels of frequency; the scale was presented as follows:

0 = “never”

1 = “once a year”

2 = ”once a month”

3 = “once a week”

4 = “once a day”

5 = “multiple times each day”

The first question was “When you become a classroom teacher, how often do you project you will use computers, Internet and digital technology in your teaching?” and “When you become a classroom teacher, how often do you project your students will use computers, Internet and digital technology as a part of the learning process?” Findings suggest that the majority of the sample did not project frequent technology use (Table 4.6). Only 38.5% and 11.7% of the sample projects technology use multiple times per day for teacher or student use, respectively, whereas, 30.2% and 45% project the use of technology once per week or less for teacher and student use respectively.

These findings imply that PST candidates may not understand that frequent technology use will be required to address the digital divide in their classrooms (“LoTi Framework,” 2011). Only 11.7% project they will use technology multiple times per day for student learning.

A deeper investigation of research question 6 included a search for relationships between PST candidates projected technology use for teaching/student purposes. The results, previously presented in Table 4.9, showed that projected technology use for teaching purposes significantly correlated with all of the scales and subscales administered at the 0.01 confidence level. In what seems to be an inconsistency, projected technology use for student learning purposes did not

significantly correlate with any of the scales or subscales, however, a moderately positive linear relationship with the projected us to technology for teaching purposes, $r = .485$, $p < 0.01$ was found. This indicates that perceptions of digital literacy, including Web 2.0 literacy, and technology integration efficacy are not significantly related to the projected use of technology for student learning purposes.

As evidenced by PST candidates' projected technology use, findings from this dissertation study show that PST candidates may not understand the role digital literacy and digital technology has in teaching and learning. Fahser-Herro and Steinkuehler (2009) explain that teacher preparation programs need to include digital literacy and Web 2.0 tools in coursework. Fahser-Herro and Steinkuehler say teacher education majors need to investigate what it means to use these tools in the practice of teaching. Mishra and Koehler (2005) and Niess (2005) developed an integrated framework to be used to prepare PST candidates to be competent with content, pedagogy and technology in technology-rich environments calling the assessment Technological Pedagogical and Content Knowledge (TPACK). Proponents of the TPACK framework have investigated different methods of teaching teacher education majors how TPACK framework can be successfully utilized. Larose, Grenon, Morin, and Hasni (2009) found that preservice teachers who experienced successful demonstrations of this type of ICT use in the classrooms they held internships in were more likely to plan to implement it in their future classrooms. Some proponents suggest that COE faculty should model the TPACK framework in their teacher education courses. Dutt-Doner, Allen, and Corcoran's (2005) research on transforming P – 12 student learning by improving teacher education programs and the next generation of P -12 teachers found that teacher education majors were comfortable with digital technology but needed to be taught that meaningful technology integration is a

pedagogical endeavor. They taught the pedagogy of technology integration by combining modeling of and hands on collaborative experience with Web 2.0 tools, digitized primary sources, and implementation of the NETS –T and NETS - S into a required Master's level course. Their method of teaching pedagogical technology integration was successful. The teacher education majors in their study were able to successfully integrate new technologies into lesson plans linked to the NETS – T and NETS - S that were to be taught in elementary classrooms.

Research from the literature supports the idea that technology should be used frequently as a part of an innovative teaching strategy ("LoTi Framework," 2011, "NETS – T 2008," 2008, 2008). Results from this study lead to a broad recommendation that COE faculty insure that PST candidates understand this concept, because, their responses show that they do not. The NETS – T requires technology to be infused into the curriculum. COE faculty need to insure that PST candidates understand what the specific NETS - T requirements entail and that all students meet the NETS – S. Meeting the NETS – S is part of the practice of educational justice insuring that all students gain an understanding of technology operation and concepts and become responsible digital citizens. NETS – S are in place so all students can have the opportunity to become fluent in information literacy; to use digital technology for creative and innovative purposes; to communicate and collaborate; to research; for critical thinking, problem solving and decision making purposes ("NETS for students 2007," 2007).

To summarize, the important implication that arose from the results of this study is that there is a perceived digital divide among this group of PST candidates and these findings could indicate that if other PST candidates were surveyed, data would indicate that they have similar perceptions. The important results from this study lead to a broad recommendation that COE

faculty insure that PST candidates understand the concepts of the digital divide, of digital literacy, and the importance of effective technology integration, because, their responses show that they do not.

Suggestions for Future Research

Findings from this study lead to several suggestions for future research that pertain to the educators' role in addressing the digital divide. Recommendations for future research about improving the educators' ability and self-efficacy to address the digital divide conclude this chapter.

Ability to Address the Digital Divide

The inconsistencies of the findings about PDL, TIE and projected technology use in the P – 12 school and classroom presented an interesting point for discussion. The results imply that this group of PST teachers are confident to integrate technology, but may not be competent with the various forms of digital tools and technologies and they may not have made the connection between effectiveness and frequency of technology use and how that may help close the digital divide. These findings point to several suggestions for future research.

Future research should include an investigation to determine how PST candidates, who are only average in digital literacy at best and who claim to be very confident to integrate technology into the classroom, actually define or perceive technology integration. For example, do they think using a DVD player or TeacherTube videos or email counts as technology integration or are they projecting to use web 2.0 tools to enhance teaching and learning?

Future research should include observation of PST candidates 'use of technology in their future classrooms. For example, do PST candidates' projected efficacy to integrate technology

into the classroom ratings relate to actual technology effective use of technology in the first year as an in-service teacher?

Future research should also include an investigation to determine if there is a disconnect between the understanding of digital literacy and what role it should have in technology integration for our PST candidates? Research about PST candidates' understanding of the role digital literacy and digital technology integration's have in addressing the digital divide could find that PST candidates may not be fully aware of the relationship among these three variables.

Future research on PST candidates' level of understanding of the digital divide could show if PST candidates know what digital divide is and do they realize that the NETS – and NETS - S can help eliminate it.

Finally, a pre and post test design research project should be done to see if the current instructional technology courses found in COE programs of study are effective by using a digital literacy and technology integration efficacy instrument.

Self-efficacy to Address the Digital Divide

The high TICS scores show that PST candidates are confident to integrate technology into their future teaching endeavors. They have high self-efficacy toward the specific task of technology integration. Bandura's theory of self-efficacy states that learner's previous experience with similar tasks and from observations of the task being conducted are powerful determinants of self-efficacy. Persuasion and verbal support and the learner's physiological state are also determinants of self-efficacy ("Bandura," 2010). According to Bandura, the higher self-efficacy one has toward a specific task, the more likely they are to succeed at performing that task. Bandura says that teachers must model that task. Observations of successful modeling of a task lead to high self-efficacy ("Bandura," 2010).

Progress toward Building Ability and Self-Efficacy in PST Candidates

The fact that these PST candidates have relatively high self-efficacy to integrate technology into the curriculum is a positive sign. Technology integration is necessary if they are to address the digital divide in the classroom. The challenge that arises is that PST candidates need to improve their perceptions of their digital literacy efficacy; which means they need to improve their digital knowledge, skills, and understandings. This study and many studies presented in the review of literature show that access and experience improve digital literacy. PST candidates need more experience with technology, especially Web 2.0 technology. Most PST candidates in this survey felt that they had "good" (16%) or "full" (70%) understanding of social networking, a Web 2.0 tool. In 2005, 85% of college students had a Facebook account and 60% logged in daily, 85% logged in once a week and 93% logged in at least once a month (Schulz, 2005). These percentages have no doubt increased. This means that many college students have experience with that digital tool and that experience leads to the perception of full understanding of that tool. COE faculty need to provide opportunities for PST candidates to have meaningful experiences with various digital tools, especially Web 2.0 tools, so their perception of knowledge, skills, and abilities with the various tools will increase. Kumar and Vigil's (2011) study supports the concept that modeling of and experience with technology leads to higher levels of digital competence and projected technology use for our PST candidates, Kumar and Vigil's study of the Net Generation of preservice teachers found gaps between the use of Web 2.0 tools in preservice teachers personal lives and their college coursework. Their findings indicated that COE faculty need to model technology use in teacher education programs so the Net generation will be able to use Web 2.0 tools for educational purposes.

The PST candidates in this study already believe they can integrate technology into their future classrooms. It is up to the COE faculty to help PST candidates learn how to use digital technology within the content area and within the pedagogy so they will integrate technology into their future classrooms that is meaningful to their students and improves student learning, promoted educational equity and decreases the digital divide.

Results from this study indicate that COE faculty should be challenged to educate PST candidates about their role in improving the digital and information literacy of their students. Branch's (2003) information literature study's results showed that education majors do not understand this concept. Branch's results, although contrary to this dissertation research's, did find that all participants understood the concept of information literacy but only 40% of the students perceived it important to help their students become information literate. PST candidates need to understand that it is part of their job as an educator to insure that all students have these skills. By doing so, they will be helping improve equity in education.

Conclusion

The digital divide is an educational justice issue. The digital divide separates both PST candidates as well P – 12 students into two camps based upon who has digital agency and who does not. Those who are without digital agency are marginalized and educational equity cannot be achieved. This educational justice issue was investigated by examining digital literacy levels of PST candidates and by asking these candidates if they believe they will integrate technology into their future classrooms. This study fell within the realm of emancipatory pedagogy because the concept that that PST candidates' digital literacy level; their confidence in technology integration; and their projections to implement technology into the classrooms and to use technology to address the digital inequities among their students could determine if the next

wave of P – 12 teachers will be ready to be change agents helping close the digital divide that has been found to exist even with the Net-Gen and Generation M^2.

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APPENDICES

APPENDIX A

Perceived Digital Literacy Survey and Technology Integration Confidence Scale

Please answer the following descriptive items.

What University/College do you attend?			
AASU ☐	GSU ☐	Brenau University ☐	Other ☐

What is your sex?	
1 ☐	2 ☐
MALE	FEMALE

What are the last two digits of your birth year? Use numbers.
19 _ _

Into which age group were you born?				
1900 - 1945 ☐	1946 - 1964 ☐	1965-1981 ☐	1982-1990 ☐	1991+ ☐
Matures	Baby Boomers	Generation X	Net Generation	Generation M[2]

What is your race/ethnicity?					
White ☐	Black/African American ☐	Latino/a or Mexican America ☐	Asian American /Pacific Islander ☐	Native American ☐	Other ☐

Do you own a laptop/personal computer?	
1 ☐ YES	2 ☐ NO

How many years have you owned a laptop/personal computer?					
1 ☐ less than 1	2 ☐ 1	3 ☐ 2	4 ☐ 3	5 ☐ 4+	6 ☐ n/a

Do you own a device, such as an iPad, iPhone, MacBook, Android, notebook, etc, that can access the Internet?	
1 ☐ YES	2 ☐ NO

How many years have you owned your Internet capable device (such as an iPad, iPhone, MacBook, Android, notebook, etc)?					
1 ☐ less than 1	2 ☐ 1	3 ☐ 2	4 ☐ 3	5 ☐ 4+	6 ☐ n/a

Are you continuously connected to the Internet?	
1 ☐ YES	2 ☐ NO

In general, how convenient (easy) is it for you to connect to the Internet?					
1 ☐ very easy	2 ☐ easy	3 ☐ somewhat easy	4 ☐ somewhat difficult	5 ☐ difficult	6 ☐ very difficult

Describe the role financial aid has in funding your undergraduate education.				
1 ☐ about 100%	2 ☐ about 75%	3 ☐ about 50%	4 ☐ about 25%	5 ☐ I do not receive financial aid

Have you taken or are you currently taking the required educational technology course in your program of study?		
1 ☐ YES	2 ☐ NO	3 ☐ n/a

Please answer the following items about your familiarity with Computer, Internet and Web 2.0-related items.

How familiar are you with the following Computer, Internet and Web 2.0-related items? Please choose a number between 1 and 5, where 1 represents *no understanding* and 5 represents *full understanding* of the item.

PDF				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

refresh/reload				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

MP3				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

JPEG				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

frames				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

BCC in email				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

weblog				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

preference settings				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

newsgroups				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

advanced search				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

bookmark				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

spyware				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

blog				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

tagging				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

tabbed browsing				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

RSS				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

wiki				
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
none	little	some	good	full

malware				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

social bookmarking				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

podcasting				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

phishing				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

web feeds				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

firewall				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

cache				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

widget				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

favorites				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

torrents				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

Boolean expression				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

HTML				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

The purpose of this question is to assess your attentiveness. Please mark response 5.				
1 ☐ none	2 ☐ little	3 ☐ some	4 ☐ good	5 ☐ full

*interactive white board (ACTIVBoard, SMART Board) **				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

webquests (Questgarden, Zunal, WebQuest, Fur.ly)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

digital storytelling (iMovie, Windows Movie Maker, Posterous, Dreamweaver)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

digital video sharing tools (TeacherTube, Videoegg, Selfcast)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

web-based word processor/spreadsheet/ presentation/form/book/data storage services (Buzzword, Book Goo, BookRix, Etherpad, Peepel, OpenGoo, ZOHO, Google Docs)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

web-based photo sharing/uploading/managing (Flickr, Shutterfly, PhotoPeach Dropshots),				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

digital mapping (Google Maps, Community Walk, ZeeMaps, Wayfaring, MapBuzz)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

audience response systems/audience clickers (iRespond, Qwizdom, TurningPoint)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

social networking (Facebook, MySpace, LinkedIn)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

online learning systems (Blackboard/Vista/WebCT)				
1 ☐	*2* ☐	*3* ☐	*4* ☐	*5* ☐
none	*little*	*some*	*good*	*full*

* Items in *italics* are part of the Web 2.0 subscale; respondents did not see *italics*.

Technology Integration Confidence and Projected Technology Integration

Instructions: For this part of the survey, you will be asked to rate how confident you are that you can complete certain technology integration tasks. Although these items are worded as if you were already teaching, rate your confidence as it is at this moment without any further instruction or practice to accomplish the tasks listed.

Instructions: Read the following situations and rate how confident you ***are at this moment*** and without any further instruction or practice to accomplish the tasks they propose.

1 −−−Not confident at all
2−−−Slightly confident
3−−−Somewhat confident
4−−−Fairly confident
5−−−Quite confident

6−−−Completely confident

TICS 1. Your district is rolling out a new technology at each school. They invite representatives from each department to an in-service demonstration. How confident are you that you can effectively learn this new technology during the in-service?

TICS 2. Unfortunately, your school will not be able to afford a computer lab attendant this year. Instead, each teacher will be assigned 2 lab hours per week. How confident are you that you can manage your students' time and activities during these lab sessions?

TICS 3. At a workshop during a statewide teacher conference you meet several teachers with whom you would like to exchange ideas and experiences during the school year. How confident are you that you can use e-mail, blogs, or other technologies to keep in touch?

TICS 4. The parents of more than half your students have asked to be kept informed of class assignments and activities via regular e-mails or a class Web site. How confident are you that you can accommodate this request?

TICS 5. Your district uses computer-based attendance records and an online grade book. How confident are you that you can use these tools to be more productive?

TICS 6. A member of the PTA feels that there is too much technology in the school and states that not all technologies are equally applicable to your classroom and not all student learning goals are well suited for technology. How confident are you that you can effectively judge when and
how to use technology to support your students' learning?

TICS 7. In preparation for a performance review with an administrator, you are asked to critically evaluate several aspects of your teaching, including your use of technology in class. How confident are you that you can accurately do so?

TICS 8. A speaker from the State Department of Education declares that effective teachers are also lifelong learners and that the Internet is a great source of information. How confident are you that you can use the Internet and other technology resources as part of your own lifelong learning?

***TICS 9. Not all of your students will have equal access to technology out of the classroom. How confident are you that you can identify situations where access to technology might be an issue for one or more of your students?*

TICS 10. When some of your students do not have access to technology outside the classroom, how confident are you that you can appropriately, legally, and ethically lessen the effects of such unequal access?

TICS 11. Your district is focusing on the integration of diversity into the curriculum. The Internet has been suggested as a way to expose students to a wide range of cultures and viewpoints. How confident are you that you can use technology (such as the Internet) to affirm diversity in your classrooms?

TICS 12. Because students are using the Internet and other technologies in school, they must be instructed how to stay safe while getting the most from these resources. How confident are you that you can model and teach safe usage of technology, including Internet safety?

TICS 13. Technology can help students accomplish tasks, good or ill. For example, students can find images of rare historical artifacts, but they can also illegally obtain copyrighted materials online (such as music). Telecommunications technology can bring the world into your classroom and allows students to text one another exam answers via cell phones. How confident are you that you can model and teach ethical and legal use of technology?

TICS 14. Your school assigns one computer lab period every 2 weeks to every class, regardless of subject. How confident are you that you can create lesson plans that effectively use the lab time for student learning?

TICS 15. A teacher in another subject has found an article that reports research on using a certain new technology in class. How confident are you that you can identify the applicable information in the article and use it in your classes?

TICS 16. An educational software vendor gives a sales pitch to your department. How confident are you that you can evaluate the products for their suitability to your teaching environment?

TICS 17. A vice principal is upset that the new equipment that was donated to the school is not being used. He asks if you can demonstrate proper usage at the next in-service meeting. How confident are you that you can accomplish this task?

TICS 18. A parent complains that a unit exam you gave was unfair and poorly written. What's worse, this parent works at a major standardized testing firm. How confident are you that you can use a spreadsheet program (or another application) to demonstrate the strengths and weaknesses of your test?

TICS 19. An administrator observes your class computer lab and reports to the principal that you are not effectively using that time. How confident are you that you can provide evidence that the time you spend in the lab is effective?

** TICS 9, 10, and 11 items are in *italics* and specifically address the digital divide. Respondents did not see *italics*.

PROJECTED TECHNOLOGY INTEGRATION QUESTIONS

69. When you become a classroom teacher, how often do you project you will use computers, Internet and digital technology in your teaching?					
0 ☐ never	1 ☐ At least once a year	2 ☐ At least once a month	3 ☐ At least once a week	4 ☐ At least once a day	5 ☐ Multiple times each day

70. When you become a classroom teacher, how often do you project your students will use computers, Internet and digital technology as a part of the learning process?

0	1	2	3	4	5
☐	☐	☐	☐	☐	☐
never	At least once a year	At least once a month	At least once a week	At least once a day	Multiple times each day

APPENDIX B

Inter-item variability results from SPSS for all scales

PDL Survey Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PDF	124.72	970.864	.628	.741	.963
refresh/reload	123.96	988.987	.450	.759	.964
MP3	124.50	965.901	.646	.709	.963
JPEG	124.75	956.102	.717	.770	.962
frames	125.83	963.530	.572	.709	.963
BCC in email	125.36	960.782	.535	.695	.963
weblog	125.68	953.185	.701	.788	.962
preference settings	124.80	962.401	.622	.737	.963
newsgroups	125.68	957.185	.705	.819	.962
advanced search	124.71	958.737	.734	.786	.962
bookmark	124.33	957.607	.734	.787	.962
spyware	125.10	948.924	.748	.830	.962
blog	125.04	945.976	.772	.839	.962
tagging	124.60	956.573	.660	.768	.963
tabbed browsing	124.61	959.757	.594	.777	.963
RSS	126.67	972.222	.563	.685	.963
wiki	125.43	950.908	.662	.767	.963
malware	125.84	950.687	.715	.831	.962

social bookmarking	125.60	954.990	.623	.763	.963
podcasting	125.78	955.007	.702	.751	.962
phishing	126.16	956.512	.624	.721	.963
web feeds	125.65	947.636	.746	.745	.962
firewall	125.27	952.090	.716	.751	.962
cache	126.03	947.526	.738	.802	.962
widget	126.08	963.851	.535	.610	.963
favorites	124.29	977.814	.545	.613	.963
torrents	126.17	952.607	.656	.769	.963
boolean expression	126.74	974.019	.509	.672	.963
HTML	124.99	970.231	.548	.652	.963
Attentiveness	123.63	1000.170	.290	.484	.964
interactive white board	125.03	967.373	.589	.783	.963
webquests	126.07	974.743	.456	.665	.964
digital storytelling	125.48	953.703	.677	.837	.963
digital video sharing tools	125.61	961.845	.596	.742	.963
web-based word processor	125.32	966.108	.529	.648	.963
web-based photo sharing	124.99	955.220	.697	.762	.963
digital mapping	124.90	960.727	.688	.751	.963
audience response systems	126.28	967.919	.532	.767	.963
social networking	123.95	982.184	.503	.704	.963
online learning systems	124.17	979.706	.520	.592	.963

PDL no Web 2.0 Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PDF	91.62	586.325	.603	.679	.956
refresh/reload	90.86	600.271	.418	.671	.957
MP3	91.41	581.084	.648	.647	.956
JPEG	91.65	573.220	.728	.699	.955
frames	92.73	579.122	.576	.624	.956
BCC in email	92.28	576.310	.547	.603	.957
weblog	92.60	571.448	.701	.743	.955
preference settings	91.72	577.041	.648	.669	.956
newsgroups	92.61	573.790	.717	.785	.955
advanced search	91.63	575.699	.734	.711	.955
bookmark	91.27	573.466	.744	.760	.955
spyware	92.02	567.247	.761	.813	.955
blog	91.96	566.106	.771	.804	.955
tagging	91.51	575.070	.643	.705	.956
tabbed browsing	91.54	576.487	.587	.722	.956
RSS	93.57	584.355	.593	.648	.956
wiki	92.34	568.550	.680	.699	.956
malware	92.74	568.837	.727	.793	.955
social bookmarking	92.52	573.457	.611	.701	.956
podcasting	92.71	572.465	.703	.724	.955
phishing	93.09	571.756	.657	.689	.956

web feeds	92.57	566.591	.750	.687	.955
firewall	92.19	568.759	.735	.725	.955
cache	92.96	564.600	.776	.775	.955
widget	93.00	578.516	.549	.512	.957
favorites	91.21	590.062	.550	.526	.957
torrents	93.10	570.883	.655	.697	.956
boolean expression	93.65	586.639	.524	.637	.957
HTML	91.89	586.827	.507	.531	.957
Attentiveness	90.53	608.209	.275	.345	.958

Web 2.0 Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
interactive white board	28.89	58.206	.691	.528	.872
webquests	29.95	61.124	.488	.436	.886
digital storytelling	29.35	55.503	.749	.595	.867
digital video sharing tools	29.52	56.197	.733	.569	.869
web-based word processor	29.23	57.612	.601	.464	.879
web-based photo sharing	29.00	56.473	.691	.540	.872
digital mapping	28.78	59.244	.615	.539	.878
audience response systems	30.17	57.361	.679	.598	.873
social networking	27.81	64.191	.465	.399	.887
online learning systems	28.05	63.179	.514	.417	.884

4-Item Analysis Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
malware	7.46	10.339	.729	.532	.740
phishing	7.80	10.499	.701	.555	.753
cache	7.68	10.380	.699	.560	.753
digital storytelling	7.04	12.272	.474	.261	.852

TICS Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
TICS 1	89.34	227.344	.724	.625	.964
TICS 2	89.50	233.919	.518	.480	.967
TICS 3	88.49	233.821	.767	.775	.963
TICS 4	88.61	235.083	.717	.769	.964
TICS 5	88.63	231.647	.817	.829	.963
TICS 6	89.04	228.940	.825	.770	.962
TICS 7	89.05	230.321	.824	.777	.963
TICS 8	88.65	231.073	.822	.782	.963
TICS 9	89.06	228.722	.817	.792	.963
TICS 10	89.27	229.553	.734	.712	.964
TICS 11	88.86	230.511	.812	.836	.963
TICS 12	88.86	232.883	.772	.700	.963
TICS 13	88.87	232.641	.766	.711	.963

TICS 14	88.90	230.540	.807	.806	.963
TICS 15	89.08	227.543	.849	.838	.962
TICS 16	89.43	226.953	.779	.753	.963
TICS 17	89.47	228.898	.750	.682	.963
TICS 18	89.68	227.847	.661	.679	.965
TICS 19	89.21	228.699	.804	.794	.963

TICS 9 10 11 Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
TICS 9	9.89	3.553	.826	.687	.724
TICS 10	10.11	3.723	.690	.515	.857
TICS 11	9.70	4.117	.712	.568	.834

Technology Integration Intentions Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Tech Teacher Use	3.47	.936	.485	.235	.
Tech Student Use	3.99	.991	.485	.235	.

Web 2.0 Inter Item variability -- a reliability test

Inter-Item Correlation Matrix

	interactive white board	webquests	digital storytelling	digital video sharing tools	web-based word processor	web-based photo sharing	digital mapping	audience response systems	social networking	online learning systems
interactive white board	1.000	.473	.627	.570	.405	.458	.462	.534	.404	.440
webquests	.473	1.000	.423	.522	.275	.364	.121	.506	.133	.308
digital storytelling	.627	.423	1.000	.582	.560	.584	.526	.612	.323	.404
digital video sharing tools	.570	.522	.582	1.000	.483	.561	.462	.633	.343	.414
web-based word processor	.405	.275	.560	.483	1.000	.507	.438	.592	.298	.224
web-based photo sharing	.458	.364	.584	.561	.507	1.000	.605	.461	.373	.441
digital mapping	.462	.121	.526	.462	.438	.605	1.000	.418	.499	.425
audience response systems	.534	.506	.612	.633	.592	.461	.418	1.000	.203	.223

social networking	.404	.133	.323	.343	.298	.373	.499	.203	1.000	.526
online learning systems	.440	.308	.404	.414	.224	.441	.425	.223	.526	1.000

Inter-Item Correlation Matrix

APPENDIX C

Dependent Variables: Descriptive Statistics, Frequency

Dependent Variables - Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PDL Mean	114	1.36	4.78	3.1322	.80369
PDLmeanNoweb2.0	114	1.18	4.79	3.0459	.86765
Web2.0Mean	114	1.40	5.00	3.2255	.84075
TICS Mean	111	1.95	6.00	4.9685	.83364
TICS91011	112	1.97	5.31	4.2073	.68198
Tech Teacher Use	109	1	5	3.99	.995
Tech Student Use	111	0	5	3.49	.971
Valid N (listwise)	109				

Individual Dependent Variable - Frequency Tables

PDL Mean

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	.9	.9	.9
	1.36	2	1.7	1.7	2.6
	1.40	1	.9	.9	3.5
	1.43	1	.9	.9	4.3
	1.58	1	.9	.9	5.2
	1.75	1	.9	.9	6.1
	1.78	1	.9	.9	7.0

1.80	1	.9	.9	7.8
1.83	1	.9	.9	8.7
2.00	1	.9	.9	9.6
2.03	1	.9	.9	10.4
2.05	1	.9	.9	11.3
2.08	1	.9	.9	12.2
2.08	1	.9	.9	13.0
2.13	1	.9	.9	13.9
2.17	2	1.7	1.7	15.7
2.23	1	.9	.9	16.5
2.30	1	.9	.9	17.4
2.38	1	.9	.9	18.3
2.41	1	.9	.9	19.1
2.45	1	.9	.9	20.0
2.45	3	2.6	2.6	22.6
2.55	1	.9	.9	23.5
2.62	1	.9	.9	24.3
2.67	1	.9	.9	25.2
2.68	1	.9	.9	26.1
2.70	2	1.7	1.7	27.8
2.74	1	.9	.9	28.7
2.75	4	3.5	3.5	32.2
2.78	2	1.7	1.7	33.9

2.80	3	2.6	2.6	36.5
2.82	2	1.7	1.7	38.3
2.85	2	1.7	1.7	40.0
2.90	1	.9	.9	40.9
2.95	1	.9	.9	41.7
2.97	1	.9	.9	42.6
2.98	2	1.7	1.7	44.3
3.00	2	1.7	1.7	46.1
3.03	1	.9	.9	47.0
3.05	2	1.7	1.7	48.7
3.08	1	.9	.9	49.6
3.13	1	.9	.9	50.4
3.13	1	.9	.9	51.3
3.18	2	1.7	1.7	53.0
3.20	1	.9	.9	53.9
3.23	1	.9	.9	54.8
3.25	1	.9	.9	55.7
3.28	1	.9	.9	56.5
3.30	1	.9	.9	57.4
3.31	1	.9	.9	58.3
3.35	1	.9	.9	59.1
3.43	2	1.7	1.7	60.9
3.44	1	.9	.9	61.7

3.45	1	.9	.9	62.6
3.45	1	.9	.9	63.5
3.48	2	1.7	1.7	65.2
3.53	1	.9	.9	66.1
3.55	1	.9	.9	67.0
3.58	2	1.7	1.7	68.7
3.60	4	3.5	3.5	72.2
3.64	1	.9	.9	73.0
3.67	1	.9	.9	73.9
3.68	1	.9	.9	74.8
3.78	2	1.7	1.7	76.5
3.80	1	.9	.9	77.4
3.83	1	.9	.9	78.3
3.88	3	2.6	2.6	80.9
3.90	3	2.6	2.6	83.5
3.98	1	.9	.9	84.3
4.00	1	.9	.9	85.2
4.03	1	.9	.9	86.1
4.08	2	1.7	1.7	87.8
4.13	2	1.7	1.7	89.6
4.15	1	.9	.9	90.4
4.20	2	1.7	1.7	92.2
4.22	1	.9	.9	93.0

	4.28	1	.9	.9	93.9
	4.33	2	1.7	1.7	95.7
	4.54	1	.9	.9	96.5
	4.55	1	.9	.9	97.4
	4.63	1	.9	.9	98.3
	4.72	1	.9	.9	99.1
	4.78	1	.9	.9	100.0
	Total	115	100.0	100.0	

PDL Mean Subscale – Exclusive of Web 2.0 Items

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	.9	.9	.9
	1.18	1	.9	.9	1.7
	1.21	1	.9	.9	2.6
	1.24	1	.9	.9	3.5
	1.34	1	.9	.9	4.3
	1.59	1	.9	.9	5.2
	1.62	2	1.7	1.7	7.0
	1.66	1	.9	.9	7.8
	1.69	1	.9	.9	8.7
	1.71	1	.9	.9	9.6

1.72	1	.9	.9	10.4
1.79	1	.9	.9	11.3
1.86	1	.9	.9	12.2
1.90	1	.9	.9	13.0
2.10	1	.9	.9	13.9
2.14	2	1.7	1.7	15.7
2.15	1	.9	.9	16.5
2.18	1	.9	.9	17.4
2.24	2	1.7	1.7	19.1
2.28	1	.9	.9	20.0
2.31	1	.9	.9	20.9
2.32	1	.9	.9	21.7
2.34	1	.9	.9	22.6
2.36	1	.9	.9	23.5
2.38	2	1.7	1.7	25.2
2.41	1	.9	.9	26.1
2.45	1	.9	.9	27.0
2.48	1	.9	.9	27.8
2.50	1	.9	.9	28.7
2.52	1	.9	.9	29.6
2.59	3	2.6	2.6	32.2
2.62	4	3.5	3.5	35.7
2.66	2	1.7	1.7	37.4

2.69	1	.9	.9	38.3
2.76	3	2.6	2.6	40.9
2.79	3	2.6	2.6	43.5
2.90	4	3.5	3.5	47.0
2.93	2	1.7	1.7	48.7
2.97	1	.9	.9	49.6
3.03	2	1.7	1.7	51.3
3.07	1	.9	.9	52.2
3.10	1	.9	.9	53.0
3.14	2	1.7	1.7	54.8
3.17	1	.9	.9	55.7
3.23	1	.9	.9	56.5
3.24	2	1.7	1.7	58.3
3.28	1	.9	.9	59.1
3.34	4	3.5	3.5	62.6
3.45	1	.9	.9	63.5
3.48	3	2.6	2.6	66.1
3.50	1	.9	.9	67.0
3.52	1	.9	.9	67.8
3.59	4	3.5	3.5	71.3
3.62	2	1.7	1.7	73.0
3.64	1	.9	.9	73.9
3.76	3	2.6	2.6	76.5

3.79	1	.9	.9	77.4
3.79	2	1.7	1.7	79.1
3.90	1	.9	.9	80.0
3.93	2	1.7	1.7	81.7
3.97	1	.9	.9	82.6
4.00	4	3.5	3.5	86.1
4.03	1	.9	.9	87.0
4.07	3	2.6	2.6	89.6
4.10	2	1.7	1.7	91.3
4.17	1	.9	.9	92.2
4.31	1	.9	.9	93.0
4.34	2	1.7	1.7	94.8
4.38	2	1.7	1.7	96.5
4.61	1	.9	.9	97.4
4.76	2	1.7	1.7	99.1
4.79	1	.9	.9	100.0
Total	115	100.0	100.0	

PDL Mean Subscale - Web 2.0 Only

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	.9	.9	.9
	1.40	1	.9	.9	1.7
	1.50	2	1.7	1.7	3.5
	1.60	3	2.6	2.6	6.1
	1.80	3	2.6	2.6	8.7
	1.90	1	.9	.9	9.6
	2.00	1	.9	.9	10.4
	2.10	2	1.7	1.7	12.2
	2.20	3	2.6	2.6	14.8
	2.40	3	2.6	2.6	17.4
	2.44	1	.9	.9	18.3
	2.50	6	5.2	5.2	23.5
	2.60	3	2.6	2.6	26.1
	2.70	3	2.6	2.6	28.7
	2.80	3	2.6	2.6	31.3
	2.90	5	4.3	4.3	35.7
	3.00	7	6.1	6.1	41.7
	3.10	4	3.5	3.5	45.2
	3.20	4	3.5	3.5	48.7
	3.30	7	6.1	6.1	54.8

3.40	7	6.1	6.1	60.9
3.50	7	6.1	6.1	67.0
3.60	3	2.6	2.6	69.6
3.67	1	.9	.9	70.4
3.70	4	3.5	3.5	73.9
3.80	4	3.5	3.5	77.4
3.90	1	.9	.9	78.3
4.00	6	5.2	5.2	83.5
4.20	5	4.3	4.3	87.8
4.30	2	1.7	1.7	89.6
4.40	3	2.6	2.6	92.2
4.50	1	.9	.9	93.0
4.60	3	2.6	2.6	95.7
4.70	3	2.6	2.6	98.3
4.80	1	.9	.9	99.1
5.00	1	.9	.9	100.0
Total	115	100.0	100.0	

Web 2.0 item analysis - online learning systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.7	1.8	1.8
	2	4	3.5	3.5	5.3
	3	15	13.0	13.2	18.4
	4	35	30.4	30.7	49.1
	5	58	50.4	50.9	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Web 2.0 item analysis: social networking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.9	.9	.9
	2	6	5.2	5.3	6.1
	3	8	7.0	7.0	13.2
	4	18	15.7	15.8	28.9
	5	81	70.4	71.1	100.0
	Total	114	99.1	100.0	
Missing	System	1	.9		
Total		115	100.0		

Mean - Technology Integration Confidence Scale

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	4	3.5	3.5	3.5
	1.95	1	.9	.9	4.3
	2.84	1	.9	.9	5.2
	3.00	3	2.6	2.6	7.8
	3.11	1	.9	.9	8.7
	3.32	1	.9	.9	9.6
	3.42	1	.9	.9	10.4
	3.47	1	.9	.9	11.3
	3.74	1	.9	.9	12.2
	3.79	3	2.6	2.6	14.8

3.84	1	.9	.9	15.7
4.00	2	1.7	1.7	17.4
4.11	1	.9	.9	18.3
4.21	2	1.7	1.7	20.0
4.32	4	3.5	3.5	23.5
4.37	1	.9	.9	24.3
4.47	2	1.7	1.7	26.1
4.50	1	.9	.9	27.0
4.58	4	3.5	3.5	30.4
4.63	2	1.7	1.7	32.2
4.74	2	1.7	1.7	33.9
4.84	3	2.6	2.6	36.5
4.89	1	.9	.9	37.4
4.89	1	.9	.9	38.3
4.95	2	1.7	1.7	40.0
5.00	7	6.1	6.1	46.1
5.05	2	1.7	1.7	47.8
5.11	5	4.3	4.3	52.2
5.16	3	2.6	2.6	54.8
5.21	2	1.7	1.7	56.5
5.26	3	2.6	2.6	59.1
5.32	4	3.5	3.5	62.6
5.37	3	2.6	2.6	65.2

5.42	4	3.5	3.5	68.7
5.47	2	1.7	1.7	70.4
5.53	4	3.5	3.5	73.9
5.56	1	.9	.9	74.8
5.58	2	1.7	1.7	76.5
5.61	1	.9	.9	77.4
5.63	2	1.7	1.7	79.1
5.67	1	.9	.9	80.0
5.68	3	2.6	2.6	82.6
5.71	1	.9	.9	83.5
5.74	2	1.7	1.7	85.2
5.79	2	1.7	1.7	87.0
5.84	3	2.6	2.6	89.6
5.89	2	1.7	1.7	91.3
5.95	4	3.5	3.5	94.8
6.00	6	5.2	5.2	100.0
Total	115	100.0	100.0	

Mean - Technology Integration Confidence Scale - TICS Items 9, 10, and 11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	4	3.5	3.5	3.5

1.50	1	.9	.9	4.3
2.00	1	.9	.9	5.2
2.50	1	.9	.9	6.1
3.00	5	4.3	4.3	10.4
3.50	8	7.0	7.0	17.4
4.00	15	13.0	13.0	30.4
4.50	14	12.2	12.2	42.6
5.00	18	15.7	15.7	58.3
5.50	23	20.0	20.0	78.3
6.00	25	21.7	21.7	100.0
Total	115	100.0	100.0	

Projected Technology Use - Teacher Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.9	.9	.9
	2	8	7.0	7.3	8.3
	3	24	20.9	22.0	30.3
	4	34	29.6	31.2	61.5
	5	42	36.5	38.5	100.0
	Total	109	94.8	100.0	
Missing	System	6	5.2		
Total		115	100.0		

Projected Technology Use - Student Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	.9	.9	.9
	1	2	1.7	1.8	2.7
	2	13	11.3	11.7	14.4
	3	34	29.6	30.6	45.0
	4	48	41.7	43.2	88.3
	5	13	11.3	11.7	100.0
	Total	111	96.5	100.0	
Missing	System	4	3.5		
Total		115	100.0		

Technology Integration Confidence Scale – Item Analysis

Scale:

1 ---Not confident at all

2---Slightly confident

3---Somewhat confident

4---Fairly confident

5---Quite confident

6---Completely confident

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
TICS 1	111	1	6	525	4.73	1.235
TICS 2	111	1	6	505	4.55	1.270
TICS 3	111	2	6	612	5.51	.893
TICS 4	110	3	6	593	5.39	.910
TICS 5	111	2	6	596	5.37	.933
TICS 6	111	2	6	551	4.96	1.026
TICS 7	110	1	6	549	4.99	.991
TICS 8	111	2	6	595	5.36	.951
TICS 9	111	2	6	551	4.96	1.061
TICS 10	109	1	6	516	4.73	1.119
TICS 11	109	2	6	561	5.15	.998
TICS 12	111	2	6	571	5.14	.962
TICS 13	111	2	6	570	5.14	.949
TICS 14	109	2	6	557	5.11	.994
TICS 15	110	2	6	544	4.95	1.057
TICS 16	110	1	6	505	4.59	1.160

TICS 17	110	1	6	501	4.55	1.154
TICS 18	110	1	6	479	4.35	1.331
TICS 19	111	1	6	532	4.79	1.088
Valid N (listwise)	103					

Technology Integration Confidence Scale

TICS 1

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3.5	3.5	3.5
1	4	3.5	3.5	7.0
2	2	1.7	1.7	8.7
3	10	8.7	8.7	17.4
4	21	18.3	18.3	35.7
5	41	35.7	35.7	71.3
6	33	28.7	28.7	100.0
Total	115	100.0	100.0	

TICS 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3.5	3.5	3.5
1	4	3.5	3.5	7.0
2	5	4.3	4.3	11.3

3	11	9.6	9.6	20.9
4	22	19.1	19.1	40.0
5	44	38.3	38.3	78.3
6	25	21.7	21.7	100.0
Total	115	100.0	100.0	

TICS 3

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3.5	3.5	3.5
2	1	.9	.9	4.3
3	5	4.3	4.3	8.7
4	9	7.8	7.8	16.5
5	17	14.8	14.8	31.3
6	79	68.7	68.7	100.0
Total	115	100.0	100.0	

TICS 4

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	4.3	4.3	4.3
3	7	6.1	6.1	10.4
4	11	9.6	9.6	20.0

5	24	20.9	20.9	40.9
6	68	59.1	59.1	100.0
Total	115	100.0	100.0	

TICS 5

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3.5	3.5	3.5
2	1	.9	.9	4.3
3	6	5.2	5.2	9.6
4	11	9.6	9.6	19.1
5	26	22.6	22.6	41.7
6	67	58.3	58.3	100.0
Total	115	100.0	100.0	

TICS 6

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3.5	3.5	3.5
2	2	1.7	1.7	5.2
3	9	7.8	7.8	13.0
4	21	18.3	18.3	31.3
5	38	33.0	33.0	64.3

6	41	35.7	35.7	100.0
Total	115	100.0	100.0	

TICS 7

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	4.3	4.3	4.3
1	1	.9	.9	5.2
3	9	7.8	7.8	13.0
4	17	14.8	14.8	27.8
5	45	39.1	39.1	67.0
6	38	33.0	33.0	100.0
Total	115	100.0	100.0	

TICS 8

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	3.5	3.5	3.5
2	1	.9	.9	4.3
3	5	4.3	4.3	8.7
4	16	13.9	13.9	22.6
5	20	17.4	17.4	40.0
6	69	60.0	60.0	100.0

TICS 8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	4	3.5	3.5	3.5
	2	1	.9	.9	4.3
	3	5	4.3	4.3	8.7
	4	16	13.9	13.9	22.6
	5	20	17.4	17.4	40.0
	6	69	60.0	60.0	100.0
	Total	115	100.0	100.0	

TICS 9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4	4	3.5	3.5	3.5
	2	4	3.5	3.5	7.0
	3	6	5.2	5.2	12.2
	4	22	19.1	19.1	31.3
	5	37	32.2	32.2	63.5
	6	42	36.5	36.5	100.0
	Total	115	100.0	100.0	

TICS 10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		6	5.2	5.2	5.2
	1	1	.9	.9	6.1
	2	2	1.7	1.7	7.8
	3	14	12.2	12.2	20.0
	4	22	19.1	19.1	39.1
	5	39	33.9	33.9	73.0
	6	31	27.0	27.0	100.0
	Total	115	100.0	100.0	

TICS 11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		6	5.2	5.2	5.2
	2	2	1.7	1.7	7.0
	3	6	5.2	5.2	12.2
	4	17	14.8	14.8	27.0
	5	33	28.7	28.7	55.7
	6	51	44.3	44.3	100.0
	Total	115	100.0	100.0	

TICS 12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	3.5	3.5	3.5
	2	2	1.7	1.7	5.2
	3	5	4.3	4.3	9.6
	4	17	14.8	14.8	24.3
	5	38	33.0	33.0	57.4
	6	49	42.6	42.6	100.0
	Total	115	100.0	100.0	

TICS 13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	3.5	3.5	3.5
	2	2	1.7	1.7	5.2
	3	6	5.2	5.2	10.4
	4	13	11.3	11.3	21.7
	5	44	38.3	38.3	60.0
	6	46	40.0	40.0	100.0
	Total	115	100.0	100.0	

TICS 14

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	5.2	5.2	5.2
2	1	.9	.9	6.1
3	10	8.7	8.7	14.8
4	12	10.4	10.4	25.2
5	39	33.9	33.9	59.1
6	47	40.9	40.9	100.0
Total	115	100.0	100.0	

TICS 15

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	4.3	4.3	4.3
2	3	2.6	2.6	7.0
3	9	7.8	7.8	14.8
4	19	16.5	16.5	31.3
5	39	33.9	33.9	65.2
6	40	34.8	34.8	100.0
Total	115	100.0	100.0	

TICS 16

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	4.3	4.3	4.3
	1	2	1.7	1.7	6.1
	2	4	3.5	3.5	9.6
	3	10	8.7	8.7	18.3
	4	31	27.0	27.0	45.2
	5	37	32.2	32.2	77.4
	6	26	22.6	22.6	100.0
	Total	115	100.0	100.0	

TICS 17

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	4.3	4.3	4.3
	1	2	1.7	1.7	6.1
	2	2	1.7	1.7	7.8
	3	16	13.9	13.9	21.7
	4	28	24.3	24.3	46.1
	5	37	32.2	32.2	78.3
	6	25	21.7	21.7	100.0
	Total	115	100.0	100.0	

TICS 18

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	4.3	4.3	4.3
	1	2	1.7	1.7	6.1
	2	9	7.8	7.8	13.9
	3	19	16.5	16.5	30.4
	4	24	20.9	20.9	51.3
	5	30	26.1	26.1	77.4
	6	26	22.6	22.6	100.0
	Total	115	100.0	100.0	

TICS 19

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	3.5	3.5	3.5
	1	1	.9	.9	4.3
	2	2	1.7	1.7	6.1
	3	12	10.4	10.4	16.5
	4	21	18.3	18.3	34.8
	5	43	37.4	37.4	72.2
	6	32	27.8	27.8	100.0
	Total	115	100.0	100.0	

FREQUENCIES: Predicted Technology Use – Teacher Use/Student Use

Statistics

		Tech Teacher Use	Tech Student Use
N	Valid	109	111
	Missing	6	4

Predicted Technology Use - Teacher Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.9	.9	.9
	2	8	7.0	7.3	8.3
	3	24	20.9	22.0	30.3
	4	34	29.6	31.2	61.5
	5	42	36.5	38.5	100.0
	Total	109	94.8	100.0	
Missing	System	6	5.2		
Total		115	100.0		

Predicted Technology Use - Student Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	.9	.9	.9
	1	2	1.7	1.8	2.7
	2	13	11.3	11.7	14.4
	3	34	29.6	30.6	45.0
	4	48	41.7	43.2	88.3
	5	13	11.3	11.7	100.0
	Total	111	96.5	100.0	
Missing	System	4	3.5		
Total		115	100.0		

Web 2.0 Inter Item variability -- a reliability test

Inter-Item Correlation Matrix

	interactive white board	webquests	digital storytelling	digital video sharing tools	web-based word processor	web-based photo sharing	digital mapping	audience response systems	social networking	online learning systems
interactive white board	1.000	.473	.627	.570	.405	.458	.462	.534	.404	.440
webquests	.473	1.000	.423	.522	.275	.364	.121	.506	.133	.308
digital storytelling	.627	.423	1.000	.582	.560	.584	.526	.612	.323	.404
digital video sharing tools	.570	.522	.582	1.000	.483	.561	.462	.633	.343	.414
web-based word processor	.405	.275	.560	.483	1.000	.507	.438	.592	.298	.224
web-based photo sharing	.458	.364	.584	.561	.507	1.000	.605	.461	.373	.441
digital mapping	.462	.121	.526	.462	.438	.605	1.000	.418	.499	.425
audience response systems	.534	.506	.612	.633	.592	.461	.418	1.000	.203	.223

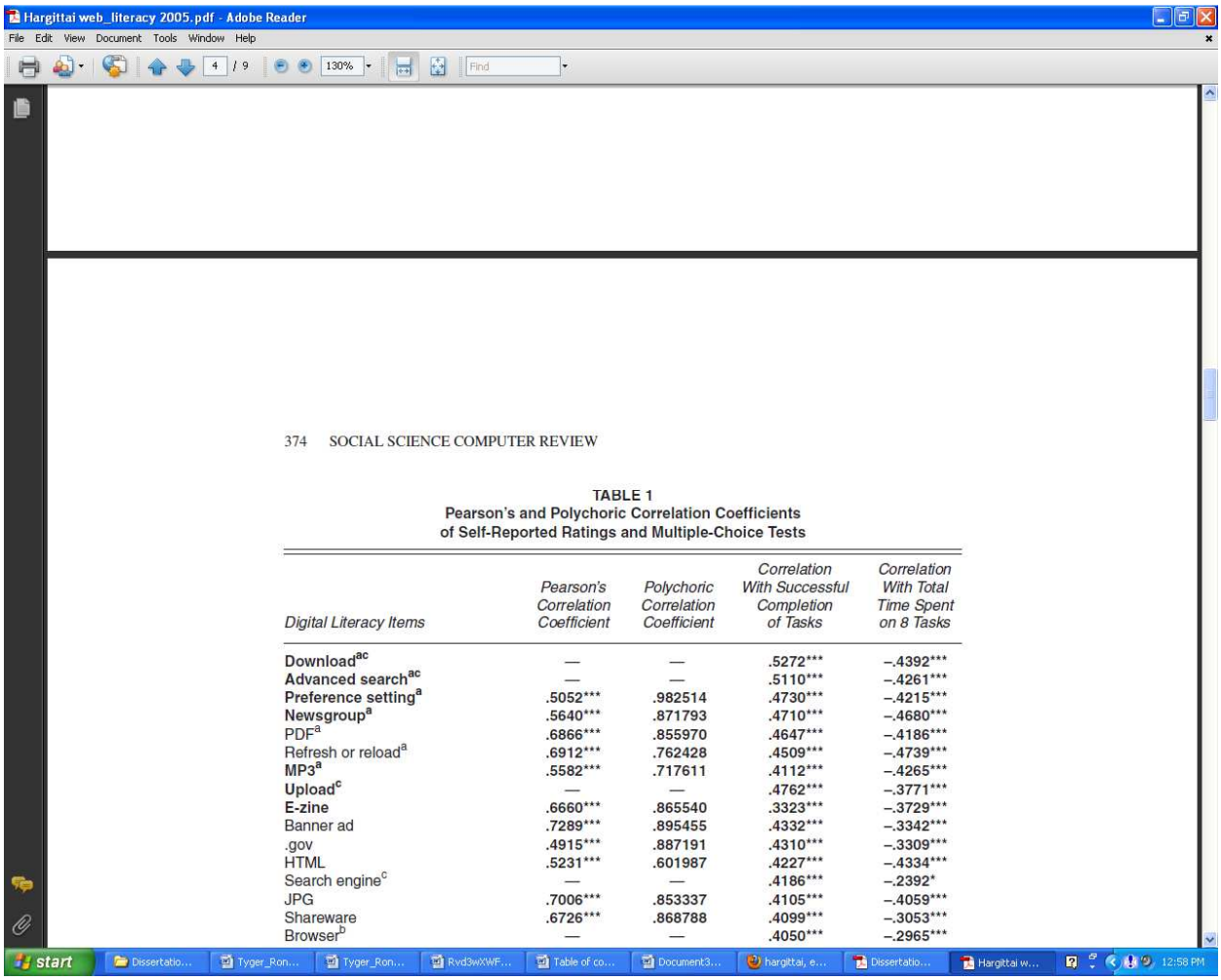
social networking	.404	.133	.323	.343	.298	.373	.499	.203	1.000	.526
online learning systems	.440	.308	.404	.414	.224	.441	.425	.223	.526	1.000

Inter-Item Correlation Matrix

Appendix D

Screenshot of Hargittai's 2005 Digital Literacy Survey Items –

Correlation Coeficients of Self-Reported Ratings and Multiple Choice Tests



Hargittai web_literacy 2005.pdf - Adobe Reader

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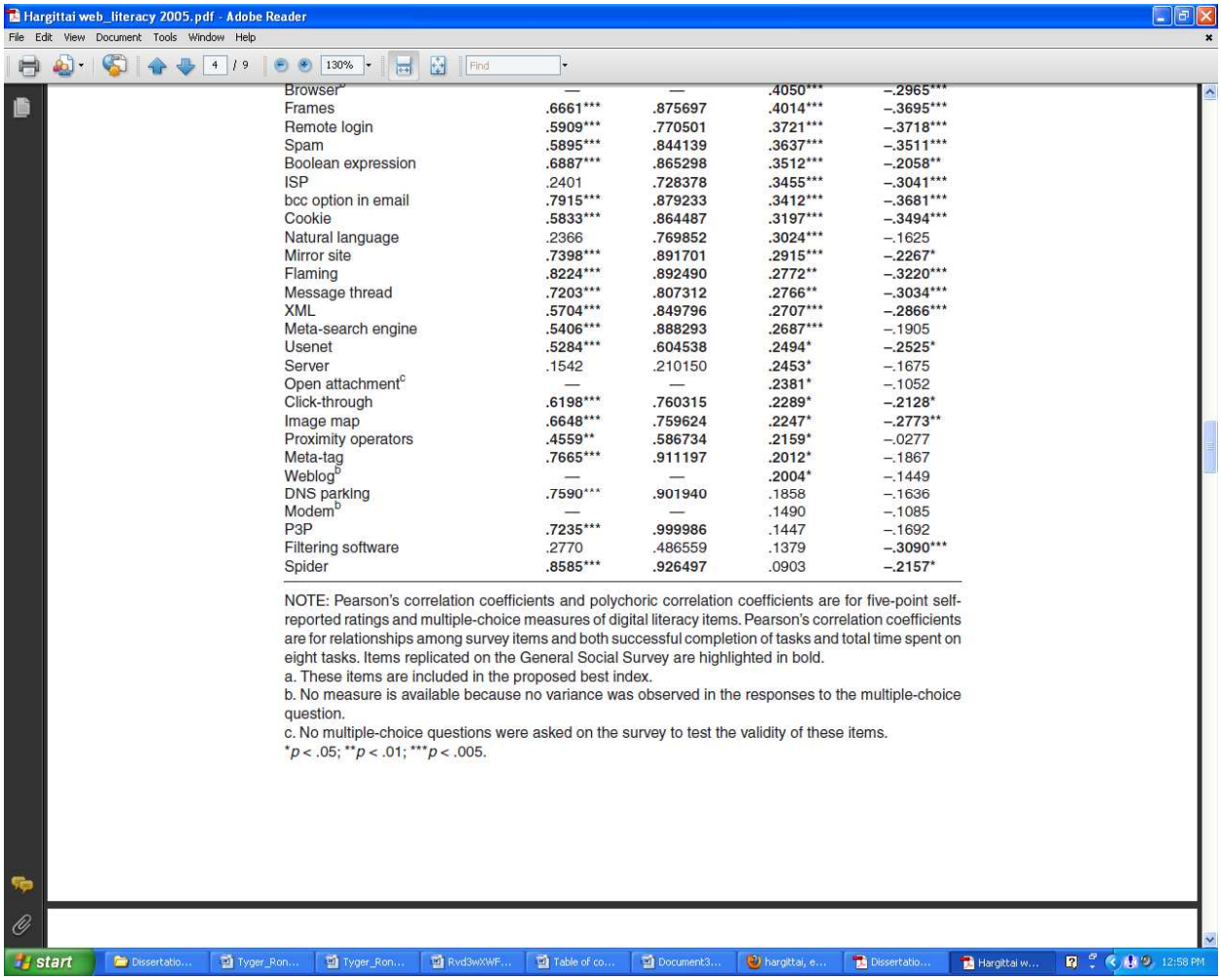
TABLE 1
Pearson's and Polychoric Correlation Coefficients
of Self-Reported Ratings and Multiple-Choice Tests

Digital Literacy Items	*Pearson's Correlation Coefficient*	*Polychoric Correlation Coefficient*	*Correlation With Successful Completion of Tasks*	*Correlation With Total Time Spent on 8 Tasks*
Download[ac]	—	—	.5272***	−.4392***
Advanced search[ac]	—	—	.5110***	−.4261***
Preference setting[a]	.5052***	.982514	.4730***	−.4215***
Newsgroup[a]	.5640***	.871793	.4710***	−.4680***
PDF[a]	.6866***	.855970	.4647***	−.4186***
Refresh or reload[a]	.6912***	.762428	.4509***	−.4739***
MP3[a]	.5582***	.717611	.4112***	−.4265***
Upload[c]	—	—	.4762***	−.3771***
E-zine	.6660***	.865540	.3323***	−.3729***
Banner ad	.7289***	.895455	.4332***	−.3342***
.gov	.4915***	.887191	.4310***	−.3309***
HTML	.5231***	.601987	.4227***	−.4334***
Search engine[c]	—	—	.4186***	−.2392*
JPG	.7006***	.853337	.4105***	−.4059***
Shareware	.6726***	.868788	.4099***	−.3053***
Browser[b]	—	—	.4050***	−.2965***



Browser[b]	—	—	.4050***	−.2965***
Frames	.6661***	.875697	.4014***	−.3695***
Remote login	.5909***	.770501	.3721***	−.3718***
Spam	.5895***	.844139	.3637***	−.3511***
Boolean expression	.6887***	.865298	.3512***	−.2058**
ISP	.2401	.728378	.3455***	−.3041***
bcc option in email	.7915***	.879233	.3412***	−.3681***
Cookie	.5833***	.864487	.3197***	−.3494***
Natural language	.2366	.769852	.3024***	−.1625
Mirror site	.7398***	.891701	.2915***	−.2267*
Flaming	.8224***	.892490	.2772**	−.3220***
Message thread	.7203***	.807312	.2766**	−.3034***
XML	.5704***	.849796	.2707***	−.2866***
Meta-search engine	.5406***	.888293	.2687***	−.1905
Usenet	.5284***	.604538	.2494*	−.2525*
Server	.1542	.210150	.2453*	−.1675
Open attachment[c]	—	—	.2381*	−.1052
Click-through	.6198***	.760315	.2289*	−.2128*
Image map	.6648***	.759624	.2247*	−.2773**
Proximity operators	.4559**	.586734	.2159*	−.0277
Meta-tag	.7665***	.911197	.2012*	−.1867
Weblog[b]	—	—	.2004*	−.1449
DNS parking	.7590***	.901940	.1858	−.1636
Modem[b]	—	—	.1490	−.1085
P3P	.7235***	.999986	.1447	−.1692
Filtering software	.2770	.486559	.1379	−.3090***
Spider	.8585***	.926497	.0903	−.2157*

NOTE: Pearson's correlation coefficients and polychoric correlation coefficients are for five-point self-reported ratings and multiple-choice measures of digital literacy items. Pearson's correlation coefficients are for relationships among survey items and both successful completion of tasks and total time spent on eight tasks. Items replicated on the General Social Survey are highlighted in bold.

a. These items are included in the proposed best index.

b. No measure is available because no variance was observed in the responses to the multiple-choice question.

c. No multiple-choice questions were asked on the survey to test the validity of these items.

*$p < .05$; **$p < .01$; ***$p < .005$.

Appendix E

IRB Approval Letter

Georgia Southern University
Office of Research Services & Sponsored Programs
Institutional Review Board (IRB)

Phone: 912-478-0843
Fax: 912-478-0719
IRB@GeorgiaSouthern.edu
Veazey Hall 2021
P.O. Box 8005
Statesboro, GA 30460

To: Rona Tyger
Judith Repman
Department of Curriculum, Foundations, and Reading

cc: Charles E. Patterson
Vice President for Research and Dean of the Graduate College

From: Office of Research Services and Sponsored Programs
Administrative Support Office for Research Oversight Committees
(IACUC/IBC/IRB)

Initial Approval Date: May 11, 2011

Expiration Date: August 31, 2011

Subject: Status of Application for Approval to Utilize Human Subjects in Research

After a review of your proposed research project numbered **H11431** and titled **"Teacher Candidates' Digital Literacy and Their Technology Integration Efficacy."** it appears that your research involves activities that do not require full approval by the Institutional Review Board according to federal guidelines. Your approval is for a maximum of **600** subjects.

According to the Code of Federal Regulations Title 45 Part 46, your research protocol is determined to be exempt from full review under the following exemption category(s):

B2 Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (I) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (II) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that your research is exempt from IRB approval. **You may proceed with the proposed research.**

Please notify the IRB when you have completed the project by emailing irb@georgiasouthern.edu. Include the date of completion, the number of subjects (records) utilized and if there were any unexpected events related to the subjects during the project. (If none, state no unexpected or adverse events occurred during the conduct of the research.)

Sincerely,

Eleanor Haynes

Eleanor Haynes
Compliance Officer

Appendix F

Participant Letter of Consent

TEACHER CANDIDATES' DIGITAL LITERACY AND THEIR TECHNOLOGY INTEGRATION EFFICACY

Participant Consent Form

The purpose of this research project is to investigate perceived digital literacy levels and technology integration efficacy of preservice teaching (PST) candidates. This is a research project being conducted by Rona Tyger under the direction of Judith Repman at Georgia Southern University. This research has been reviewed and approved by the GSU IRB under protocol number H11431. You are invited to participate in this research project because you are a preservice teacher candidate.

Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, you will not be penalized.

The procedure involves filling an online survey that will take approximately 10 minutes. Your responses will be confidential and we do not collect identifying information such as your name, email address or IP address. The survey questions will be about preservice teacher candidates' perceived digital literacy and their teaching innovation intentions.

We will do our best to keep your information confidential. All data is stored in a password protected electronic format. To help protect your confidentiality, the surveys will not contain information that will personally identify you. The results of this study will be used for scholarly purposes only and may be shared with Georgia Southern University representatives.

If you have any questions about the research study, please contact Rona Tyger at 912 596 3811. This research has been reviewed according to Georgia Southern University IRB procedures for research involving human subjects.

ELECTRONIC CONSENT: Please select your choice below.

Clicking on the "agree" button below indicates that:

- you have ready the above information
- you voluntarily agree to participate
- you are at least 18 years of age

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button.