2010 A Digital Odyssey: Exploring Document Camera Technology and Computer Self-Efficacy in a Digital Era

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Abstract

Within the sphere of education, navigating throughout a digital world has become a matter of necessity for the developing professional, as with the advent of Document Camera Technology (DCT). This study explores the pedagogical implications of implementing DCT; to see if there is a relationship between teachers' comfort with DCT and to the self-efficacy beliefs of teachers. The literature describes our educational system "at risk," comprised of digital "natives" and "immigrants" each challenged by a culture of "disconnected" digital-kids (DOE, 1999; Prensky, 2001; Levin, 2002).

Narrative inquiry thematically analyzes the experience of teachers on the cusp of Technology Integration (TI). Research results indicate positive experiential evidence of DCT integration irrespective of CSE. The battery of teacher experience discloses variance in DCT integration. The "singularity" of DCT integration and the mediation of big-screen-instructional practices were found shifting the paradigm for teacher pedagogy in a digital era (Prensky, 2001).

Chapter 1 Introduction

The "Digital Divide" (DD), an evolving idiom coined from the dawn of the Information Age, has come to encompass a phenomenon vetted in the science of Information and Communication Technology (ICT) (Williams, 2001 unpublished paper). Participating in today's 'Learning Society' requires individuals to navigate this phenomenon. In the world of education, navigating this phenomenon is increasingly a matter of due course for the developing professional.

In the midst of this DD phenomenon, Educational Technology (ET) and Computer Assisted Learning (CAL) modalities continue to provide innovations in teaching, while popular culture propels forward generations of digital-kids. Seemingly, new technology avails itself throughout today's K-5 curriculum on a regular basis, challenging teachers to integrate technology while reinterpreting their role in the classroom. As a result, our digital culture portends a new charge to educators: To remain solvent agents of learning in the 21st century, we must accommodate for Technology Integration (TI), or face floundering in the wake of "digitally disconnected," disenfranchised students (Levin, 2002, p.ii).

Teachers charged with integrating technology today are on the cusp of a new era in Professional Development (PD). In short, the recurring, dynamic relationship between technology and pedagogy is challenging teachers to transform their practice. Navigating this charge often connotes a journey. The teacher's journey of discovery, experience, reflection and professional development, altogether contribute to the crucible of Teacher Self-Efficacy (TSE), a fulcrum in the science and profession of teaching.

Most recently, Document Camera Technology (DCT) has found its way into the science and profession of teaching, impacting the self-efficacy beliefs of teachers. In the history of

presentation technology, not since the chalkboard and overhead projector, has another technology enjoyed such universal appeal and the reputed exceptional educational honor of "ubiquitous classroom adoption" (Brooks-Young, 2007, p. 1). The Document Camera's growing popularity has been attributed to its initial ease in operation and potential for classroom applications. The significance of engaging students, as it pertains to constructivist learning theory, i.e., the construction and production of knowledge, is why the "visualizer" is being held in such high regard and rapidly assuming the 2Ist century version of *the* visual presenter. Brooks-Young (2007) cites previous research in standards, research-based instructional strategies for increasing student achievement--the paradigm for teaching in an era of No Child Left Behind-- to help endorse DCT: "Key decision-makers for educational organizations and institutions should consider the document camera as a standard technology solution that will provide visually rich learning experiences for their students" (Brooks-Young, 2007, p. 2)

Once again, the proverbial promise of technology has challenged teachers to reconsider their best practices. According to Marzano, Pickering and Pollack (2005), effective pedagogy may be understood as involving three related areas: (1) the instructional strategies used by a teacher, (2) the management techniques used by a teacher, and (3) the curriculum designed by the teacher (Marzano et al., 2005, p.10). The purpose of this study is to examine DCT integration as it pertains to these three interrelated components of pedagogy. Moreover, by examining whether or not DCT implementation is affecting the Computer Self-Efficacy (CSE) of teachers, we can begin to understand, appreciate and support pedagogy on the margins of a digital era. Underwood (2007) helps contextualize the notion of CSE with prior research: "Self-efficacy is the belief 'in one's capabilities to organize and execute the courses of action required to produce

given attainments'. It is not a skill *per se;* rather, it reflects what individuals believe they can do with the skills they possess" (Underwood, 2007, p. 215).

Personal Anecdote

When I punched my first computer keyboard in 1999, computers were well into their fifth generation. Prior to this time my angst at the idea of learning a highly elaborate technical language arrested any real urgency to embrace technology altogether. Throughout my undergraduate career I resisted the encouragement to join in the Information Age. I even procrastinated at learning how to type. Hopelessly resigned to old-school ways, I persevered only to find myself woefully behind the times. Upon completing my undergraduate degree in 1995, my upstart intentions were to employ a hands-on, project-based approach to learning. I naively perceived the whole notion of Computer Assisted Learning (CAL) with skepticism. With no frame of reference, I could hardly imagine it.

I began my teaching career in 1999 with novice user capabilities at a time when the demands for computer literacy were increasing exponentially. In my first attempts to integrate technology, I did so reluctantly. My introduction to computers, that is, my first real user experience was the required task of taking daily attendance. I navigated the first of many administrative tasks from my teacher's desk before sending my first email, or catching my first wave surfing the Internet.

I soon realized just how much of my job would entail managerial duties. This became abundantly clear when faced with having to manage the multiple subjects in my elementary grade level curriculum. For several years I struggled to condense the sum of my assignment into that educational convention, the pen and paper based Teacher's Lesson Planner (TLP). Distraught over the unlikely probability of ever being able to distill well over five feet of Teacher

Edition curricula into the incongruous 9” x 12” x ½’’ TLP, I finally gave up. I went on to manage each discipline separately with relative success, but the question of how to administer my entire curriculum remained staggering.

As I acquiesced to the demands of my job, finding an effective way to manage my curriculum remained paramount. Altogether the precedent to manage the numerous commitments from all incumbent offices within the culture of school remained outstanding. From my mailroom in-box, I would quite literally cut and paste notices into my TLP, highlight events, and attach color-coded post-its crammed with information. In between keeping track of compulsory duties, I interfaced my lesson plans. In the end, my TLP appeared useful, but what otherwise could be deemed as quite cryptic.

After several years struggling to manage my office and curriculum, I was finally introduced to a software program designed to display and share calendar information, *i-Cal.* Unbeknownst to me, Apple Incorporate provided a platform for meeting my unmet managerial and organizational needs. At once, I rejoiced at my newfound adeptness at managing my office and calendar adjunct duties. The “singularity” of this event was to be a watershed experience in my proverbial journey across the Digital Divide (DD), although I had not yet grasped the genius of the microcomputer to micromanage (Prensky, 2007, p. 1). I had no idea of the future capabilities for *i-Cal* to manage my curriculum.

Instead, I continued to labor under the illusion that all I needed was a bigger TLP. I resorted to wallpapering the pacing guides from Teacher Editions behind my desk. Soon after, the highlighting and post-it notes followed. I thought I was actually getting somewhere when I began to make cross-curricular links with pushpins and black string. When my wall started to look more like a constellation map and less like the curricular map, I once again gave up.

Eventually, I came to depend more on my teacher's intuition to guide and manage my curriculum. However, this plan would not serve the needs of my students or the prerequisites of my profession.

I consider myself utilitarian by nature; yet found the summons to get organized a most besetting challenge. I surmised there had to be a more practical way to manage my affairs and a more proficient way to monitor my curriculum. A turning point came in my own Computer Self-Efficacy (CSE), that is, my own perceived effective use with the computer, when I finally grasped the concept of a database management system. At long last, I had found the TLP of my dreams, and I came to recognize it in a digital world. Whereas my experience with iCal was a watershed event with regards to organizing and managing my curriculum, DCT changed my perception of how I might deliver content to my students.

Statement of the Problem

Since the promise of technology became real to me, I was determined to increase my Computer Self-Efficacy (CSE). I availed myself to as much technology training as I could muster and my mentors would stand for. However, no sooner did I cross over the Digital Divide (DD), did my resolve encounter the relative nature of this phenomenon. Not having been born into a digital world, my marginalized position was soon revealed to me. For all intents and purposes, I discovered myself a "digital immigrant" (Prensky, 2007, p.2). Prensky theorizes: "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" (Prensky, 2007, p.2).

In fact, in a world for "digital natives," many teachers continuously struggle with their "digital immigrant accent" (Prensky, 2007, p.2). In other words, with their computer literacy to

understand and communicate their own technical needs, in short, with their CSE. Underwood (2007) cites previous research suggesting that today's teachers face a 'Second-level Digital Divide', wherein access to skills can furthermore divide or compromise one's digital literacy. When the benefits of Educational Technology (ET) and Computer Assisted Learning (CAL) are vast, but the means for manifesting those benefits a source of marginalization for teachers, the pedagogical implication is clear: teachers must confront their own preconceived notions of Computer Self-Efficacy (CSE) and adapt the way they teach (Prensky, 2007; Palmer, 2007).

Purpose Statement

Through narrative design, this exploratory study will qualitatively examine the interrelationships between Document Camera Technology (DCT) integration and the Computer Self Efficacy (CSE) of teachers. Altogether, the research seeks to identify factors contributing to the positive or negative integration of DCT, as well as factors contributing to a positive or negative profile for CSE. Through interviews, a database of teacher experience will be compiled. In turn, this database will be analyzed to find common themes and anomalies. Through data extrapolated from the major research question, a summative thematic analysis will be constructed along side a discussion of the central phenomenon, pedagogy in a digital era.

Background and Need

Navigating the Digital Divide (DD) may aptly serve to help our general understanding of Computer Self-Efficacy (CSE) in an Age of Information. Information and Communication Technology (ICT) has transformed business and industry to help create our global economy and change the nature of our social contract with students in an essential way. In 1989, accompanying the advent of the microcomputer came the Internet, fundamentally altering the speed and exchange of information. The microcomputer ushered in a technological cultural

revolution in widespread fashion. Such rampant technological advances could aptly be reflected in the evolution of the telephone, where a phone the size of a shoe evolves into a device with the facility to perform thousands of applications--be no bigger than the size of one's wallet--but capable of communicating information throughout the world.

In the world of education, Educational Technology (ET) and Computer Assisted Learning (CAL) modalities continue to influence the nature of pedagogy and the CSE of teachers. Consider the 21st century smart-classrooms that provide a host of interactive teaching and learning technology. LCD projectors, document cameras, interactive whiteboards, surround-sound systems, personal student-response input devices, laptops with wireless keyboard and mouse comprise a multitude of hardware currently available. In addition, there is plethora of on-demand online content capable of acting in concert. For example, Web sites, streaming video, image banks, PowerPoint presentations, interactive software, video conferencing and the omnipresent social networking sites (Vogel, 2006; Levin, 2002). Altogether, a precedent for a new pedagogical paradigm is being established, challenging the CSE needs of teachers.

Putting the Computer Self Efficacy (CSE) of teachers into the proper historical context can be traced back to the 1983 landmark report by The National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform.* The U.S. Department of Education (DOE) published a revised version in 1999. Attention was garnered to "the widespread public perception that something was seriously remiss in our educational system," was charged to address "the quality of teaching and learning in our Nation's public and private schools, colleges, and universities" (DOE, Introduction, 1999, p.1). At this time, the CSE of teachers remained on the horizon of the DOE's concerns.

This DOE (1999) collected a glut of testimony reflecting four essential aspects of the educational process: content, expectations, time and teaching. Much of their findings corroborated a decrease in overall educational achievement. However, the DOE (1999) concluded: "Declines in educational performance are in large part the result of disturbing inadequacies in the way the educational process itself is often conducted" (DOE, Findings, 1999, p. 1). Summarily, the DOE (1999) found expectations diminished and educational standards lowered. Regarding the process of teaching, the commission found the profession generally unattractive to more academically capable students and teacher preparation programs in need of substantial improvement, while a national shortage of teachers persisted (DOE, 1999).

The DOE (1999) recommended excellence in education to encompass two main objectives: "The twin goals of equity and high quality schooling have profound and practical meaning for our economy and society, and we cannot permit one to yield to the other in either principle or in practice"(DOE, 1999, p.5). Altogether, the DOE (1999) recommended: "Educational reform should focus on the goal of creating a Learning Society" (DOE, 1999, p.6). To this end, the teaching of computer science in high school was mentioned in their report, although the report made no specific recommendations about preparing educators to teach or employ computer science applications in their work (DOE, 1999).

Ultimately, what the DOE (1999) found spoke louder than what they would recommend. *A Nation at Risk* revealed: "what was unimaginable a generation ago--that others are matching and surpassing our educational attainments" (DOE, 1999, p. 1). In many respects, this report served more as a wake-up call to the American public, encapsulating an "effectively disenfranchised" citizenry, where those who are unable to attain the skills, literacy and training for the Information Age will be unable to participate fully in the American way of life (DOE,

1999, p. 2). The report concludes in perhaps its most alarming language, that we have "been committing an act of unthinkable unilateral, educational disarmament" (DOE, 1999, p.1). Given this compromised skill set, our position to readily compete within the context of a global economy was found altogether compromised, along with the CSE needs of teachers faced with the an impending Digital Divide.

Origins of the Digital Divide

To what extent have we addressed the skills, literacy and training of teachers to function in the Information Age? How many students will remain 'effectively disenfranchised' due to teachers' insufficient Information and Communication Technology (ICT) knowledge base? Twenty-five years after *A Nation at Risk* our understanding of the Information Age and the ensuing Digital Divide (DD) phenomenon is found wanting. Williams (2001) helps contextualize both the history and future of the DD, proposing a platform for continued research: "We will see that the concept is not punditry or policy talk. It is an intellectual concept that is part of information science and part of the multidisciplinary study of the information society" (Williams, 2001, p.1).

William's (2001) research framed the origins of the term digital divide between 1995 and 1997 when the U.S. administration and journalists coined the term initially "to describe a social gap between those involved with technology, particularly between children and their schools" (Williams, 2001, p. 2). In remarks from a 1996 speech in Knoxville TN, Vice-president Al Gore made reference to the term in support of the ICT revolution:

> Two years ago, President Clinton and I challenged America to connect every classroom—inner city, rural, suburban—to the Information Superhighway by the year 2000. We challenged the nation to ensure that all of our teachers and students had access to modern computers and engaging educational software. We challenged the nation to provide all teachers with the training and support they need in order to help students

> make the most of these wonderful new technologies. We challenged the nation to make sure that the digital divide will never separate our children (p.2).

Interestingly, here the origins of the term digital divide stem from a relationship between teachers and students, yet to be fully substantiated according to the U.S. Department of Commerce (DOC, 1995; 1997; 2000). While the standard definition of DD holds true today, i.e., a divide that separates the "haves" from the "have-nots," there is little account for the phenomenological nature of the 'Second-level DD' (Underwood, 2007), which suggests an evolving meaning and use of the term. The present research proposes a definition of the Digital Divide as one between those who do integrate technology and those who do not, and proposes that a teacher's level of computer integration in his or her work is related to the Computer Self-Efficacy (CSE) of the teacher.

Robots, Teachers and the Digital Divide

Given the propensity for technology to rapidly advance in the wake of warfare, a glimpse into its changing nature may further elucidate the ramifications for students and educators, alike. Author P.W. Singer (2009) explores the burgeoning science of robotics and the U.S. military's campaign for "smart-weaponry," i.e., sending robots into arms way instead of humans. Singer describes the "ripple effects" of unmanned warfare in a 19 year old high school drop out who attained the title of U.S. Army Specialist and the reputation for the best "drone" pilot in the military. Singer (2009) invites one to consider: How can a soldier of no rank be found training F-15 pilots, officers with college degrees and years of training, but who are unable to perform competitively with a nineteen year old 'soldier' who owes his edge to years of playing video games (Singer, 2009).

According to Singer (2009), seeing the war played out on video screens is not far from the truth behind robotics design. He contends the U.S. Military has intentionally taken advantage of the research already invested in by the gaming industry to design its hand-held control devices and, moreover, the "training-up" of young soldiers who have already been weaned on *X-Box* and *Play-Station*. Singer (2009) surmises that for kids who have been "gaming" for years, the demographics of who goes to war are also called into question. Singer (2009) proposes that as the nascent science of robotics grows so must a new code of ethics. Clearly, when robots are fully capable of becoming autonomous, the question of "keeping humans in the loop" becomes divisive (Singer, 2009).

As Computer Assisted Learning (CAL) modalities continue to be a more viable facet in our educational landscape, there may be cause to consider its 'ripple effects,' as well. When smart-tools of instruction affect the extent to which teachers remain in the loop of learning, the question of pedagogy may also come into question. If soldiers can be removed from the battlefield because a machine can do a better job, will teachers someday face the same fate? Will the DD phenomenon presume the need for a new educational code of ethics, where Teacher Self-Efficacy (TSE) is predicated on Computer Self-Efficacy (CSE)? For generations of students who are more 'wired' than ever, more capable of becoming autonomous learners, more ready to power-up rather than power-down, perhaps it would be wise to train future teachers as educational software specialists. The DD many teachers are faced with today is based on the escalating and pervasive use of technology by youth, compounded by the efforts of teachers to integrate engaging Educational Technology (ET) into the classroom.

How we reach and teach kids today is an ongoing figurative story line to educators. With the advent of newer and smarter technology weighing heavily in our social contract with

"Generation Z,"--the most technologically advance generation yet--many teachers are increasingly finding themselves in classrooms on the cusp of a digital renaissance, with students who have never known a world without technology (Levin, 2002; Posnick-Goodwin, 2010). In spite of advancements in Educational Technology (ET) and Computer Assisted Learning (CAL), the gravity of Technology Integration is (TI) is omnipresent. Periodically, the DD yawns and thickens the pedagogical plot.

Although the construct for integrating technology successfully continues to pivot largely on the 'haves' and 'have-nots,' as technology becomes more readily available successful integration is depending moreover on the Computer Self-Efficacy (CSE) of teachers (Levin, 2002; Underwood, 2007). Naturally, navigating the trials of Technology Integration (TI) requires computer literacy. Characteristically, ignorance of this kind by in large expresses the current deviation in educational practice among many teaches today. Teachers who are able to navigate the DD successfully have ET at their disposal. For those who are unable, they instead face an abyss of computer illiteracy, and subsequently are being disenfranchised from our evolving ICT knowledge base. This variance in computer literacy continues to yield divergence while testing teachers' resolve to develop professionally. This source of marginalization will frame the directed research question.

Altogether, the current educational climate suggests that Educational Technology (ET) will continue to captivate the method and application of teaching and learning (Levin, 2002). Furthermore, pedagogy in a digital era suggests looking through a technological paradigm, through the eyes of teachers beset with notions of CSE. Because Document Camera Technology (DCT) is relatively new, its influence on the CSE of teachers is largely unknown.

Research Question

- Are teachers integrating Document Camera Technology? If so how and why?
- Is the integration of Document Camera Technology influencing teachers' Computer Self Efficacy?
- In what ways, if any is Document Camera Technology influencing pedagogy, defined as instructional strategies, curricular design and management techniques?
- If Document Camera Technology is not being integrated, why not?

Assumptions

Given the evolving expression of the Digital Divide (DD) phenomenon, this practitioner as investigator must confront the unpalatable likelihood that bridging the DD may be an elusive goal altogether. As a 'digital-immigrant' I am assuming Technology Integration (TI) will remain a tenable educational issue and not fade away over time, through better technology or more digitally capable 'native' instructors (Prensky, 2001). Finally, I am assuming that the promise of Educational Technology (ET) will continue to viable in the future of education, a prospect that has recently come under scrutiny for its association with sedentary lifestyles and the deplorable obesity epidemic facing nearly one third of American school children. Given these assumptions, I am further assuming that TI is worth investing our best instructional practices in.

Theoretical Rationale

Recognizing the Digital Divide (DD) phenomenon within the context of the science of Information and Communication Technology (ICT) can more fully account for the theoretical foundations for Technology Integration (TI) in our schools: "The developments in science and

information technologies have changed the meaning of the verb, 'to know.' It used to mean 'having information stored in one's memory.' It now means the process of having access to information and knowing how to use it" (Molnar, 1997, p. 1). From the emergence of cognitive science, Molnar (1997) recognizes a major paradigm shift in education from theories of "learning" to theories of "cognition:" Molnar (1997) states: " The cognitive approach…focuses, instead, on organizing information to fit human capacity, and has changed the emphasis in education from learning to thinking"(Molnar, 1997, p.1).

Friesen and Feenberg (2007) suggest that this change in emphasis sparked a cognitive revolution responsible for redefining key concepts in educational research. Citing previous research, Friesen and Feenberg (2007) help to account for this change:

> Learning itself is understood not as an enduring behavioral change achieved through stimulus and response conditioning; instead, it is seen as changes in the way information is represented and structured in the mind. Teaching is no longer conceptualized as the provision of rewards for the successive approximation of target behaviors. Instead, it is understood in terms of the support of the effective processing, representation and structuring of information by the student's cognitive apparatus"(Friesen & Feenberg, 2007, p.721).

With the help of previous research on major cognitive theorists, Dalgarno (2001) encapsulates three broad principles of this 'cognitive apparatus,' which altogether help define the constructivist view of learning:

> The fundamental principle attributed to Kant and later by Dewey, is that each person forms their own representation of knowledge, building on their individual experiences, and consequently that there is no single "correct" representation of knowledge. The second principle, normally attributed to Piaget, is that people learn through active expression, and that learning occurs when the learner's exploration uncovers inconsistency between their current knowledge representation and their experience. The third principle, normally attributed to Vygotsky, is that learning occurs within a social context, and that interaction between learners and their peers is a necessary part of the learning process (Dalgarno, 2001, p.184)

Mueller, Wood, Willoughby, Ross, and Specht (2008) cite previous research suggesting that one's teaching philosophy, in particular constructivist pedagogy, may be the prerequisite to successful computer integration. Further research previously explored by Mueller et al. (2008) acknowledges the potential for the computer as a cognitive tool for knowledge construction, but suggests it may take several years to integrate. Given the relationship between computer integration and teachers' beliefs, Mueller et al. (2008) surmise that the inverse relationship may also be true, that is, " a teacher's pedagogical philosophy may be altered following the integration of computers"(Mueller et al. 2008, p.1525).

Chapter 2 Review of the Literature

Introduction Historical Context

Prensky (2001) suggested the historical implications of the Information and Communication Technology (ICT) revolution may be perceived in the following way: "A really big discontinuity has taken place. One might even call it a "singularity"—an event which changes things so fundamentally that there is no going back. This so called "singularity" is the arrival and rapid dissemination of digital technology in the last decades of the 20th century" (Prensky, 2001, p.1). To ignore this 'singularity' may effectively disenfranchise us from today's evolving (ICT) knowledge base.

Have we acknowledged the 'singularity' of this event? In the 2008 publication *A Nation Accountable: Twenty-Five Years After A Nation at Risk,* the U.S. Department of Education (DOE) reviewed our nation's progress since the landmark document of 1983. The DOE (2008) reported: "We remain a nation at risk but are also now a nation informed, a nation accountable, and a nation that recognizes there is much work to be done" (DOE, 2008, p.1). The DOE (2008) corroborated the 'at-risk' status of our educational system in 1983; a system found lacking in its abilities and confidence to meet the emerging and competitive demands of a global economy (DOE, 2008).

Twenty-five years later, in the midst of a burgeoning Information Age, the need to educate students at an even higher level remains at a premium. While the DOE (2008) contended *A Nation at Risk* as a sweeping indictment of the American people for "complacency," it suggested, "we continue to push forward with a sense of urgency," comparing the work before us to a mountain "more challenging than we realized"(DOE, 2008, pp.2-3).

The DOE (2008) report recommended teacher quality remains a corner stone for improvement in our educational system. The DOE (2008) found past efforts to strengthen teacher preparation short on subject-matter knowledge and long on classroom teaching philosophy. Perceived as a shortcoming for teachers, congress enacted the *No Child Left Behind Act's* Highly Qualified Teacher provision. However, the DOE (2008) found "little evidence to conclude that this provision has led to notable increase in the requisite subject matter knowledge of teachers or to increases in measures of individual teacher effectiveness" (DOE, 2008, p.6).

The DOE (2008) asserted that as gaps in student achievements persist others have arisen. Thanks primarily to the standards and accountability movement, the DOE (2008) contended: "Where solutions have been found, they have not been put fully in place because not everyone is willing to accept and make the changes that are necessary"(DOE, 2008, p.14) The DOE (2008) reminded us of what was barely contemplated in *A Nation at Risk*: *"*Schools today must…keep pace with rapid advances in technology (which are slowly changing the way students and teachers learn and interact)…"(DOE, 2008, p. 14). While painstaking research has been collected on what works in the classroom, the DOE (2008) recommended continued research be dedicated to developing a more effective teacher.

The DOE (2008) echoed much of what was predicted in *A Nation at Risk,* adding academic standards and testing to provide the leverage needed to continue informed reform efforts. To this end, the DOE (2008) would have us consider our stride and mind set: "The pace of change in the global economy poses an already enormous and growing challenge for educators. As Microsoft founder Bill Gates has said, 'You need to understand things in order to invent beyond them'" (DOE, 2008, p.15).

Review of the Previous Research

Computer Self-Efficacy

What ultimately facilitates the effective integration of technology remains the overriding question that is explored in this study. This imperative requires augmenting our understanding of the underlying *self* in Computer Self-Efficacy (CSE). Making Technology Integration (TI) a successful enterprise may be predicated on the notion of General Self Efficacy (GSE) or Teacher Self-Efficacy (TSE), i.e., the compilation of self-image, self-perception, self-esteem and other individual characteristics, such as gender, age, prior experience and subject area emphasis (Palmer, 2007; Paraskeva et al., 2008). This compilation of self-efficacy belief structures suggests a baseline for understanding how teachers might more effectively integrate technology into their practice.

In light of our digital age, Parker Palmer's (2007) charge to examine "the inner landscape of a teacher's life" imports a deeper significance to CSE (Palmer, 2007). The technological urgency that is transforming pedagogy today challenges teachers' preconceived notions of self-concept all the more. Confronting a new sense of self in a digital world can be a daunting task, especially to the 'digital immigrant' (Prensky, 2001). Clearly the perpetually evolving precedent 'to speak an entirely new language' has challenged the nature of teacher self-efficacy in today's classrooms (Prensky, 2001).

In a quantitative study, Paraskeva, Bouta, and Papagianni (2008) examine the self-efficacy belief structures of teachers who are integrating technology. Based on previous research showing how teacher's attitudes towards modern technologies considerably influence the effective use of ET, the purpose of this study was to further investigate the relationship between GSE, self-esteem and CSE. Paraskeva et al. (2008) employed salient definitions from previous

research wherein they found the efficacy beliefs of teachers related to instructional practice and student achievement. Paraskeva et al. (2008) surmised GSE as a personal judgment of one's capability to adopt certain behaviors and actions in order to accomplish certain objectives and outcomes; and surmised CSE as a "judgment of one's capability to use a computer" (Paraskeva et al., 2008, p.1085)

In their research surrounding the relation between general self-efficacy and computer self-efficacy, the data revealed a significant positive correlation between the two variables. Not surprisingly, the survey results revealed that the higher a teacher's GSE is, the higher the CSE. These results corroborated an overall working premise, which postulated a direct relation between GSE and CSE (Paraskeva et al., 2008).

In their research concerning the relationship between self-esteem and computer self-efficacy, the data showed no significant correlation between the two variables. Paraskeva et al. (2008) argued that the correlation between self-esteem and attainments in a given domain is very specific: "It is possible that the evaluation of teachers' general self-esteem we made in our survey and its comparison with computer self-efficacy has led to the statistical relation between the two variables being diminished" (Paraskeva et al., 2008, p.1089).

In their research examining the relationship between teachers' subject area, prior experience in using computers and software as an educational tool, and previous computer training, all three variables were found strongly correlated with CSE (Paraskeva et al., 2008). The strongest correlation to CSE was prior experience in using a computer, prior use being the greatest factor in forming a positive attitude toward computers. The positive correlation between subject area and CSE showed teachers with a substantially richer experience in technological

subjects had a greater sense of CSE. Moreover, Paraskeva et al. (2008) point out that using educational software contributed substantially to an increase in CSE (Paraskeva et al., 2008).

Interestingly, in the relationship between previous training in computer use and CSE, the data reveal no correlation. Paraskeva et al. (2008) concurred with previous research that the inadequate training of teachers in computer use might impede the increase in their CSE. Paraskeva et al. (2008) believed that the individual characteristics that comprise a teacher's personality are worth emphasizing, although with the caveat that the greatest yield for 'professional development' will occur when stressed within the context of technology trainings. Moreover, Paraskeva et al. (2008) concluded that teachers needed to have specific subject needs addressed during these trainings to over come the reticence toward using technology in the classroom. Paraskeva et al. (2008) recommended project-based curriculum emphasizing technology as the most useful means of service to teachers integrating technology into the classroom.

In a similar study, Mueller, et al. (2008) examined teachers' perspectives regarding technology integration in the classroom. In this quantitative study, Mueller et al. (2008) ask: "What is it that makes a teacher successful in the integration of computer technology?" (Mueller et al., 2008, p.1526). Acquiring the skills to integrate technology naturally takes time. Citing previous research, Mueller et al. (2008) remind us that this skill can take up to 5 or 6 years to master. Mueller et al. (2008) enlist other research suggesting that being able to fully integrate technology into a classroom is a multi-stage process that teachers must learn to navigate. Navigating the fine art and science of computer integration led Mueller et al. (2008) to refer to the "perpetual novice" status of many teachers when confronted with the continuous changes in ICT (Mueller et al., 2008, p. 1524).

Mueller et al. (2008) recognize the traditional professional development training approach as a viable means toward computer integration, but found fault in the short-term focus most training models have to offer. Mueller et al. (2008) argued for a more sustainable training model, one in which the impact of technology on the beliefs, attitudes and philosophies of teachers is explicitly addressed: "A teacher's pedagogical beliefs about how technology fits, or does not fit with those beliefs, may be the determining factor in computer integration" (Mueller et al., 2008, p.1525). Mueller et al. (2008) posited that while the import of pedagogical beliefs of teachers on classroom practice has been well documented by former research, "…the direct influence of pedagogical beliefs for the integration of computers is not clear" (Mueller et al. 2008, p.1525).

In their study, Mueller et al. (2008) surveyed measures addressing both computer related variables and general constructs. The computer related variables included: computer integration, comfort with computers, type of computer use, computer training, attitudes toward computers and experience with computer technology. General constructs included: demographics, teacher-efficacy, teaching philosophies and attitudes toward work (Mueller et al., 2008).

In their discussion of the results from this survey, Mueller et al. (2008) "clearly implicate experience with computer technology and attitudes in the classroom as important variables that predict differences between teachers who successfully integrated computer technology from those who did not" (Mueller et al., 2008 p.1532). Specifically, Mueller et al. (2008) found computer experience variables, such as comfort with technology and higher frequency of use as significant contributors that separated integrating teachers from non-integrating peers. In addition, their results revealed training with computers especially important at the elementary level, "although 'general' exposure and use is less critical than very specific, task relevant and classroom–applicable experience" (Mueller et al., 2008, p.1532). Altogether, their results

revealed: “The positive outcome measure contributed most of all to the discriminating function for both elementary and secondary teachers” (Mueller et al., 2008, p. 1532).

Mueller et al., (2008) found the frequency teachers had experienced positive outcomes using computer technology in classrooms correlated directly with their confidence in using computers as an instructional tool. Mueller et al., (2008) corroborated this correlation with earlier studies indicating the need for specific positive experiences with technology in the classroom, and the need for teachers to see the potential to improve learning or instruction before they are willing to back it. Mueller et al. (2008) also concurred with previous research, which found classroom success with computer technology as a prerequisite for the integration of computers as an instructional tool (Mueller et al., 2008).

Concerning attitudes towards computer technology, Mueller et al. (2008) found attitude to be a critical contributor distinguishing the successful integrators from the less successful ones. Mueller et al. (2008) found teachers who perceived computer technology as a viable, productive, and cognitive tool had greater success at integrating technology. In addition, the perceived usefulness of computers was found to be an important component in teacher motivation, while support and computer anxiety had only indirect effects on usage (Mueller et al., 2008).

Other salient points from this study revealed no significant impact in the number of years of teaching experience, suggesting that teachers in all stages of their career were equally able to integrate computer technology (Mueller et al., 2008). The high and low integration groups did not differ in terms of years of experience, gender, technical difficulties, or in their general attitudes toward work. Mueller et al. (2008) suggested that this is perhaps because technology has become so much a part of the recent educational landscape that teaching experience is no longer influential on computer experience (Mueller et al., 2008).

Concerning a teacher's intrinsic motivation to integrate computers, Mueller et al. (2008) found the degree of effort and risk involved to integrate computers offered few rewards outside of the intrinsic satisfaction of meeting a challenge. They suggested that unless integration is seen less as an insurmountable challenge and more as a vehicle for positive learning outcomes, only "risk-takers" would continue to avail themselves of professional development designed to improve computer skills (Mueller et al., 2008).

As to what makes a teacher successful in the integration of computer technology, their conclusions ultimately settled upon 'positive outcomes,' i.e., professional development aimed at revealing the potential for computer technology as a cognitive tool within the context of instruction (Mueller et al., 2008). Muller et al. (2008) suggested that professional development should be designed as learner-centered and highly engaging, while offering teachers the opportunity to explore theory and pedagogy in concert with technology integration. In addition, because of the large variance accounted for in these variables, Muller et al. (2008) suggested that the individual characteristics of teachers are significant, namely: attitudes, beliefs and behaviors, and should be duly considered when developing effective professional development (Mueller et al., 2008).

Administrative Records

Beginning in 1995, the U.S. Department of Commerce (DOC) and the National Telecommunications and Information Administration (NTIA), an agency that is principally responsible for advising the President on telecommunications and information policies, began producing a series of reports intended to inform policy development at the dawn of our Information Age. Beginning in 1994 the DOC (1995) surveyed American households with its *Falling Through the Net* series to provide a more accurate portrait of its goal for "universal

service." The DOC utilized data where it cross tabulated information according to specific variables, such as geographic location, income, race, education level, age, and household type.

The *Falling Through the Net* series, beginning with *A Survey of the "Have Nots" in Rural and Urban America,* provided our first real sense of the Digital Divide (DD). This project provided insight into the structure of those who were not connected to the Information Superhighway and provided the preliminary findings into the "information disadvantaged" by degree of urbanization (DOC, 1995, p. 2).

Larry Irving, the original head of NTIA recalled these surveys as "the catalysts for the popularity, ubiquity, and redefinition" of the term "digital divide" (Williams, 2001, p.2). Irving surmised that the working definition for the "digital divide" was derived from these original surveys: "The social gap between those who have access to and use computers and the Internet" (Williams, 2001, p.2).

By 1997, the survey *Falling Through the Net 2: New Data on the Digital Divide* revealed expanded access to information services, a persisting DD and a profile of the "least connected" (DOC, 1997, p. 2). Not surprisingly, the data demonstrated that between 1994 and 1997 Americans increased their over all access to information. However, the DOC (1997) survey also revealed:

> In fact, the "digital divide" between certain groups of Americans has *increased* ...so that there is now an even greater disparity in penetration levels among some groups…between those of upper and lower income levels. Additionally, even though all racial groups now own more computers than they did in 1994, Blacks and Hispanics now lag *even further behind* Whites in their levels of PC-ownership and online access (DOC, 1997, p.2)

Altogether, the DOC (1997) data demonstrated additional "pockets of 'have-nots,' especially among low-income, minorities, and young, particularly in rural and central cities" (DOC, 1997, p.5).

In 2000 the DOC produced *Falling Through the Net: Defining the Digital Divide,* its third installment on behalf of the burgeoning digital economy. Charged with understanding, measuring and explaining how the ICT revolution was affecting our country, the DOC (2000) began where its previous reports had left off. In the 2000 report cover letter, William M. Daley states:

> While we know that Americans are more connected to digital tools than ever before, the report provides evidence that the "digital divide" between certain demographic groups and regions of our country continues to persist and in many cases is widening significantly. We should be alarmed by this news (DOC, 2000, p.1).

Internet access and usage among individuals was the newest body of evidence to be included in the 2000 *Falling Through the Net* series. Asserting the promise of the Internet for the emerging global economy, the DOC (2000) analyzed access and usage with the hopes of providing more useful information to future policymakers in a blossoming Information Age. At this time the DOC (2000) furnishes a revised definition for the DD: "The "digital divide"-- the divide between those with access to new technologies and those without – is now one of America's leading economic and civil rights issues"(DOC, 2000, p.1).

The overall patterns that emerged from the *Falling Through the Net* series described a widening gap defined largely along the lines of socio-economic opportunity. These lines between the 'haves' and 'have-nots,' between the information-rich and the information-poor, deepened our meaning of the term DD and revised our context for understanding this phenomenon as one that is socially evolving. The DOC (2000) restated the charge facing stakeholders in the digital era: "Education and income appear to be among the leading elements driving the digital divide today. Because these factors vary along racial and ethnic lines, minorities will continue to face a greater digital divide as we move into the next century" (DOC, 2000, p.8).

Interview with an Expert

Sample and Site

Sandy has been the Curriculum Technology Specialist for the San Joaquin City Schools district for the past 8 years. She holds an M.S. degree in Education Technology and elementary teaching credential. Although she has had no direct experience with Document Camera Technology (DCT), she has taken a keen interest in observing teachers integrate this new technology over the past two years. She described her own Computer Self-Efficacy as high. (The following direct quotes were transcribed from a personal interview with Sandy on March 23, 2010).

Sandy began describing how before there was any real district level awareness of DCT, a handful few teachers were writing grants to acquire them:

> *"It's really something that has come-up from a grassroots level…from teachers finding out about it, and immediately seeing the usefulness of it."*

According to Sandy the response to DCT has been like "*wildfire,*" with principals from all around the district planning to purchase them as soon as they can find the resources. She recounts the same handful of teachers integrating DCT into their practice over the last two years, while just recently two schools have purchased the technology outright for the entire staff. Currently, between 40-50 teachers have been integrating DCT over the past 6 months in the district. With regards to Technology Integration, I specifically asked, what was the decision to integrate DCT in the SJCS district specifically based upon:

> "*I wouldn't necessarily say that the decision to adopt DCT was research based, unless you account for the research that indicates you can appeal to learners visually, that 'visuals' engage students. In this regard, DCT is "visually engaging" technology. But, the decision to integrate was not based on research; it came from teachers who were intrigued by the technology."*

In her experience with these teachers, she discovered all have found "*amazing"* classroom uses for DC and remain very excited about it. Although, she is curious about how teachers who did not seek out this technology will respond, Sandy acknowledged:

> *"DCT rates right up there with the advent of LCD projectors. Teachers immediately found a use for them. Some might say that DCT adds to a teacher's repertoire of tools. I think its popularity is because it allows teachers to present so many different things, so easily, while drawing-in the student's attention. The whole class is literally 'on the same page'."*

Sandy claimed that both LCD projectors and DCT have enjoyed widespread adoption by teachers using them. When compared to other Computer Assisted Learning (CAL) programs, programs done at either classroom computer stations or in a school computer lab, Sandy described a real struggle for teachers having to figure out how they will integrate these CAL programs into their schedule:

> *"They take longer to integrate because teachers have to really plan around them, whereas this technology (LCD projectors and DCT) is designed to be a part of their whole class instruction."*

Regarding her experience with the Computer Self-Efficacy (CSE) of teachers, Sandy spoke with passion and animation about what she considers the key to teaching technology today. She professed:

> *"Technology is changing so rapidly that it's really more important to have a high CSE than it is to know any one particular program."*

She recognized that one builds CSE by becoming more acquainted with any particular program, because there are so many skills that transfer from one program to the next. However, Sandy expressed:

> "*Self-Efficacy, the belief that <u>you</u> can use this technology, the belief that <u>you</u> can figure this technology out--that's the 'golden ticket.'"*

In Sandy's estimation, figuring out how to help teachers, especially credential candidates, to increase their CSE will remain paramount in her mind as she continues to teach Technology Integration. Acknowledging the rapidly changing and adapting nature of Information and Communication Technology (ICT), Sandy also recognized the need for teachers to learn how to change with it. She reflected:

> "*Maybe, teachers need to decide first if it's worth trying. I look at the teacher Marisa, who is saying, "I'm not a computer person," who believes her own CSE is low, and yet she is the one willing to try virtually anything!*"

Sandy denounced the notion that teachers need to know everything there is to know about computers in order to try, but acknowledged the fear preventing many teachers from trying out new technology:

> *"That's my big frustration… how do we break through this 'fear factor,' like Marisa did. She's willing to try one little thing at a time, and then show it to her team. I look to Professional Learning Community (PLC) team members to show each other 'what's new' with technology… I think PLC's are ultimately the best place for PD to transform practice… everybody learning, and everybody sharing. I think it's less scary that way."*

I asked Sandy if she has observed the CSE of teachers specifically influencing their DCT integration:

> "*I observed Marisa approach a math problem in an entirely new way. When she sees a student doing a math problem in a way she believes will help other students, she now asks that student to share their problem solving strategy with the class under the DC. It allowed other students to see what exactly the student was thinking, and allowed Marisa express her facility with new technology, too.*"

Sandy is most interested to see if DCT will take students learning to a higher level, especially with English Language Learners (ELL's) who have a language barrier to overcome:

> *"I'm thinking its going to help ELL's access the content easier…simply because they can see it better. But also, teachers can readily use visuals, including video because of the LCD projector, to supplement vocabulary and concepts being taught. There is less time wasted explaining things. Unfortunately, we don't have enough time invested in DCT, but I see the potential in them to change teacher pedagogy. I think it has tremendous potential."*

When I pressed Sandy for her candid opinion on factors influencing the CSE of teachers, she narrowed them down to two: the perceived value of the technology, and time invested in learning how to use new technology. She found too often the assumption that teachers resist integration when really what teachers need is more time to practice with it:

> *"I think those are the two keys. Unfortunately, we don't allow enough time for this… other things in the curriculum are often stressed over technology, or there's not enough money for workshops and when there is, people are too exhausted to attend an after school workshop."*

Concerning what area of teacher pedagogy DCT might be influencing the most, Sandy prefaced her comments by describing DCT as taking advantage, for better of for worse, with "*screen fascination*." She is curious to see how long this fascination will last; however her curiosity was tempered with concern:

> "*I'm afraid teachers are going to need some training around this. I'm not convinced all teachers naturally ask themselves, 'what kind of 'visuals' can I use to enhance my lesson?'"*

Sandy hopes that with DCT integration there will be cause for a conversation centered on helping teachers learn more about the way they teach. She admitted, some things may be obvious about DCT usage but other things might be less obvious:

> *"For example, having students share their <u>own</u> writing under the document camera. Some teachers may need this suggested to them."*

Concerning the Professional Development for teachers integrating DCT in the SJCS district, Sandy's tone turned somber. With her district in Program Improvement Status, there exists a lot of pressure to focus on ELA and Math, on testing and on getting kids test-ready. There is also the Title-1 requirement that monies be spent on PD trainings that are researched-based. These requirements are not district policies per se, but they are dictated by the state due of her district's status. With regards to technology specifically, Sandy retorted:

"There are no PD policies. That's one of the problems we face. There are no state standards for technology in California. There are nationally recommended technology standards, but this notion of 'infusing technology'…. people aren't paying attention to it because it's not a state requirement. Unless it's apart of a legal requirement, it's just not happening."

When it comes down to the actual PD trainings in technology for teachers, this service is offered based on site, grade level or individual need. Sandy found after school workshops very poorly attended, attributing it to teachers simply not having the energy to attend. Her answer has since been creating video tutorials and uploading them to the district website, along with links and flyers on different programs being offered. Unfortunately, the problem now is people are not aware what's available*:*

"I think it's because we don't have any 'time' dedicated to technology. It's a shame because it's not really about technology, it's about teaching the curriculum in a more engaging way."

Concerning, the specific integration of DCT, Sandy's response was put plainly:

"The technology is really, 'Push here to turn on.' It's really that simple. So it's more about how do I use this, than how do I turn it on?"

Sandy offers her help around the district, but adamantly believes teachers learn best from each other*:*

"It's the teachers that are actually using it in the classroom. They're going to be much more receptive to a fellow teacher, than me coming out and showing them."

When I asked Sandy what her ideal for training teachers is, she spoke deliberately about the nature of Professional Development as it pertains to teacher pedagogy:

"*In my opinion the best PD is embedded in one's practice. A 3-Day PD workshop can be ideally modeled with <u>you</u> embedded in the experience, with <u>you</u> actually practicing how <u>you</u> would integrate the technology with kids…with workshop leaders actually modeling for you, as though you were one of the students. That's one way to shift one's pedagogy."*

However, over time Sandy believes there has to be an ongoing dialog embedded in teachers' day-to-day practice, about what's working and what's not. She compared PD to a diet-fitness program, asserting PD is about changing ones practice over time, with little habits incrementally changing the way one teaches. She worries because technology is *"spiraling out of control*," without an ongoing conversation about how teachers are going to use it:

> *"Presently, professionally development isn't providing a real sense of 'what can technology do for my practice?' or 'what else can we do with it?' There's so little time dedicated specifically to brainstorming about technology…So, I'm really into video tutorials right now… Making videos of teachers in action, not just telling teachers, but also actually showing teachers how to use technology. This one teacher was telling me how in a PD training on math, not until the trainers showed videos of real teachers doing it, did he actually 'get it.'"*

Finally, I asked Sandy to juxtapose our conversation along side the Digital Divide phenomenon. Taking into account our K-12 student population, her thinking was directed toward cyber safety and cyber citizenship:

> *"What disturbs me is how many students are going online without the guidance of adults. They're literally lining up at Computer Learning Centers to get online with their My Space/ Face Book account online. But they're out there making their own rules…. they're not aware of all the bogus information on the Internet, or what learning programs can be actually valuable to them*."

Strongly recommending the need for additional guidance on how to use this new medium, she described kids as not mature enough to think through their actions:

> *"Often enough, they lie about their age to get a Face Book account and then say, in text, thoughtless things to their peers without understanding how their words are affecting other people."*

Sandy assured me that this is symptomatic of yet another phase our digital culture is going through, and that the responsibility to guide students can't possibly be put all upon teachers. Although, this kind of cyber-bullying deeply affects students and school climate, she

recognized the tremendous responsibility of parents to be aware of what their kids are doing online, and that ultimately cyber safety and cyber citizenship is a societal concern.

Concerning teachers practicing a *"stand and deliver mode"* in a digital age, Sandy's concern returned to the current teaching climate predicated on the emphasis with testing:

> *"Filling up kids minds in preparation for the test, humm… In my teacher training experience, I was taught to teach kids in a constructivist model, that is, to teach kids to constructively build upon their knowledge… to build knowledge through social and hands-on interaction with peers, teachers and materials."*

In the current test-ready climate kids face today, Sandy observes kids showing up for up for class disengaged by the lack of interactivity:

> "*They're use to being interactive with their peers. All of these social networking sites 'teach' them to be interactive. They're learning how to interact, how to collaborate with their peers, and they naturally expect this when they come to school.*
> *It sort of freaks them out when they can't."*

Sandy critiqued teachers who naively think that just showing a '*You-Tube'* video will make the content more interesting, when kids actually want to learn how to make their own videos, themselves:

> "*They've got more computing power in their pockets, on their cell phones, than I did on my first three computers!"*

In summation, Sandy's posture toward pedagogy in a digital era expressed an invitation to a challenge:

> *"I believe the challenge for teachers teaching in the digital era is: How do we rethink the way we are conveying the curriculum to match what kids are already doing on their own. I think teachers need to ask themselves, 'how can I make the classroom more interactive, so that it can be more engaging for my kids?'"*

In addition, her concerns for the "have-nots" were made obvious:

> *"What we will do for those kids who don't have access? How will we help them catch up with experiencing the same degree of interactivity and collaboration with those students who "have" access?"*

Ethical Standards

This study adhered to the ethical standards from the American Psychological Association in the protection of human subjects. A proposal was submitted and reviewed by the director of the master's program, and received approval.

Summary of Major Themes

Since the 1983 landmark report, *A Nation at Risk: The Imperative for Educational Reform,* there has been serious research dedicated to addressing the 'at-risk' status of our nation's educational system. While the Digital Divide (DD) continues to be largely defined by "have and have-nots," an evolving expression of DD is emerging, characterized by a divide in the effective use of technology. The width and breadth of literature reviewed here reflected this phenomenon, and dominate themes common in the ongoing research dedicated to pedagogy in a digital era. Taken as a whole, Prenksky framed our age of Information and Communication Technology as a "singular" event, predicated on the rapid dissemination of technology that has, in turn, brought about a cultural discontinuity between 'digital natives' and 'digital immigrants' (Prensky, 2001).

The literature reviewed described this cultural discontinuity as an ensuing implication to the world of education, presenting a tremendous challenge: the charge of creating and training teachers in the effective use of Educational Technology (ET). The literature revealed that this desired digital literacy is predicated on the Computer Self–Efficacy (CSE) of teachers, a compilation of general self-efficacy beliefs, all of which are implicated by teachers' experience and their professional development with technology integration.

How Present Study Will Extend Literature

This study means to extend the battery of knowledge surrounding teacher experience with digital technology, specifically, experience with the recent advent of Document Camera Technology (DCT) integration. This exploratory examination of anecdotal evidence aims to contribute to the ongoing research essential to our further understanding of the Computer Self-Efficacy of teachers. This database of experiential evidence is intended to extend the otherwise prerequisite knowledge base required for digital literacy in a digital age of learning.

Chapter 3 Method

In this exploratory study, a narrative design is employed to qualitatively examine the interrelationships between Document Camera Technology (DCT) integration and the Computer Self-Efficacy (CSE) of teachers. From a purposive sampling of semi-structured interviews, the research will seek to extrapolate data of the major research question:

- Are teachers integrating Document Camera Technology? If so how and why?
- Is the integration of Document Camera Technology influencing teachers' Computer Self Efficacy?
- In what ways, if any is Document Camera Technology influencing pedagogy, defined as instructional strategies, curricular design and management techniques?
- If Document Camera Technology is not being integrated, why not?

The researcher will seek to analyze the experiences of teachers for connecting and interrelating themes. Through a summative thematic analysis, the researcher will then construct a narrative discussion of the findings juxtaposed to the central phenomenon of pedagogy in a digital era.

Sample and Site

San Pablo School (SPS) is part of San Joaquin City School (SJCS) district, located in a suburban community just north of the San Francisco Bay Area. This K-5 elementary school site serves a predominantly Latin American community of 400 students with a high percentage of English Language Learners (ELLs). The majority of students are bused several miles to and from their home community. Students come from low socioeconomic status and take part in a subsidized lunch program. In their home communities, these families are periodically subject to immigration raids.

This site was chosen purposefully because of the recent infusion of Document Camera Technology (DCT). Over the past three years (11) classrooms out of (20) at SPS have been equipped with DCT, with the remainder to follow this year. In the entire SJCS elementary district, a district comprised of (7) schools, there are approximately (30) classrooms equipped with DCT. SPS has the second highest percentage of teachers currently integrating DCT in the SJCS district.

A purposive criterion sampling of teacher participants was selected based on the belief that their experience would provide a reliable source of information for the objectives in this study. Out of a population of (30) teachers who are currrently using DCT in the SJCS district, and (11) teachers that are currently using DCT at SPS, six (6) teachers were selected based on the following criteria:

1. Level of Computer Self-Efficacy (CSE): Based on a self-assessment tool to determine one's 'comfort level' with technology the sampling represents a range of Computer Self-Efficacy (CSE), from low, medium to high.
2. Level of Document Camera Technology (DCT) usage: Sampling represents a range of DCT usage, from 1-6 months, 6-12 months, and 12 months or more. Based on relative DCT usage, participants were selected randomly to represent each usage period. Usage is to be understood as "instructional usage."
3. Demographic Information: Age, gender, current assignment, length of employment are included to help create a more accurate profile of a teacher's CSE.

In all, these teachers were purposefully selected to provide the broadest scope of experiential data available. The variables for CSE and DCT usage, are deliberate design features

intended to account for the variance in today's teacher population, both 'native' and 'immigrant' alike who are faced with Technology Integration (TI). Altogether, the site and sample was selected to increase the likihood of developing a deeper understanding of the advent DCT integration.

Access and Permissions

Access to the site and sample in this study was initially gained by virtue of my employment with the San Joaquin City School (SJCS) district and current standing as a first grade teacher at San Pablo School (SPS). Permissions to interview district personnel and teachers from SJCS were gained following the protocol set forth in the Dominican University of California Institutional Review Board for the Protection of Human Subjects (IRBPHS). A "Letter of Introduction" petitioning involvement in this study was sent to all potential participants via email, followed by a face-to-face invitation. Subsequent volunteers were issued a "Consent to be a Research Subject" form.

Data Gathering Strategies

The researcher will qualitatively seek data by conducting face-to-face, semi-structured interviews. These interviews will be audio-taped and transcribed for subsequent data analysis. The protocol for administering and recording data is as follows:

1. Provide a copy of the Interview Protocol for each interviewee prior to the interview.

2. Since the interviewer has over two years of experience with Document Camera Technology (DCT), and could possibly predispose an interview, a brief process of self-disclosure will be conducted prior to each interview.

3. The following central questions will be asked of all study subjects:
    - Are teachers integrating Document Camera Technology? If so how and why?
    - Is the integration of Document Camera Technology influencing teachers' Computer Self Efficacy?
    - In what ways, if any is Document Camera Technology influencing pedagogy, defined as instructional strategies, curricular design and management techniques?
    - If Document Camera Technology is not being integrated, why not?

4. A standard series of probing sub-questions will follow to help clarify or amplify participant responses, if necessary. These sub-questions stem from recurring themes found in the literature review and are organized under the sub-headings: Technology Integration; Computer Self-Efficacy; Pedagogy; Professional Development and the Digital Divide Phenomenon.

5. The nature of these questions will be both open-ended and close-ended. Simple close-ended questions will be asked to elicit background information, as well as data concerning each participant's relative experience with technology. Without bias from the interviewer, open-ended questions will be asked to allow participants to respond freely, according to their own perspective. These participant responses will comprise the database for analysis.

6. In the event that the data collection process produces categories or common characteristics, participants may be asked increasingly specific questions to

collect progressively pertinent data, i.e., data that may prove helpful in data analysis, or useful to corroborating theories found in prior literature.

Altogether, the data gathering strategy of semi-structured interviews will seek to examine factors contributing to the positive or negative integration of DCT, as well as factors affecting the positive or negative profile for the CSE of teachers. Moreover, the interview process will seek to examine emerging themes influencing teacher pedagogy.

Data Analysis Approach

A phenomenological approach guided the research objectives in this study. Data was prepared and organized for analysis according to one-on-one participant interviews. These interviews provided the sum of qualitative data to be collected. This data collection process was followed by a hand-analysis to prepare the data for further exploration. From this database, text was coded with the intent to elicit, describe and develop an aggregate of connecting and interrelating themes via multiple perspectives. Through a summative thematic analysis of the major ideas revealed in the database, the researcher constructed a narrative discussion of the findings juxtaposed to the central phenomenon of pedagogy in a digital era. This narrative tells the story of how participants are empowered or changed by Document Camera Technology (DCT) and discusses what issues raise further questions in need of research.

Ethical Standards

This study adheres to the ethical standards proposed in the American Psychological Association (2010). These standards protect the human rights of individuals included in this research study. The Institutional Review Board approved the research proposal for the Protection of Human Subjects, at Dominican University of California, approval #8060.

Chapter 4 Analysis

Description of Site, Individuals, Data

Teacher participant ages ranged from 27-62 years old. Three men and three women participated in the semi-structured interview process, with grade levels 3rd through 5th represented in the sampling. The length of tenure for participants ranged between 2 and 10 years. The length of Document Camera Technology (DCT) *usage* ranged between 3 months and 2 years. The levels of Computer Self-Efficacy (CSE) represented were as follows: 1 teacher with low CSE; 2 teachers with medium CSE; and 3 teachers with high CSE.

Analysis of Themes

The general posture toward Document Camera Technology (DCT) from all teacher participants was found to be overwhelmingly positive in nature, as seen evident in the following direct quotes taken from all six participants:

"I really only have positive things to say about the Document Camera (DC). It's invaluable. It has made me a more effective teacher—absolutely. The DC increases your teachable moment level by a 1000 percent. I don't know of a subject where I can't use it…maybe P.E. When I really think about the DC, I don't know how I ever managed without it." (T. Green, personal interview, April 4, 2010)

"I use it daily. I was really excited to get it. I see it as a tool, and like any other, if it's used effectively it makes you a better teacher. Its definitely changing the way I teach." (S. Franklin, personal interview March 30, 2010)

"I love the DC. I can't imagine working without it--certainly I could-- but it's become indispensable. I use it without even thinking about it, and I'm interested in learning new ways to use it. It's made me more effective at classroom management and with less stress. I think the DC is an essential ingredient to the evolution of teaching. If we were to liken our profession to a house with many rooms--we just opened a door to a room we didn't know existed--and it's a room we can use however we want." (T. Koffee, personal interview, March 29, 2010)

"I really value DCT because I can work right with the students. We can be on the 'same page,' working together." (T. Bell, personal interview, March 30, 2010)

"It's revolutionary, especially for our English Language Learners (ELL's). You can provide visuals whenever you need them--it's really effective. Now kids can bring their own work up and place it under the camera—that's my favorite part of using it. I think seeing things in 'real-time' is fascinating for them. I use it all day-- for everything. I introduce every single skill with it." (M. Ray, personal interview, April 8, 2010)

"It's totally changed my life and it's only been 3 months. I absolutely love it and I don't even like technology. It magically appeared one day and stayed there until my partner came over and said, "It's really easy…just turn it on here and it'll change your life." I went, "No, no, I've got to read the directions." She was right though, I turned it on and in one day it <u>did</u> change my life. My jaw is still dropped from this." (D. Hall, personal interview, April 1, 2010)

This list of resounding endorsements for DCT is impressive and indicative of welcomed Technology Integration. However, DCT integration was not a perfect endeavor, nor without its trials. The following analysis corroborates both recurring and discordant themes found common among the cohort sampling of teachers from San Pablo School (SPS). Above all else, the research strived to relate the experiences of teachers. However divergent the database of experience may be, the point of the research was to reveal what themes emerged due to DCT integration. How themes connected or remained, as outlaying anomalies was the crux of this analysis.

Technology Integration

While the reception for DCT was met with enthusiasm, the decision to actually integrate DCT revealed different points of origin. Two teachers with high CSE, Todd a 5th grade teacher with 10 years of experience and Ted a 5th grade teacher with 5 years, followed the example of another teacher from the SJCS district and together wrote a grant to purchase their own DC. The remaining teachers lucked out and received their document camera (DC) the following year, having been purchased by the principal with site specific categorical funding. In either case, the decision by any of the participants to integrate DCT was not based on "research" *per se*, but instead on the DC's preceding reputation or subsequent site adoption.

The hardware installation of the DC and its 8'X8' screen was found to be of no real consequence, although the actual physical placement of each was found to be problematic. When DCT was employed, the screen's location barred the use of valuable white board space. Moreover, in all but one of the classrooms, the wiring for computer portals was physically located in the rear of the classroom with the screen being located in the front of the classroom, thereby precluding teachers from being able to operate the camera while simultaneously facing their students. Obvious concerns presented themselves, summarized here by Trish, a second year 4th grade teacher with medium CSE:

"*In this classroom my computer is set up in the back of the classroom. This has been a big adjustment for me. It's not the same as every classroom, but I can't see the kids' eyes. I don't know if they're understanding or paying attention, and I think they're use to having a teacher in the front of the room. I know I would prefer teaching from the front of the classroom.*" (T. Bell, personal interview, March 30, 2010)

All of the teachers faced with the physical limitations of the camera's location concurred with Trish that teaching from the back of the room was not optimal, especially with regards to monitoring student engagement, checking for comprehension, and classroom management. Steve, a 10th year 4th grade teacher with medium CSE welcomed the addition of DCT, but described the problem as such:

"*Both the DC and the LCD projector are great, but teaching from the back of the room is really hard with this particular group of kids. I'm looking at the backs of their heads…it's a management thing. This year I need to be front and center—with eyes on me. I notice they're not totally engaged with this set-up.*" (S. Franklin, personal interview March 30, 2010)

Accommodations for the camera's physical location have thus far been left to the ingenuity of teachers, like Todd:

"Its location has presented a bit of a dilemma. So, what I'm doing is using the 'freeze' feature quite a bit. I'll zoom in on what's under the camera, hit the 'freeze' button and run up to the

front of the class. I can then touch the screen and have kids come up, too. It's a small sacrifice." (T. Green, personal interview, April 4, 2010)

Additional infra-structural adjustments were made to accommodate for the DC's defining feature as a 'visual presenter.' Teachers found themselves rearranging their desktops to accommodate for a new battery of visual aids. Office space was reorganized into workspace. In turn, room was needed for curricular materials that could be readily available to display, ideally obtainable within arm's length. In short, DCT dictated many of its own parameters before becoming viable. Denise, a 3rd grade teacher with low CSE in her 10th year, described this accommodation, and a not so obvious ramification:

"The whole circus act of explaining things changed for me. No more running over to my books to grab pictures of things, or to the whiteboard to draw things. Instead I do it right here. I've had to rearrange my office area… now that I need everything I'm teaching right here. I've had to rethink how to accommodate for this. But, it's also affecting my physical body because I don't walk around the room as much--I'm a walker. I use to spend all my time up, now I'm spending my entire time sitting and I'm having a hard time adjusting to that. I may need to move the camera…my neck is a little crooked. I'm not sure where it should be? It's good for them, but bad for me. But, the biggest thing is that with no more overhead projector, I don't have to go looking all over for transparencies, and believe me they're all over." (D. Hall, personal interview, April 1, 2010)

Made conspicuous by the integration of DCT was the absence and removal of overhead projectors, which now litter the hallways of San Pablo School. All but Steve replaced this visual presentation technology with DCT. He asserted:

"I think it's more effective than the overhead, for sure. But, I still have the management issue. It would be so much better if I could set it up in the front and teach from there. It has to do with the bunch of kids I have." (S. Franklin, personal interview March 30, 2010)

However, every teacher agreed that DCT was infinitely more '*effective*' and '*dynamic*' a teaching tool than the overhead projector protocol for using transparencies. Todd put it succinctly:

"*I've never been a fan of the overhead projector; I never enjoyed staring down into that light and being blinded by it, nor was I a fan of transparencies. I was using all my funds on transparencies, making these big subject binders filled with them. I have since tossed all that stuff…. you don't need it."* (T. Green, personal interview, April 4, 2010)

Or, as Ted, a 5th grade teacher with high CSE in his 5th year captured with this creative comparison:

"*The overhead projector is so lame and limited compared to the DC. It's like comparing a telegraph machine to a cell phone."* (T. Koffee, personal interview, March 29, 2010)

When it came down to actually implementing DCT pedagogically, the consensus from teachers was depicted as virtually '*seamless.'* In fact, the DC's defining feature-- to visually project objects in live-action, *'real-time'* onto an 8'x'8' screen-- is as easy as turning on the device and placing the desired object under the camera. As Marion, a 10th year 3rd grade teacher with high CSE recalled:

"*It was so easy. I knew I wanted to use it, so when it arrived I decided to focus and figure it out. It literally took me 10 minutes. I ended up on a mission-- going around and showing other teachers that all they had to do was push here and here. I knew how they were feeling--the same way I was—like, what am I suppose to with this."* (M. Ray, personal interview, April 8, 2010)

Computer Self-Efficacy

Marion's mild case of angst over DCT integration spoke to her Computer Self-Efficacy (CSE). With only minor difficulty, all teachers were able to reckon with how the DC interfaced with the LCD projector and one's computer. The ease with which teachers were able to employ DCT was universally appreciated, especially by Denise:

"*I don't use technology very much. I wish I did, but everything seems harder to learn these days--this was quick to learn. I'm really a physical and descriptive person. I can draw all day long, so I didn't really need DCT, but it is making me more comfortable with computers. I'm not so afraid of new technology, I suppose. I'm more comfortable using the computer… I visit websites that might help kids with something they don't know, and use the LCD projector more. I do it more often now because I'm right next to the computer …before, I would be in the middle of*

teaching and have to stop and go over to the computer station…. and that, I would put off." (D. Hall, personal interview, April 1, 2010)

For teachers with high CSE, like Todd, the integration of DCT was, in effect, the next logical step in their practice:

"I've never felt uncomfortable with technology, because I've been fiddling with the computer since the Internet was born. When I plan a lesson I generally don't question how or even if I'm going to use technology, because that's a gimmee. I know I'm going to use the DC because I know I don't have to make 20 copies. I know I'm going to use the DC because it's easier to show a picture from my i-phone up on the screen, rather than showing it to 20 individual students." (T. Green, personal interview, April 4, 2010

Pedagogy

Altogether, the facility to utilize DCT was found to be lowering the affective filter for teachers learning how to make use of it. With confidence levels high and one's sense of CSE embolden, the next matter of import considered by teachers was DCT *usage*. Without exception, DCT was found influencing the pedagogy of teachers. Instances of teachers perceiving and designing curriculum differently were found across grade levels and throughout the gambit of CSE. In each case the DC's *'real time'* feature offered a whole new dynamic in preparing for and planning instruction. Moreover, the groundbreaking *'zoom'* feature provided explicit attention to detail rarely available to elementary classroom teachers before. Working together, these features were found enabling teachers to, quite literally, revise their perception of curriculum and their instructional strategies for delivering curriculum. Ted described how he approached the subject of Science differently:

"*When I was planning this unit on the Human Body, I thought to myself how could I incorporate the DC. So, I used it to help kids create their own 'Body Book.' I planned on putting my book under the DC, so that they could see more plainly all the elements that need to be included in a specific part of the body. It's become another way to hook kids into learning.*" (T. Koffee, personal interview, March 29, 2010)

Denise described how DCT redefined the long held tradition of the teacher 'read-aloud':

"*Well, it's just fantastic when I can say, 'Have you noticed the details in this picture,' and the picture is 8'X8'! Every single reader, for some reason, thinks its so much fun to follow along now. I'm reading out loud--and without me telling them-- they're joining right in. It's changing the dynamics of our read-aloud, since now they can see it and follow along. That's huge for the 'read-aloud.'*" (D. Hall, personal interview, April 1, 2010)

Moreover, DCT was found to be changing the nature of student participation in curriculum. Marion praised DCT for this principal benefit, and the overriding difference it has made in meeting the needs of her students:

"*I don't even use my whiteboard much any more. Before, I couldn't teach the "WE-DO" part of the lesson like I am now. I think that's the biggest difference in my instruction.*" (M. Ray, personal interview, April 8, 2010)

DCT was also found enabling teachers to instruct more inclusively with their students across the curriculum, permeating the instructional strategies of teachers such as Steve:

"*I'd say I use it mostly with Math—reviewing student workbook pages and showing them how Math manipulatives work. I also use it to solve problems. We're learning a new way to multiply multi-digit numbers--it's called the lattice method-- it's kind of a visual way to learn multiplication. I'm doing it under the camera. When the kids see me problem solving –they learn from that. With Writing—putting students work right under the camera, we can look at and edit together, often with a kid coming up to do it.*" (S. Franklin, personal interview March 30, 2010)

The ability to include students in '*real time*,' big-screen-instruction was found providing a movie-star incentive for kids to participate. Most teachers found their students more engaged in learning for this reason alone. Todd found DCT most helpful with his new Math adoption:

"*For this particular Math program, it's been a lifesaver--a game changer. I don't have to walk around and attend to 20 kids-- in a 90 minute block-- to see if they're all getting it, or not. I'm now using a student workbook and we work together. Kids can now go up and point out on the screen what they have questions about, or they can come up the DC and write directly into the workbook. I think it would be hardly possible to teach this program effectively with out the DC. I know with the DC I can get everyone engaged--there's buy-in—and, there's more effective assessment from me. Before I had the DC, I really struggled with informal assessment.*" (T. Green, personal interview, April 4, 2010

Addressing and assessing the needs of English Language Learner's (ELL's) remained a prevailing concern for all teachers at San Pablo School, and DCT was found capable of answering this priority. Ted endorsed DCT at the outset of a new English Language Development (ELD) program:

"I can throw the chants right under the DC. I don't have to put it up on the wall, and even if I did the kids wouldn't be able to see it. On the screen it's enlarged, and boom-- there are those words-- they're so big! I can go right up and point them out." (T. Koffee, personal interview, March 29, 2010)

Denise found the DC especially effective with teaching ELD:

"I'm supposed to gather them all on the rug in front of the poster and songbook, when really it's more effective for me to do from here, where I can enlarge the text 10 times. So when I plan for ELD, I say to myself, 'This and that is for the DC.' Also, you know how important pronunciation is to our kids. Well, I started using the camera to show students what their mouth is suppose to <u>do</u> when pronouncing the /th/ sound…its kind of gross because they see inside my mouth, but its working!" (D. Hall, personal interview, April 1, 2010)

The apparent advantage of big-screen-instruction was not found entirely welcomed without reservation. Steve explained:

"This works great with visual learners, but not all of my kids are visual learners, a lot of them are kinesthetic or auditory learners—so the big screen doesn't do anything for them. So, of course you get off task kids when that happens." (S. Franklin, personal interview March 30, 2010)

Certainly, the role of DCT for teachers plagued with behavior problems remains an outstanding issue. Yet, numerous teachers countered with claims of the advantages DCT was providing for their classroom management concerns. Todd defended the DC's apparent proviso for classroom management:

"For this class, the buy-in <u>is</u> classroom management. Enthusiasm negates bad behavior, especially for this cohort o kids. Simply knowing that they have an opportunity to share answers, or do something that the whole class can see, is everything to my classroom management. On a daily basis, I'll write series of basic directions and post it under the DC, so that when the kids come in from recess they'll know exactly what to do. What's up there is their signal for what is

expected. I can make it so clear to them with the DC." (T. Green, personal interview, April 4, 2010

Denise found Todd's rubric for buy-in and classroom management equally effective:

"I think I can watch them better because I'm not fumbling around with so much stuff. I use to have to stop my lesson and go to the board to tally points, or keep a tab with me. Now I can do it right from my desktop. Look at this class management chart… on one side I have 'team points' and on the other I have 'recess minutes off. They're aware of it too. They say, 'Hey team, points are up!' And they focus a little harder, or 'Oh-oh, our recess minutes are up!' I also have this 'Note Home' that I display if someone in particular is acting up. I say, "Here's a note home with nobody's name it, humm?" It's awesome for classroom management in that way." (D. Hall, personal interview, April 1, 2010)

When it came to managing the often-debilitating succession of homework teachers are charged with, DCT was also found helpful. Marion recommended:

"It really helps with doing homework—with staying engaged and following along with it. It's also a reward for kids to bring up their work and share it. And, if I call on someone to come up, I can also use it to check who isn't doing his or her work, as well." (M. Ray, personal interview, April 8, 2010)

Denise also commended the DC for help with homework:

"*Now I ask, 'Who wants me to correct their homework?' The kids love it. And, we made these 'Brave Tickets,' that say: 'I let the teacher use my mistakes so we can all learn from it. Everybody makes mistakes. We're all brave!'"* (D. Hall, personal interview, April 1, 2010)

Professional Development

Perhaps, bravery best described how each teacher was able to face DCT integration without the direct, formal support from a financially strapped district office of Professional Development (PD). As a matter of fact, every teacher was left to their own devices, as to how one *should* implement DCT into their practice. Trish summed up just how this feat was accomplished:

> "*I received no training, except what I got from a colleague who self taught herself."* (T. Bell, personal interview, March 30, 2010)

Like Todd and Ted, who first purchased their own cameras and helped each other install, train and integrate DCT, the task of integration fell upon the shoulders of teachers themselves. Moreover, the task of "professional development" was left to teachers. The under-lying presumption of DCT integration and how it might be affecting the pedagogy of teachers was not officially addressed by the SJCS district office of PD, or directly by teachers themselves. In the meanwhile, teachers had to fend for themselves, many left wondering what to expect or what might they hope for. Steve captured the current climate surrounding Professional Development:

"We're pretty much on our own...I'd love to see some demos with some expert using of this stuff. I don't know if that's going to happen, or whether we'll be on our own like everything else lately—'Here's a book—learn it,' now 'Here's a Document Camera--use it.' For me, what works best is someone coming in to teach a lesson and demonstrate using the technology, rather than sitting in a computer lab and having someone show me all the commands? I'd like to see someone come in and teach a really good lesson with the DC and see how he or she moves around the room-- how they're integrating technology into their teaching. That's what works for me--seeing it live, in person." (S. Franklin, personal interview March 30, 2010)

With no PD model to choose from, teachers like Ted dreamed of what could be helpful:

"I'd prefer experts coming in and giving a 'show, <u>not</u> tell' demonstration of all the awesome tricks you can do with the DC…like a 'Best of the DC' In-Service'. Hopefully, that would spark some ideas….and get people to start collaborating to create their own uses for it. If I could see what other people are doing with it, that would be most helpful to me." (T. Koffee, personal interview, March 29, 2010)

While all teachers helped each other integrate DCT, the matter of PD remained an issue for many. Marion, had come to rely on herself or her son when it came to help with technology:

"Most things I can learn myself…or I can ask my son... But when if do have questions, it would be nice to have someone to ask--on the phone, or ideally someone coming by at regular intervals. I'd actually like some training with video right now. I saw Aaron Water's video on our website and that inspired me to look into video. I emailed him once about it, but I feel all by myself and like giving up…because there's no one around to ask for help--in person… Trainings are offered and they look great—even the tutorials, but when it comes to going to them, or watching them, or learning by emails, well, I haven't-- that doesn't work for me--I need a real person around, like a designated site tech person. But mainly, I think we learn from each other." (M. Ray, personal interview, April 8, 2010)

Denise, who has expressed a desire for more PD, has often confronted Marion's paradigm for PD with reservation. Here, she expressed her own experience in detail:

*"I'm pretty much on my own, but then I basically don't do much. If I did, I wouldn't want to bother my colleagues… we're all too busy. With little things, I think we should teach each other, but I need bigger things. When Sandy (*from the district IT office*) was here she knew my skill level and she knew when I was ready to move on… She showed me how to do a PowerPoint slide show for open house once--really easily-- just her and me. But I know that's a luxury we can't afford anymore. I can't do a PowerPoint now-- I forgot how. I learned it 5 years ago, and never used one again…I notice the emails and I intend to go to the trainings, but I run out of time. I'd like to go, but they're being provided for less and less. I'd go if they were really short and really close. I'd rather do short workshops after school, than being taken out of class during the day… If money were no object, I'd rather have on-going small groups meet in the computer lab…small groups to accommodate for our different levels of CSE. It's frustrating when a whole lab is filled up with people on different levels. It gets to be a waste of time and it makes us not want to come back."* (D. Hall, personal interview, April 1, 2010)

Clearly, PD was found functioning on a slippery continuum between teachers. This manifestation was found to be a forgone conclusion that the staff acquiesced to admirably. Trish furnished a curt but honest appraisal of how most teachers have assessed the situation regarding PD:

"It really doesn't matter to me who has the knowledge; so long as I have the chance to interact with the technology—that, and learn it correctly--that's what's important to me." (T. Bell, personal interview, March 30, 2010)

Equally frank in his assessment of PD was Todd, who spoke candidly:

"I think our PD is pretty poor. Overall, I think our site and our district is pretty unfocused on technology. I don't think it gets nearly enough focus. And that's a whole other can of worms. If there was more focus, then I think we would be all teaching the technology skills posted in our lab. I don't think anyone—besides the posters themselves-- clearly knows what those skills are, or teaches them to their kids. Through no fault of our own, I just think our district is not focused on teaching technology as a really important tool…like some other districts. Probably due to funding, or maybe because testing isn't done on computers, I am not sure." (T. Green, personal interview, April 4, 2010)

With teachers left wondering what to expect next from their district, there appeared little doubt as to who they would ultimately depend on: each other. The initiative and cooperation

showed by this cohort of teachers exemplified not simply a commitment to the promise of Computer Assisted Learning (CAL), but a genuine 'courage to teach.' Altogether, their collective nerve added new meaning for what it implies to be a part of a Professional Learning Community (PLC).

Digital Divide Phenomenon

In light of their recent experience with DCT, teachers were asked to speculate on the Digital Divide (DD) phenomenon--on facing pedagogy on the margins of a digital era-- and what this might imply for themselves and their prospective students. The general consensus amongst teachers was that the precedent for the future of education has, in fact, already been set. Instead, the real question found waxing in the minds of these teachers was what shall be done about it. Todd poignantly stated his position:

"We have to bridge this divide… we're no longer preparing our kids for the same job market. We need to prepare them for technological jobs…. it's no longer paper and pencil. These are kids living and learning in a multimedia world. They need to be instructed in this medium--so they can someday be ready to go and find a job… The jobs they apply for are going to require computer skills….I know our 5th grade is doing their best to prepare kids technologically, but I know not every teacher has these technological capabilities...and that's just wrong. We all need them, perhaps the younger grades more so than the 5th graders." (T. Green, personal interview, April 4, 2010)

Not every classroom at San Pablo School (SPS) was found operating on the same technological par. Nor was technological inequality unusual to the SPS student population, who comes from low socio-economic status (SES) typically unable to afford computers or Internet access. Teachers were often reminded of this, and why the 'haves and have-nots' remain the standard for dictating to whom the DD impacts most directly.

However, there was a stark contrast between the quantity and quality of technology available to these students. When compared to other schools in the district, San Pablo School had

noticeably more technology going for it. Yet, with all this technology available, not all teachers were found proactively employing it. Herein lies an expression of the 'Second-level Digital Divide': those who do integrate technology and those who don't. Again, Todd redresses the topic of the DD, in hopes of laying claim for some accountability:

"There is this generational dilemma. Maybe there is a time in our lives when we kind of shut down and stop letting in all the technology. Some say it happens in your 40's and 50's, when you learn to resent it all and say, 'The technology I've learned in my life time is enough.' I hope that doesn't happen to me, but I know that it does happen, and to plenty of teachers. Even though we have all these tools, some just as soon teach with a book and a poster because that's the way they learned how to teach. I don't think that's doing our kids justice." (T. Green, personal interview, April 4, 2010)

For Steve, a self-professed 'medium-low' on the CSE savvy-ness scale, the issue is not so simple:

"I do think technology is a very effective tool. And this tool in particular-- this computer—it's an unlimited source of information. I do feel I should be using it more than I do. I don't feel pressured, except maybe from myself…but, I don't feel really that comfortable. I feel comfortable enough to navigate, but I know there are teachers out there who are all over it, and probably more effective in some of the concepts they're trying to teach because they know how to access their computers, and put that stuff into a kid friendly version up on the screen. For me there's a lot of stumbling around trying to find the right websites. It takes a lot of time. And sometimes you have to edit the stuff because it's not kid friendly." (S. Franklin, personal interview March 30, 2010)

For Ted the matter of the DD takes on another dynamic:

"*I had to integrate, or evolve into our digital world. I panic a little when something more is presented to me and I have to figure it out…like Excel. I learned things going online and 'Googling it'-- from tutorials-- but it takes a lot of time for me to do that. I am not a natural; I've had to teach myself… and I do have a guard up against things like Twitter or Face Book, because I don't want to speed up my life any more than it already is. But at the same time, I have a thirst for it…. The only difficult part about the DC was figuring out how I was going to integrate this new technology. It's not intuitive…and, I have this creative block…I have this resistance, because I think human connection is the best way to teach. I don't want to see kids getting too wired, but, our ability to search for images to augment our learning has been so helpful…to have all of this at our fingertips…I believe I'm using the 'digital font' to feed my best practices—which is real human connection, rather than just plugging them in. I want them to be computer savvy, but I'm moreover interested that they learn how to read."* (T. Koffee, personal interview, March 29, 2010)

With the exception of Todd, a bona-fide 'digital native,' who is comfortable in confronting whatever technological challenge comes next, all other teachers were found challenged by the current DD, irrespective of their level of CSE. The culprit, for all intents and purposes, was not found in lack of hardware or software, or in a '*thirst*' for more technological knowledge, but in what to do with all of this technology given the parameters of PD and the continuum of Technology Integration. This expression of the DD phenomenon was most apparent to Trish:

"I feel a though I am slowly falling behind, since everything is developing so rapidly. Particularly Internet based information or cell phone technologies. I don't use this technology, so I can't be knowledgeable about them for my kids. I feel out of the loop, although I have a thirst for wanting to learn more, but it takes time and money and effort to learn all these things." (T. Bell, personal interview, March 30, 2010)

Marion keenly articulated this expression of the DD phenomenon:

"Having a partner like Melanie, who is younger and who knows more about technology helps a great deal. I was reluctant to do projects in the past, because of lack of support, but now my colleagues help me--we compliment each other. So, right now I don't see myself being left behind, but I do see the pace is picking up…The ability to keep pace with hand held technologies is challenging to me, though. That's the next level in education, where kids have hand held devices they can use interactively in the classroom. Web 2.0 technologies are spiraling--exponentially growing-- like I never imagined. And, kids have access to all of this by middle school, so that's good—but, I don't see our district keeping up with the rest of the world…Here, we have little time to teach tech because we're too busy teaching them how to read." (M. Ray, personal interview, April 8, 2010)

Denise, who perhaps faces the largest gulf predicated by the DD, expressed a most temperate attitude:

"So, there's this big, gigantic disconnect… I see the future. I see the advantages for kids. But if were going to use it, someone has to help me connect the dots, please…to find out their disconnects, too. That would take me a long time… But I think there will always be people like me. I'm not really afraid for the future, even though there are teachers like me who are not so 'connected'… Whereas younger teachers who are more comfortable with technology, they would probably be able to absorb the next technology, and the next, the entire better. I'll retire and new ones will come along… In the future we might not have this problem. But, you know there will always be a need to teach the next technology." (D. Hall, personal interview, April 1, 2010)

Over the course of conducting this research project additional LCD projectors were ceiling mounted in the remaining classrooms at San Pablo School (SPS), while Document Cameras arrived in boxes waiting to be installed. For another cohort of teachers the next piece of technology had arrived and with no apparent apparatus for PD in place, they are likely to face many of same challenges. To the credit of administrators with the foresight and funds to bridge the DD amongst teachers who 'have not' integrated this technology, the onus to bridge the gap of 'digital opportunity' remained paramount in the minds of teachers, such as Trish:

"What the kids have at this school is a good start, but they need more access…more instruction. I've taught some basic things, taking for granted they knew how to open a file or capitalize... I've seen kindergartners learning to touch type at other schools, and compared to these kids, our kids have fallen behind. Kids with less experience and exposure to computers aren't going to have the same access to jobs out there." (T. Bell, personal interview, March 30, 2010)

For Todd, the DD that poses disadvantages for his students is made plain in this comparison:

"I know that every kid in my wife's class has a laptop; she even has a 'green screen' in her room. She now has the technology where she can put her kids in front of the screen and place colonial America behind them. She also has a Smart Board, which would be the next logical step for me…Her kids are interacting with all sorts of 'mind-maps'—all of that 'pre-thinking' that is so important, especially for our population." (T. Green, personal interview, April 4, 2010)

Faced with the notion of a future in education on the margins of a digital era, teachers expressed both anticipation and apprehension. This expectancy was found most apparent with the advent of big-screen-instruction, the corollary of DCT that was found fundamentally influencing the best practices of teachers. Todd assessed this phenomenon with equanimity:

"I think our screen fascination is becoming a cultural norm. I think kids are getting use to learning this way and I bet when they go on to sixth grade they'll be expecting DC's and Projectors—and, to be taught using this technology." (T. Green, personal interview, April 4, 2010)

While Denise acknowledged this fascination, her conscience revealed caution:

"Looking up at a screen, we're seeing more up close and better on the big screen. But, we both read Last Child in the Woods, so we know that it's already affecting us-- looking at the screen more, and being more sedentary…. We're experiencing less directly." (D. Hall, personal interview, April 1, 2010)

With composure, as in point of fact, Steve told his truth about what the future of education could imply for teachers facing such big-screen-fascination:

"I do think it's changing the way classrooms are set up… Sure, someone still has to make up the curriculum-- that's our job-- but the teaching profession, as we know it, could be a dinosaur in the next 25 years. I bet we'll see classrooms change so much so that we won't recognize them. I think public education classrooms have a lot of benefits socially, but we're going to be able to do it all online, really, just like colleges do today. Most kids know how to use technology now… they're teaching me some of these commands… It's a lot cheaper to give a kid a laptop and have them do their assignments from home. It could happen, you know." (S. Franklin, personal interview, March 30, 2010)

What '*could'* happen, of course, remains to be seen. The probability of predicting such an outcome, qualitatively or even quantitatively is certainly beyond the scope of this paper, and otherwise unattainable at this juncture in our nascent journey into a digital era in education. However, teachers in this sampling were found exceptionally mindful of the DD as they drew near to the potential of 'digital opportunity.'

Chapter 5 Discussion

Summary of Major Findings or Results

Even though the overall reception and endorsement for Document Camera Technology (DCT) was found to be tremendously optimistic, the record of teacher experience disclosed anomalies in its integration. Whereas the negligible amount of research invested in DCT was found inconsequential in its purchase, the ensuing import of this technology was found significantly problematic in its implementation.

Inconsideration for the physical limitations of classrooms necessitated concessions both infrastructurally and pedagogically. All teachers were found making accommodations to their classrooms and adjustments to their practice, principally by way of that essential pedagogical tenet between student and teacher: eye contact. With students' gazes fixated forward onto the big-screen, teacher-centric instructional practices were reported waning. Yet, regardless of these allowances, teachers remained committed to the ease and versatility of DCT, especially when compared to the limitations of the now antiquated overhead projector. Despite the foibles of DCT integration, its assimilation was found throughout all grade levels represented, across all curriculums and by all teachers, irrespective of their Computer Self- Efficacy (CSE).

In point of fact, the facility to utilize DCT was found to be of little negative consequence to the CSE of teachers. Irrespective of CSE, teachers found little cause for anxiety at the prospect or actual execution of DCT. To the contrary, the ability to operate DCT with such '*ease and versatility,*' quite naturally, contributed positively to the CSE of teachers. Teachers were found universally encouraged by the DC's defining '*real-time*' and '*zoom*' features, and employed each with fidelity. Commitment to DCT *usage* was found by and large augmenting teacher pedagogy

and revitalizing best practices. Altogether, the CSE of teachers was emboldened to exercise DCT and to further explore its untapped uses.

With the advent of visual presentation technology featuring '*real-time'* and *'zoom'* attributes, DCT was found interfacing across all curricular domains and influencing all aspects of teacher pedagogy. Moreover, students were found starring in a seemingly unlimited engagement between teacher, technology and content. DCT's characteristic features were found literally to be revising the teacher perception of curricular design, the teacher method for instructional strategies and the teacher manner of classroom management. Consequently, for better or for worse, big-screen-instruction was found prevailing throughout most the instructional day.

Over the course of DCT integration at San Pablo School, the absence of Professional Development was conspicuous throughout. Again, irrespective of teacher CSE, the onus to integrate this new technology was assumed solely by the teachers, themselves. As a testament to the capacity for a Professional Learning Community, teachers were found exhibiting remarkable initiative, cooperation and collaboration in their collective endeavor to make use of DCT. Nevertheless, in addition to the question of what else *could* be done with DCT, there remained the uncertainty of what *should* be done with DCT. This query remains an unrealized addendum to the Professional Development of teachers confronted with the mediation and outcome of big-screen-instruction.

The reality of the Digital Divide (DD) juxtaposed to 'digital opportunity' remained foremost in the minds of all teacher participants throughout the interview process. The DD proverb for those who 'have or have-not' technology stayed entrenched in the minds of teachers, while the maxim for those who 'do or do not' incorporate technology continued to be enmeshed in Technology Integration (TI). The continuum for TI and the CSE of teachers correlated to variables of time invested in digital culture and consequent posture toward the proverbial

promise of Educational Technology (ET) and Computer Assisted Learning (CAL) modalities. Without exemption from Information and Communication Technology (ICT), the phenomenological nature of the DD was found influencing the pedagogy of all teacher participants and, moreover, their vision for the future of education bordering on a digital era. Although DCT, in and of itself, did little to exacerbate the anticipation or angst associated with the TI, the DD phenomenon was found impacting teacher practice and amplifying teacher portents of things to come.

Comparison of Findings/Results with Existing Studies

Upon reflection of the battery of teacher experience, several themes were found resonating with findings from previous research and interview with expert Sandy Raznakov. Noteworthy, was the utter lack of research invested into the widespread endorsement of DCT by district administrators and teacher participants, alike. This apparent capricious decision to integrate DCT without deliberation or forethought to its ramifications presently goes unchecked.

There appeared no accounting for this kind of decision-making apart from accepting Prensky's explanation for the historical implication of the Information and Communication Technology (ICT) revolution. It appeared that the arrival and "singularity" of DCT impelled its universal acceptance. Prensky described this "singularity" as an occasion that alters things so essentially that there is no return. Prensky prognosticated: "This so called "singularity" is the arrival and rapid dissemination of digital technology in the last decades of the 20th century" (Prensky, 2001). To be sure, expert and practitioner concur upon the arrival of DCT. Perhaps, by default of the age we live in, but nonetheless DCT was found evidentially transforming the way teachers teach. In light of the imminent integration of DCT, the matter of what *could* or *should* be done about it weighs heavily in the balance. According to expert and practitioner, the post for

Professional Development (PD) lies vacant. In its place a void resides for what was once vital technical support.

With an impending population of 'disconnected,' 'disenfranchised' digital-kids on the rise—now, all the more fascinated by big-screen-instruction and the prospect of interactive Web 2.0 technologies-–an ominous sense of necessity looms before teachers: They are challenged to transform their pedagogy while beset with a vacuum in PD. Once again, by default of the financial times we live in, the CSE needs of teachers go unmet. For the 'digital native,' the pressure to fill this vacancy can be profound. For the 'digital immigrant,' whose 'digital accent' thickens with each technological upgrade, the pressure to overcompensate can be grave.

Apparently, the PD solution lies with teachers. From the district office Sandy framed this challenge with a query: "*How do we rethink the way we are conveying the curriculum to match what kids are already doing on their own?"*(S. Raznakov, personal interview, March 23, 2010) Having observed the social networking behavior and talent of students, Sandy recognizes the competence with which they operate: "*They're use to being interactive with their peers. All of these social networking sites 'teach' them to be interactive. They're learning how to interact, how to collaborate with their peers, and they naturally expect this when they come to school. It sort of freaks them out when they can't."* (S. Raznakov, personal interview, March 23, 2010)

In a climate where teachers are expected to tackle the task to PD, the prerequisite skills of interaction and collaboration remain at a premium. Could part of the solution be as simple as following the example students are modeling for us? In reality, the onus placed upon teachers to train themselves necessitates interactivity, the same kind of interaction seen throughout the integration of DCT at San Pablo School. Upon inspection, their solution essentially mimicked the digital dealings of today's students. Could the provincial dictum for 'computer savvy-ness'

that so many teachers require develop in concordance with the needs of our 'digital-kids'? However, PD needs to facilitate a higher sense of CSE for teachers if they are to persevere with today's students. Perhaps, once more by default, the time has come to seek solutions from our students.

Although, the ideal Professional Development (PD) model remained an allusive issue, commonalities emerged. Sandy's model of PD as *"embedded in one's practice"* correlated to the model espoused by Paraskeva et al. (2008), wherein they concluded teachers require specific subject needs addressed during trainings to over come their reticence toward using technology in the classroom. While Paraskeva et al. (2008) recommend project-based curriculum emphasizing technology as the most useful means of service, teacher participants concurred with *whatever* model could provide them with the necessary experience to confidently integrate technology into the classroom.

At the juncture where PD and CSE convene, Paraskeva et al. (2008) believed that the individual characteristics that comprise a teacher's personality--self-concept and self-esteem--are worth emphasizing. Sandy's example illustrates this emphasis between PD and self-efficacy: "*A 3-Day PD workshop can be ideally modeled with <u>you</u> embedded in the experience, with <u>you</u> actually practicing how <u>you</u> would integrate the technology with kids…That's one way to shift one's pedagogy.*" (S. Raznakov, personal interview, March 23, 2010)

The purpose of Paraskeva et al. (2008) study was to further investigate the relationship between General Self-Efficacy (GSE), self-esteem and CSE. In addition, Paraskeva et al. (2008) cited previous research showing how teachers' attitudes towards modern technologies considerably influenced the effective use of Educational Technology (ET). In this present body of research on DCT, the experience database of teacher participants clearly revealed divergent

attitudes toward technology. Moreover, without formal PD in place, notions of CSE were challenged by the unabated integration of DCT.

In the final analysis, the charge for making Technology Integration (TI) a more viable enterprise remains predicated on the self-efficacy beliefs of teachers, the compilation of self-image, self-perception, and self-esteem that support the overarching *self* in the developing professional (Palmer, 2007). For this sampling of teachers, the charge to effectively integrate technology into their practice corroborated a novel construct for PD: a model wherein the *self* in Computer Self-Efficacy is acknowledged.

Limitations of the Study

Given the recent arrival of Document Camera Technology (DCT) onto the educational scene, this study was limited by its relative presence in the field of educational research. With little evidence of its attendance in classrooms today, the width and breadth of its influence could not be longitudinally studied, documented or compared with the present study. Given these parameters, the purview of directed research was limited to one purposive sampling of six (6) teacher participants, all of who were from the same school site.

In addition, due to budgetary constraints, a common standard for Professional Development (PD) could not be considered as a constant variable in the integration of DCT. All participants were literally trained on the run by either themselves or empathetic colleagues. In other words, not all participants were provided with equivalent training in DCT, and therefore could not begin DCT integration equitably. Teachers also began using DCT at different periods of time. Therefore, DCT *usage* was considered a relative variable, as well. Furthermore, the scope of this study did not include observing teachers employ DCT, nor did it include observing

or interviewing students' reception of DCT. Finally, the study was unable to include the experience of any veteran teachers with an excess of 10-30 years in the profession of teaching.

Implications for Future Research

Given the limitations of this study, the implications for future research infer the need for greater constants in variables. Had a sampling of teachers been given equal footing in both accesses to DCT and training of DCT from the outset, the database of teacher experience would have likely been different. A battery of anecdotal evidence derived from such a scenario would probably yield a dissimilar set of themes, and thereby elicit an alternative thematic analysis of DCT integration.

Since the scope of the study did not include the direct observations of teachers employing DCT, future research would be wise to include a third person perspective to help account for DCT integration. Equally prudent to future research would be to observe and or interview the vested experiences of students, who remain 'guinea pigs' in the nascent deployment of DCT.

Unfortunately, it was beyond the control of the study to include 10-30 year veteran teachers. Through no fault of their own, DCT was unavailable to them during the course of this research project. However, it would be forthcoming for future research to include their experience of DCT, in light of their lengthy tenure with 'old-school' traditions and probable 'digital immigrant' status.

Overall Significance of the Study

Taken as a whole, the import of this study sought to address the seminal issue of pedagogy in the 21st century, as seen through the lens of a Document Camera (DC). This practitioner has been lead to believe that given the advent of Educational Technology (ET) and Computer Assisted Learning (CAL) modalities into the world of education, altogether they

remain an anomaly, as in the recent arrival of Document Camera Technology (DCT). Characteristic of the Information and Communication Technology (ICT) revolution, DCT arrived in a heated rush of anticipation. Its subsequent and speedy implementation deviated from the normative, standard overhead projector--leaving teachers to devise method out of novelty.

With further innovations in ICT certainly bound for the classroom, the import of this study sought to alert attention to the awesome task of Technology Integration (TI) and the current construct for Professional Development (PD) charged with meeting the Computer Self-Efficacy (CSE) of teachers. Such a feat bears the crux of uncharted territory and begs the question of whether or not today's teachers might be better off trained as ET software specialists.

By and large, the territory ahead positions teachers on the boundaries of a digital era in education. Both digital 'natives' and 'immigrants' have already embarked upon this journey (Prensky, 2001). To help elicit stories of this journey, a narrative design was purposefully employed in this study. The relative body of experience from the stories of teachers in this study is considered not only relevant, but also critical to future educational research. The choices teachers make to help navigate throughout this digital age speaks in confidence to their own and shared experience with CSE, the same experiential data that is needed more than ever for building PD constructs that work.

In summation, the significance of this study addresses one more expression of the Digital Divide (DD) phenomenon. Our current station in relation to the evolving continuum of Technology Integration (TI) juxtaposed to CSE, balances on the venture of big-screen-instruction. Seemingly, with the click of a mouse the paradigm for teacher pedagogy has shifted. The debut of big-screen-instruction has fascinated teacher and student alike, and for better or for worse has intervened into an otherwise meaningful relationship between teacher and student. In

due consideration of all the wonderfully positive attributes DCT has awarded us, the fact remains that the big-screen may be destined for mediating instruction throughout most of the day.

The "singularity" of this event should be cause enough for real concern, and certainly reason for future research to be conducted on the implications of big-screen-instruction (Prensky, 2001). Plainly, this shift in perspective has occurred without real counsel or bearing as to the probable course it portends for pedagogy on the cusp of a digital era. While we find respite in the narratives of teachers who upload our self-efficacy, our journey continues to be fraught with dire digital thirst. And so, our digital odyssey continues to unfold, sometimes by default with portents of prophetic pedagogical significance.

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