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Beliefs and Technology - Does One Lead to the Other? Evaluating the Effects of Teacher Self-Efficacy and School Collective Efficacy on Technology Use in the Classroom

Elaine Studnicki

BELIEFS AND TECHNOLOGY – DOES ONE LEAD TO THE OTHER? EVALUATING THE EFFECTS OF TEACHER SELF-EFFICACY AND SCHOOL COLLECTIVE EFFICACY ON TECHNOLOGY USE IN THE CLASSROOM

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BELIEFS AND TECHNOLOGY - DOES ONE LEAD TO THE OTHER?
EVALUATING THE EFFECTS OF SELF-EFFICACY AND SCHOOL COLLECTIVE EFFICACY ON TECHNOLOGY USE IN THE CLASSROOM

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ABSTRACT

BELIEFS AND TECHNOLOGY – DOES ONE LEAD TO THE OTHER?
EVALUATING THE EFFECTS OF TEACHER SELF-EFFICACY AND SCHOOL COLLECTIVE EFFICACY ON TECHNOLOGY USE IN THE CLASSROOM

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This exploratory mixed method study builds upon previous research to investigate the influence of teacher self- and collective efficacy on technology use in the classroom. This population was purposefully sampled to examine first- and second order technology barriers, instructional strategies, and human influences on technology. The quantitative finding was supported by qualitative analysis of the teacher interviews and led to the conclusion that even thought there were strong teacher tendencies towards a belief in using technology actual practice demonstrated a lack of productivity or transference of that belief into classroom practice. A high self- and collective efficacy had no effect on technology use in the classroom and a belief in technology did not lead to the use of technology.

The study explored three research questions: 1) what is the effect of teacher self-efficacy on technology use in the classroom, 2) what is the effect of collective efficacy on technology use in the classroom, and 3) what is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting? Thirty-five teachers in a New Jersey K-8 school district volunteered to take a 36-question survey. Three teachers were interviewed to corroborate the survey data.

This study is unique in the combined analysis of self- and collective efficacy and technology. It raises several questions for future study. Teacher responses overwhelmingly identified first order or extrinsic barriers as impediments to technology. These included poor technical support, access, time issues, and a lack of vision and training. These barriers are decades old and have been acknowledged for as long as technology has been in the classroom. Why, despite thirty years of technology in education, do the same barriers that existed in the very beginning continue to be strong deterrents of technology use?

Teachers identified administrators as the least influential on teacher practices. If this is so, how can there be such a high sense of collective efficacy? How much influence does the collective agency have on classroom teacher behavior? Specifically, at what point in a teacher's decision-making does the collective agency over-ride personal beliefs and what are the characteristics that contribute to this conflict and possible submissive behavior?

Finally, are we seeking answers to the wrong questions? Is it possible that teachers and educational systems are not able to modify intrinsic and standard operating practices to utilize technology successfully?

DEDICATION

To My David,
Let's Play!

And

To the Women in My Life,
You are Strong, Resourceful, and Resilient,
Smart, Generous, and Kind.

I love that about you!

Thank you for being an inspiration in my life.

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This degree hasn't been an 8-year program but one that has been going on for 35 years. In all of this time it has been my David, my daughter Jill, and my son John who, on a daily basis, have supported me and endured me too. I love you. Thank you.

I want to thank my mother Eleanor, sister Ellen, and brother Jay. You have always encouraged me and supported my endeavors. You are my cheerleaders. Your unconditional love is my foundation.

I sincerely thank my dissertation committee: David Carbonara, Debra Scigliano, and Debra Piecka. I appreciate your time, guidance, and patience. This has been the experience of a lifetime and I could not have completed it without you. Dr. Carbonara was especially available when I needed him. He was available in traffic on his way to work, in traffic on his way home from work, on a Florida beach at a wedding, in Florida at a conference, in his office at Duquesne, in the early morning in his home, at the car dealership and who knows where else. Thank you.

It has been a few years since my cohort has completed our studies. Yet I can still count on Michelle and Debbie to help me. They are my friends for life.

I would like to express my gratitude to the participants in the study. They didn't have to do it but did anyway. Their kindness and professionalism will be remembered.

I also want to send a special note to my friend Debbie. I could not have completed this process without you. She listened to me complain, freak out, and deflate. She knew when to email me with encouraging words and looked out for my best interests. She accepted me as I am. What more could a person ask? Thank you.

And who are the women? Eleanor, Ellen, Jill, Alice, Ida, Marilyn, Kate, Kim, Peggy, Monica, Michelle, Luise, Barb, Michele, Debbie, Denise, Kim, Caryl, Carol, Mona, Patricia, Betty, Peg, Jan, Elizabeth, Diana, Peg, Meredith, Liz, Gail, Diane, Marylou, Lois, Cindy, Pauline, Freida, Janet, Helen, Darlene, Diane, Joy, Carol, Anne, Demi, etc.

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CHAPTER I

INTRODUCTION

How do teachers decide to use technology in the classroom? Despite its presence in education for over two decades there is still a strong resistance by some teachers to use technology for instruction. How and why this happens has been researched and documented since the first Commodore computer in the classroom. Yet computers remain untouched in many schools. This project seeks to expand the research and understand the influence of teacher self-efficacy and a school's collective efficacy on technology use in the classroom.

Teachers' perceptions about their own capabilities to foster students' learning and engagement, has proved to be an important teacher characteristic often correlated with positive student and teacher outcomes (Shaughnessy, 2004). In an interview with Anita Woolfolk, professor in the College of Education at The Ohio State University and preeminent educational researcher, Shaughnessy (2004) quotes her as saying, "For my money, self-efficacy is the most useful self-schema for education because it relates to choices and actions that affect learning such as goal-setting, persistence, resilience, effort, and strategy."

Evidence suggests that teacher self-efficacy or belief systems influence school culture and also technology use in the classroom (Becker, 2000; Pajares, 1997; Ertmer, 2005; Bandura, 1997; Kagan, 1999; Cuban, 2002). The construct of "self-efficacy" for this study originates with Albert Bandura, as noted, "In Social Foundations of Thought and Action." Bandura wrote that individuals possess a self-system that enables them to exercise a measure of control over their thoughts, feelings, and actions (Pajares, 1996). It

is how individuals *interpret* the results of their performance attainments, which inform and alter their environment and their self-beliefs, which in turn informs and alters their subsequent performances (Pajares, 1996).

Researchers have reported that teachers' beliefs of personal efficacy affect their instructional activities and their orientation toward the educational process (Pajares, 2007). Pajares (2007) writes the following:

> Teachers with a low sense of efficacy tend to hold a custodial orientation that takes a pessimistic view of students' motivation, emphasizes rigid control of classroom behavior, and relies on extrinsic inducements and negative sanctions to get students to study (Woolfolk & Hoy, 1990; Woolfolk, Rosoff, & Hoy, 1990). Teachers with high efficacy create mastery experiences for their students whereas teachers with low instructional efficacy undermine student's cognitive development as well as students' judgments of their own capabilities (Gibson & Dembo, 1984; Cohn & Rossmiller, 1987). Teacher efficacy also predicts student achievement and students' achievement beliefs across various areas and levels (Ashton & Webb, 1986; Midgley, Feldlaufer, & Eccles, 1989) and helps us understand how these beliefs influence educational outcome variables such as instructional practices or students' beliefs and achievement.

Bandura (2000) believed that people are partly the products and producers of their environment. Additionally, the attainments of a school, as a group, are the products not only of shared knowledge and skills of its different members, but also of the interactive, coordinative, and synergistic dynamics of their transactions (Bandura, 2000). Given this, teacher self-efficacy and the collective efficacy and agency of a school culture is a critical part of the equation for change and for the successful use of technology in the classroom. One of the most compelling reasons for the recent development of interest in perceived collective efficacy is the probable link between collective efficacy beliefs and group goal attainment (Goddard, Hoy, & Hoy, 2004).

Just as individual teacher efficacy may partially explain the effect of teachers on student achievement, from an organizational perspective, collective teacher efficacy may help to explain the differential effect that schools have on student achievement (Goddard, Hoy, & Hoy, 2000). Collective teacher efficacy, therefore, has the potential to contribute to our understanding of how schools differ in the attainment of their most important objective, the education of students (Goddard, Hoy, & Hoy, 2000).

As Goddard, Hoy, and Hoy (2000) explain, if collective efficacy gains enhance organizational performance, reciprocal causality suggests that resulting performance improvements may, in turn, strengthen collective organizational efficacy. Thus, to the extent that collective teacher efficacy is positively associated with student achievement, there is good reason to lead schools in a direction that will systematically develop teacher efficacy; such efforts may indeed be rewarded with continuous growth in not only collective teacher efficacy but also student achievement (Goddard, Hoy, & Hoy, 2000). When people act on their beliefs, they are manifesting their sense of human agency.

Human agency describes the ways that people exercise some level of control over their own lives (Goddard, Hoy, & Hoy, 2004; Sweetland & Smith, 2002). The term *agency* can be used to describe individual as well as collective actions. Collective agency or personal agency operates within a broad network of socio-structural influences (Bandura, 1997). Additionally, human agency is critical to our understanding of group functioning (Goddard, Hoy, & Hoy, 2004). A most fundamental assumption of social cognitive theory involves the choices that individuals and collectives make through the exercise of agency. A robust sense of group capability establishes a strong press for collective performance (Goddard, Hoy, & Hoy, 2004). According to social cognitive theory, the choices that individuals and organizations (through the actions of individuals) make are influenced by the strength of their efficacy beliefs (Goddard, Hoy, & Hoy, 2004). Because *agency* refers to the intentional pursuit of a course of action, we may begin to understand school organizations as agentive when we consider that schools act purposefully in pursuit of their educational goals (Goddard, Hoy, & Hoy, 2000). The organizational intentionality of schools reflects their agency, their purposeful action to achieve goals. This is true for both positive and negative conditions and environments.

Our nation's schools are infused with technology. What causes teachers to use technology to the extent that they do, however, may involve their attitudes toward the barriers inherent in the traditional deployment of school technologies.

Barriers can include personal fears, technical and logistical issues, and organizational and pedagogical concerns (Ertmer, 1999). Although teachers may not face all of these barriers, the literature suggests that any one of them alone can significantly impede meaningful classroom use (Hadley & Sheingold, 1993; Hannafin &

Savenye, 1993; Hativa & Lesgold, 1996, as cited in Ertmer, 1999). Such barriers can reflect school culture, support or degrade a teacher's self-efficacy, and ultimately determine the teacher's ability to use technology in the classroom. Technology helps prepare students for the "real world" and addresses current skill development. It offers an increasingly valuable tool for research and curriculum activities, and autonomous learning opportunities abound when both teachers and students have access to it. Additionally, nearly every textbook has a compendium of online curricula to enhance the educational opportunities of all students.

Therefore, the purpose of this study is to discuss, illuminate, and explore the role of three educational constructs: teacher self-efficacy, the collective efficacy of the school, and their influence on classroom technology use.

Statement of the Problem

Is there a synergy between a teacher's self-efficacy, the collective efficacy, and technology? Lee Shulman (2002) said, "There are times when action is absolutely necessary in order to figure out what's going on, rather than waiting to figure out what's going on in order to act." This statement epitomizes the current state of technology use in the classroom. Because of technology's innate ability to bring the world into the classroom, its uncompromising learning curve, and its capacity to realistically create disturbance, teachers are presented with decisions concerning its practice. Despite the enormous amount of money invested in educational technology, its use in the classroom continues to be limited (Albion & Ertmer, 2002; Cuban, 2001).

The importance of beliefs for understanding human behavior is well researched. Pajares (1992) states that "Beliefs are the best indicators of the decisions individuals

make throughout their lives," (p. 307) and notes the strong relationships among teachers' beliefs and their planning, instructional decisions, and classroom practices. Pajares (1992) also articulates the view that beliefs are "far more influential than knowledge in determining how individuals organize and define tasks and problems and are stronger predictors of behavior" (p. 311).

In their research, Albion and Ertmer (2002) cite a Marcinkiewicz (1994) study that reports the only variable found to be a significant predictor of teachers' computer use was "subjective norms;" that is, "expectations of computer use from among teachers' significant others— principals, colleagues, students, and the profession" (Marcinkiewicz, 1994, p. 522). They also cite a study by Lumpe and Chambers (2001) that found teachers' reported use of technology- related engaged learning practices was influenced by their self-efficacy for teaching with computers and their context beliefs about factors that would enable them to be effective teachers and the likelihood of those factors occurring in their schools.

Windschitl and Sahl's study (2002, p. 165) points to the importance of the school environment as an influence. Teachers who learned to integrate technology were "powerfully mediated by their interrelated belief systems about learners in schools, about what constituted 'good teaching' in the context of the institutional culture, and about the role of technology in students' lives" (as cited in Albion & Ertmer, 2002). Kitchenham (2009) found that the school culture appeared to affect the degree of transformation and the readiness for technology adoption.

To date, most of the research on educational technology integration has focused on individual components such as school barriers, pre-service training, staff development,

or time and access (Cuban, 2001; Ertmer, 1999). Tschannen-Moran et al. (1998) noted in their review that qualitative teacher efficacy research was "overwhelmingly neglected" and that case study and qualitative approaches would serve to deepen understanding of how teacher efficacy beliefs operate (as cited in Klassen, Tze, Betts, & Gordon, 2010). Researchers also suggest that additional study is needed to better understand the relationship and influence that teacher self-efficacy and schools' collective agency have on technology use in the classroom (Albion & Ertmer, 2002; Hoy, Sweetland, & Smith, 2002; Kitchenham, 2009).

This dissertation will contribute to existing research by exploring the relationships between teacher self-efficacy, the school collective efficacy, and the use of technology in the classroom. While each teacher plays a powerful role in education, the systemic use of technology in a school reaches beyond one person and is measured by the cooperation and work of many people. This dissertation will also explore the extent to which teachers and staff influence each other to use technology and whether external barriers are the primary reason for excluding technology in lesson plans.

A mixed methods approach will enhance the project by extracting both quantitative and qualitative data, allowing for a more balanced, pragmatic perspective of the research hypothesis. The quantitative data provides a general synopsis of the research problem, i.e., to what extent does teacher efficacy and the collective efficacy of schools influence classroom technology use, while the qualitative data and its analysis will refine and explain the statistical results by exploring participants' views in more depth (Creswell, 2002; Tashakkori & Teddlie, 1998), as well as a gauge of the teachers' forthrightness in the quantitative data (Creswell, 2007).

Purpose of the Research

This study will investigate whether teachers' self-efficacy and/or collective efficacy has a significant effect on technology use in the classroom and the technological barriers that teachers face on a daily basis in the school environment. The data in Phase I, dealing with teacher self-efficacy, the school collective efficacy, and technology usage, will be obtained by quantitative surveying of a school(s) population, and then followed up, in Phase II, with two to six randomly selected individuals to explore these results in more depth by semi-structured interviews.

In Phase I, the quantitative phase, a thirty-six question survey will measure teacher self-efficacy, collective efficacy, and technology use and barriers. The teacher self-efficacy survey will measure a teacher's self-efficacy in terms of student engagement, instructional design, and classroom management. The second survey will collect data concerning the staff's collective efficacy, or the shared perceptions of teachers in a school that the efforts of the faculty as a whole have positive effects on students. The technology survey will use expert questions to elicit technology usage, human influences, barriers, and instructional style information.

In Phase II, the qualitative research will consist of two to six teacher interviews per school, randomly selected from volunteers and across the technology use spectrum by the principal. Interview questions will address barriers in the classroom, collective agency, outstanding survey data from Phase I, and other unobtrusive data. All interviews will use audiotapes to create a transcript for evaluation.

Research Questions

H1: What is the effect of teacher self-efficacy on technology use in the

classroom?

H2: What is the effect of collective efficacy on technology use in the classroom?

H3: What is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting?

Significance of Study

By identifying the influence of teacher self-efficacy on classroom technology, this study will be able to provide schools with staff development options to enhance technology use. Zhao (2003) states, "It is more likely that teachers are socialized by other teachers to change their beliefs regarding the value of computer technology." This study's data will show the influence teachers have on each other's teaching practices using technology in a K–12 school setting. It will identify the relationship between the collective efficacy and agency of the school on teachers' classroom practices and inform us of how technology barriers influence teacher technology plans and usage. Hence, the study will provide a systemic perspective and a possible guideline for schools to use to understand how their organization influences technology practices in the classroom.

Definition of Terms

Agency -The intentional pursuit of a course of action (Goddard, Hoy & Hoy 2000).

Collective efficacy - A group's shared belief in its conjoint capabilities to organize and execute the course of action required to produce given levels of attainments (Bandura, 1998).

Classroom technology - Technology tools used for learning and instruction.

Human agency - The capability of humans to exercise intentionality by exerting

control over their thoughts, their behaviors, and their external environments.

Self-efficacy -The beliefs in one's capabilities to organize and execute the course of action required to produce given attainments. (Bandura, 1997)

Social cognitive theory -The set of interrelated concepts, principles, and generalities that explain reciprocal causation among human behavior, internal personal states, and the external environment, and which postulates self-efficacy as a common mechanism of behavioral change. (Goddard, 1998)

Teacher efficacy - The extent to which teachers believe their efforts will have a positive effect on student achievement (Ross, 1994, as cited in Goddard, 1998)

CHAPTER II

LITERATURE REVIEW

This literature review describes self-efficacy, efficacy sources, collective efficacy, change concepts, and classroom technology. Because social cognitive theory forms the basis for both self- and collective efficacy these concepts are reviewed first. Next, conceptual change principles and involvement in education, and lastly, technology use in the classroom and its role in current educational settings are discussed. The concept of agency is included, as it naturally and constructively contributes to the discussion. Finally, the chapter concludes with a rationale for the research hypotheses introduced earlier.

Self-Efficacy

Every day teachers make dozens of decisions that impact student learning and influence student perceptions of their world. The responsibility is enormous, and yet how these decisions are made receives little attention in the K-12 setting. Often teachers make the same decisions that have been made over time, even decades before, despite the years of research describing how their beliefs impact what happens in the classroom and school (Bandura, 1997; Ertmer, 2005; Guskey, 1986; Kagan, 1992; Pajares, 1992). Individuals' beliefs strongly affect behavior (Pajares, 1992), but its nuances may confuse readers and make it a difficult concept to translate into an educational setting. This translation becomes even more complicated because of the personal nature of beliefs. Kagan (1999) suggests that the teacher may even be unaware of her own beliefs. Self-efficacy is the belief in one's capability to organize and execute the courses of action required to produce given attainments (Bandura, 1977). It influences thought patterns and emotions

that enable actions in which people expend substantial effort in pursuit of goals, persist in the face of adversity, rebound from temporary setbacks, and exercise some control over events that affect their lives. Self-efficacy is a future-oriented belief about the level of competence a person expects he or she will display in a given situation (Tschannen-Moran, Hoy, & Hoy, 1998). It is the filter that teachers use for determining how to deploy technology in the classroom, as well as for all of the other experiences in the classroom. As such, it becomes a powerful theory to understand and utilize in education, because it will be those experiences, fostered by a strong or weak teacher self-efficacy, from which students learn every day. Understanding self-efficacy, and how it is developed and maintained, is important for identifying how, what, and why teachers use any resources in their classroom successfully.

Albert Bandura developed the Social Contract Theory (SCT) from Rotter's (1966) social learning theory, which received increased interest when the Rand Corporation included two efficacy items in their questionnaire. They were used to determine internal and external relationships to what they called teacher efficacy. Is it the environment that determines a teacher's ability to have an impact on student learning (external), or is it within a teacher's control to teach difficult or unmotivated students (internal)? They found teacher efficacy to be a strong indicator of student performance, and the study ignited the flame for teacher efficacy research, as well as the ongoing study for stronger and reliable measurements. Several other studies followed the Rand/Rotter tradition and built on it to develop and evaluate additional teacher behaviors that the Rand study did not include. They found that teachers with high efficacy, a strong internal confidence in their ability, had less stress, used a cooperative student work format, accepted

responsibility for student performance, and were willing to implement innovations (Tschannen-Moran et al., 1998). In 1977, Bandura identified teacher efficacy as a type of self-efficacy. His SCT purports that it is first a person's beliefs about his or her abilities and the outcome of his or her actions that actually drives a person's actions (Pajares, 1996). Self-efficacy is a maturing concept as it enters its third decade of growth (Tschannen-Moran et al., 1998), and is the focus of this study.

However, there are significant differences between SCT and Rotter's Theory. Rotter's theory succeeded in creating a movement to evaluate teacher influence in learning, and did this based on internal and external factors. Bandura's self-efficacy and other expectancy beliefs have in common that they are beliefs about one's perceived capability. They differ in that self-efficacy is defined in terms of individuals' perceived capabilities to attain designated types of performances and to achieve specific results (Pajares, 2007). Self-efficacy beliefs are also bound to contextual matters. This point is critical, because it allows for environmental and subjective conditions to factor into and constitute part of the belief equation. They are also more task and situation specific, allowing judgments to be in reference to a particular goal (Bandura, 1986). People regulate their level and distribution of effort in accordance with the effects they expect their actions to have. As a result, their behavior is better predicted from their beliefs than from the actual consequences of their actions (Bandura, 1986).

In the last thirty years there has been much progress in defining efficacy, but it can still be considered a messy construct, as Pajares (1992) suggests. There is a lot of confusion, not only in the labels used but also in their definitions (Ertmer, 2005). For example, many researchers delineate between different belief concepts, such as content or

domain specific beliefs, knowledge, and cognition. Belief research also raises additional questions; such as do beliefs differ from knowledge? Calderhead (1996), as stated in Ertmer (2005), delineates between the two by suggesting that beliefs generally refer to "suppositions, commitments, and ideologies," and knowledge refers to "factual propositions and understanding (p. 307)." Knowledge and beliefs are inextricably intertwined, but the potent affective, evaluative, and episodic nature of beliefs makes them a filter through which new phenomena are interpreted (Abelson, 1979; Calderhead & Robson, 1991; Eraut, 1985; Goodman, 1988; Nespor, 1987; Nisbett & Ross, 1980; Posner et al., 1982; Schommer, as cited in Pajares, 1992). Kagan (1992) situates a teacher's knowledge in three important ways: a) context, b) content, and c) in person, or, in other words, how knowledge is related to specific groups of students, the material being taught, and a teacher's unique belief system. Knowledge becomes important in SCT because of its cognitive attributes, as well as the ability to bring theory into the K-12 setting.

The use of awareness and reflection to understand how teacher actions translate from beliefs is important too. For example, teachers may have very different reasons for following similar practices. Ertmer (2005) identifies the common use of spreadsheets for student record keeping. Some teachers create spreadsheets and use them successfully, but don't believe that they are very helpful. This distinction between the attainment of knowledge and what one believes is another nuance in understanding teacher action. Knowledge may encourage one to use technology but a belief that a particular action is the right thing to do opens the door to new experiences and second-order change. Beliefs

are stronger predictors of behavior (Ertmer, 2005), and understanding them can help us understand how teachers are using technology.

Striving for control over life circumstances permeates almost everything people do throughout their lives (Bandura, 1997). People may often make judgments based on prior actions, but Bandura suggests that knowledge, skill, and prior attainments are often poor indicators of outcomes. According to Bandura, how people behave can often be better predicted by the beliefs they hold about their capabilities, or self-efficacy beliefs, than by what they are actually capable of accomplishing, because these self-perceptions help determine what individuals do with the knowledge and skills they have. Having control over one's life is pivotal for decision-making, and for personal characteristics such as resiliency and perseverance as well. Self-efficacy beliefs help determine this control and how much effort is put into an activity. The higher the self-efficacy, the greater resiliency, perseverance, and effort will be. These traits become critical when teachers engage in learning anything new in the classroom, including instructional strategies or the use of technology. Teachers have learning curves too, and it usually takes time and some frustration to learn a new skill or theory. Perseverance, effort, and resiliency become critical for staying the course and implementing it in the classroom. They are the hallmark of someone with a high sense of self-efficacy. Pajares (2007) suggests that beliefs become the internal rules individuals follow as they determine the effort, persistence, and perseverance required to achieve optimally as well as the strategies they will use.

The power of efficacy beliefs also influences individuals' thought patterns and emotional reactions (Pajares, 1996). A person's belief in his or her ability to succeed in a

certain situation will have a major influence on success or failure. As Bandura (1997) points out, a high level of self-efficacy does not necessarily mean success, but a low self-efficacy level will surely mean failure. In understanding classroom dynamics, activities, and personal interactions, the influence of a teacher's beliefs has a great impact on students' learning environment.

Agency refers to acts done intentionally (Bandura, 1997). But most human behavior is determined by many interacting factors, with people being contributors and not sole determiners of what happens to them (Bandura, 1997). Human action, or agency, is layered with multiple sources of events that Bandura (1986a) terms triadic reciprocal causation. In his reciprocal determinism theory, he puts forth three interacting bidirectional classes of determinants to illustrate how human agency works. The three determinants are (a) personal factors in the form of cognition, affect, and biological events, (b) behavior, and (c) environmental influences that create interactions that determine actions. These do not work in unison; it takes time for the causal factor to insert its influence. They demonstrate the relationship between behavior, our environment, and our self, as shown in Figure 1.

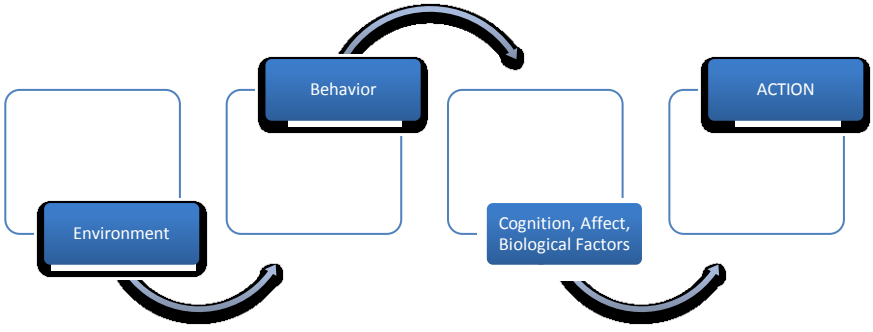

Figure 1: Elements of Action

Additionally, being products and producers of our own environments highlights the interactivity of the triad and allows for social influences to be recognized as shaping the beliefs of the individual (Bandura, 1986; Pajares, 1996). The sequence for interpretation of beliefs highlights the role of cognition in the process. The role of actual events is not the dependent factor. It is the cognitive processing concerning the *capability* rather than the performance per se (Bandura, 1997). This is often seen in interviews of sport legends. They will often diagnose their performance based on their perception of their capability. For example, the following is part of an interview between Golf Digest and Phil Mickleson.

> **GD:** You hired Tiger's former coach, Butch Harmon, a couple years ago. How is that working out?
>
> **PM:** I don't believe you've seen the full benefits of my working with Butch yet. The numbers don't indicate the progress I feel, but I feel it happening. My misses are smaller; I'm closer to hitting more fairways (Verdi, 2009).

Efficacy beliefs are created when individuals weigh and interpret their performance relative to other information (Goddard, Hoy, & Hoy, 2004).

Gusky (1987) suggests that a growing number of educational researchers have identified teachers' perceived sense of efficacy in teaching and learning situations as a powerful variable in studies of instructional effectiveness. Pajares (1992) cited research to suggest that teachers' beliefs guide the decisions teachers make and actions they take in the classroom (Cuban, 2002; Fullan, 2001, 2003; Guskey, 2002; Ringstaff & Kelley, 2002; Sandholtz, Ringstaff, & Dwyer, 1997). Pajares goes on to say that, "Any inquiry into teachers' practices should involve a concurrent investigation into teachers'

educational beliefs, as beliefs profoundly influence teacher perceptions and judgments, which in turn influence their classroom behavior" (Pajares, 1992, p. 317).

Bandura (1986, 1997) postulates four sources of efficacy-shaping information: mastery experience, vicarious experience, social persuasion, and affective state (Goddard et al., 2004). Each one of the sources makes an influential contribution to efficacy.

A mastery experience is the most powerful source of efficacy information. In this, individuals gauge the effects of their actions, and their interpretations of these effects help create their efficacy beliefs. Outcomes interpreted as successful raise self-efficacy; those interpreted as failures lower it (Pajares, 2007). Bandura (1986) emphasizes that one's mastery experiences are the most influential source of self-efficacy information and have important implications for the self-enhancement model of academic achievement. It contends that, to increase student achievement in school, educational efforts should focus on altering students' beliefs of their self-worth or competence. Educators usually try to accomplish this through programs that emphasize enhancing self-beliefs through verbal persuasion methods (Pajares, 2007), as opposed to offering authentic learning experiences.

But teachers are also role models, watched carefully by students. Vicarious experiences are those effects produced by watching the actions of others. This source of information is weaker than the interpreted results of mastery experiences; however when people are uncertain about their own abilities or have limited prior experience, they become more sensitive to it (Pajares, 2007). Part of one's vicarious experience also involves the social comparisons made with other individuals (Pajares, 2007). Pajares

references Schunk (1983a), who suggests that these comparisons, along with peer modeling, can be powerful influences on developing self-perceptions of competence.

Social Persuasion or verbal persuasions also help individuals create and develop self-efficacy beliefs as a result of the feedback they receive from others. These persuasions involve exposure to the verbal judgments that others provide, and are a weaker source of efficacy information than mastery or vicarious experiences, but persuaders can play an important part in the development of an individual's self-beliefs (Zeldin & Pajares, as cited in Pajares, 2007). For example, teachers will often praise student performance, thus offering the student a moment of success and positive reinforcement. Unfortunately the opposite is also true, and students will feel less worthy and sometimes failures based on the opinions and comments of others.

Finally, affective or physiological states such as anxiety, stress, arousal, fatigue, and mood states also provide information about efficacy beliefs. Because individuals have the capability to alter their own thinking, self-efficacy beliefs, in turn, also powerfully influence their physiological states. Bandura (1997) has observed that people live with psychic environments that are primarily of their own making. It is important to restate that these sources of efficacy information are not directly translated into judgments of competence. Individuals interpret the results of events, and these interpretations provide the information.

The School as a Collective Agency

The interaction of independent contexts that influence individual learning with groups and communities of learners describes the concept of social learning. It is the interaction of teachers and students within the environment that creates a causal

relationship for learning, instruction, and culture. Theorists generally agree that beliefs are created through a process of enculturation and social construction (Pajares, 1992), more specifically; it is the teachers' beliefs about the conjoint capability of a school faculty (Goddard et al., 2004). Bandura (2000) identifies these perspectives as the collective agency:

> People's shared beliefs in their collective efficacy influence the types of futures they seek to achieve through collective actions, how well they use their resources, how much effort they put into the group endeavor, their staying power when collective efforts fail to produce quick results or meet forcible opposition, and their vulnerability to the discouragement that can beset people taking on tough social problems. (p. 76)

Kagan (1992) suggests that teacher beliefs appear to be instrumental in determining the quality of interaction among teachers in a given school. Ertmer and Ottenbreit-Leftwich (2009) continue with this direction when they state, "teachers' knowledge and beliefs appear to interact with the existing culture to create action" (p. 9). Pajares (1992) research indicates that individuals develop belief systems that house all the beliefs acquired through the process of cultural transmission (Abelson, 1979; Brown & Cooney, 1982; Eisenhart et al., 1988; Nisbett & Ross, 1980; Peterman, 1991; Posner et al., 1982; Rokeach, 1968; Van Fleet, as cited in Pajares, 1992).

Bandura (1977) suggests that teachers with a high sense of collective efficacy have high expectations for student achievement. They view all their students as capable, and provide learning activities that are structured and implemented in ways to ensure student mastery. Teachers take responsibility for their students' learning, and do not use

excuses such as low academic ability or difficult family backgrounds as reasons for students' inability to learn. When students fall behind in an academic area, strategies are developed to accelerate students' learning so that they can be successful in the regular instructional program, rather than being permanently segregated from the rest of their peers (Bandura, 1997).

In an article published in *American Psychological Science*, Bandura (2000) suggests that people are partly the products of their environment, and are producers of it as well. He is not alone in his ideas. Sewell (1986) also suggests in his paper, *The Theory of Structure*, and in the review of Giddens's Structural Theory within it, that agents reproduce cultures and social institutions. The same agents can also alter them. For example, Goddard et al. (2004) write:

> When individuals and collectives choose to work in pursuit of certain attainments, their actions reflect the exercise of agency. Because agency refers to the intentional pursuit of a course of action, we see school organizations as agentive when they act purposefully in pursuit of educational goals. For example, one school may work to close achievement gaps by race while another acts to increase the quality of teacher professional development. When such differences are purposeful, they reflect the exercise of organizational agency. (p. 5)

Of course, organizational agency results from the agentive actions of individuals directed at the attainment of desired goals (Goddard et al., 2004). Individuals create consequences that others are going to react to in their own way, whether these are positive or negative. Ultimately, the exercise of agency, or action, depends upon how individuals and groups interpret efficacy beliefs shaping information and experiences (Goddard et al., 2004). In

other words, it depends on how they interpret their environment, their interactions and interpretations of it, and also how others perceive them. Schools are social institutions.

For schools, perceived collective efficacy refers to the judgment of teachers that the faculty as a whole can organize and execute the courses of action required to have a positive effect on students (Goddard et al., 2004). Bandura's (1997) social cognitive theory acknowledges that "personal agency operates within a broad network of socio-structural influences" and, thus, the theory "extends the analysis of mechanisms of human agency to the exercise of collective agency," and people's combined beliefs that they can work together to produce desired effects (as cited in Goddard et al., 2004, p. 5).

When groups believe themselves capable of reaching specific attainments, they are more likely to approach those goals with the creativity, effort, and persistence required to attain success (Goddard & Skrla, 2006). Thus, the exercise of agency is strongly influenced by the strength of collective efficacy beliefs (Goddard & Skrla, 2006). A fundamental assumption of social cognitive theory involves the choices that individuals and collective groups make through the exercise of agency (Goddard et al., 2004). When extended to the group level, agency is reflected in the collective pursuit of specific attainments or courses of action, and just as individuals react to stress, so do organizations. For example, the response to poor state standard test results can characterize the level of school efficacy and determine how it responds to the situation. Organizations with strong beliefs in the group capability can tolerate pressure and crises and continue to function without debilitating consequences; indeed, such organizations learn to rise to the challenge when confronted with disruptive forces. Less efficacious organizations, however, are more likely to react in dysfunctional way, which, in turn,

increases the likelihood of failure. Thus, affective states may influence how organizations interpret and react to the myriad challenges they face (Goddard et al., 2004). Lee and Smith (1997) focused on teachers' sense of collective efficacy and how this belief increased their feelings of responsibility for student learning, classroom management, staff cooperation, and school working conditions. Their research revealed that student achievement gains were significantly higher when teachers assumed collective responsibility for students' academic success as well as for student failure. Student achievement improved with cooperation between staff. Goddard, Hoy and Hoy (2000) also focused more directly on collective teacher efficacy. They stated, "Just as individual teacher efficacy may partially explain the effect of teachers on student achievement from an organizational perspective, collective teacher efficacy may help to explain the differential effect that schools have on student achievement" (p. 8). Collective efficacy has the potential to contribute to how schools differ in achieving their goal to educate all students. Schools with staff members demonstrating a high sense of collective efficacy judge themselves capable of teaching all students, and provide a positive school atmosphere for all students.

Understanding what influences a teacher's practice can be instrumental in shaping training opportunities and understanding school cultures. Efficacy beliefs are a corner stone to collective agency. Bandura (2000) states;

> What people believe influences whether they think erratically or strategically, optimistically or pessimistically, what courses of action they choose to pursue; the goals they set for themselves and their commitment to them, how much effort they put forth in given endeavors; the outcomes they expect their efforts to

> produce; how long they persevere in the face of obstacles; their resilience to adversity; how much stress and depression they experience in coping with taxing environmental demands; and the accomplishments they realize (p. 75).

The individual is critical to the whole organization, but as Bandura points out, the sum of an organization is greater than the sum of its individual parts.

A group's attainments are the product not only of the shared knowledge and skills of its different members, but also of the interactive, coordinative, and synergistic dynamics of their transactions (Bandura, 2000). We have seen this time and again in education, especially with regard to technology. Grade level teachers or those teaching the same subject share experiences, align curricula, and practice with technology to integrate it into student learning and instruction.

In cases where teachers do not have direct control over social conditions and institutional practices, people will turn to proxy agency (Bandura, 2000). In this way they will get others to act on their behalf, and often this will also allow them to sidestep the hard work and responsibilities related to decisions. An environment that fosters these types of conditions will unfortunately encourage proxy agencies, and in itself, sidestep the responsibilities needed to help teachers move forward. Brodie (as cited in Ertmer, 2009) suggests that when people get immersed in a culture with strong memes, it tends to be a sink-or-swim proposition. Either you change your mind, succumbing to peer pressure and adopting the new memes as your own, or you struggle with the extremely uncomfortable feeling of being surrounded by people who think you are crazy or inadequate.

Research by both Ponticell, (2003) and Roehrig et al., (2007) indicates that the pressures to conform easily overpower innovative teachers. Maintaining membership in a group is important to people in general, and may be even more important to teachers, given the particularly strong cultures that exist within schools (Ponticell, 2003; Roehrig et al., 2007; Somekh, as cited in Etmer, 2009). Zhao and Frank (2003) noted that a technology innovation was less likely to be adopted if it deviated too greatly from the existing values, beliefs, and practices of the teachers and administrators in the school.

The collective efficacy of a school has a great influence on the success of both students and teachers. When collective efficacy is high, a strong focus on academic pursuits not only directs the behavior of teachers and helps them persist, but also reinforces a pattern of shared beliefs held by other teachers and students (Hoy, Sweetland, & Smith, 2002). Hoy, Sweetland, and Smith (2002) reiterate the research that collective efficacy builds greater teacher effort, supports challenging goals, and enhances teachers' abilities to overcome temporary setbacks (Bandura, 1986, 1993, 1997; Tschannen-Moran et al., 1998), and suggest in their research model that it is the collective efficacy of a school that may be the significant variable in influencing school achievement. They also state some of the relationships are reciprocal; for example, collective efficacy promotes higher school achievement, but higher school achievement also produces greater collective efficacy (Hoy et al., 2002). School norms that support academic achievement and norms of collective efficacy are particularly important in motivating teachers and students to achieve; and when the collective efficacy is strong the academic press, or the ability of the staff to work together to achieve high academic goals and achievements, is stronger (Hoy et al., 2002). This academic press includes,

among other valued educational objectives, the ability to use technology across the curriculum for learning and instruction.

The key ingredient to a collective agency is the shared beliefs of people in their collective power to produce a desired result (Bandura, 2000). Schools, as collective agencies, are the consequential example. The collective agency can determine the staff's ability to use resources successfully or otherwise, and to work together to produce a positive successful environment for student learning. The idea that teacher beliefs are heavily influenced by the subject and school culture (Ertmer, 2009) should not be understated. In the past two decades technology has created new opportunity, new tools, and a new interdependence that has never been as prevalent in our global society or schools, particularly in learning. It has changed the scope and magnitude of the influence that one person can have on the collective, albeit globally or within a school itself, and also underscores the need for shared beliefs, social learning, and supportive environments in schools.

Goddard et al. (2004) suggest that affective states, for example, may be less germane, or at least less well understood, as explanations for how collective efficacy perceptions form and change, but collectively, they influence a group's ability to perform and can alter the academic press of schools, despite the use of norms and standards. Bandura's four sources of efficacy-shaping information: mastery experience, vicarious experience, social persuasion, and affective state are critical for individuals, but they are also important to the development of collective efficacy beliefs. These four sources of efficacy experiences shape information for the group and highlight how low or high levels of efficacy are accomplished.

The Influence of Change

Understanding what influences classroom actions, especially with regard to technology integration, is complicated. Cuban, (2002); Fullan, (2001, 2003); Guskey, (2002); Ringstaff and Kelley, (2002); and Sandholtz et al., (1997) support the concept that teachers' beliefs guide the decisions teachers make and actions they take in the classroom. But change in the classroom can happen on many different levels and adjust current practices without changing beliefs (Ertmer, 2005). Teachers simply mold new activities around existing practices. Changing fundamental beliefs requires a new way of doing and seeing things (Ertmer, 2005). This requires the teacher to internalize new behaviors and engage in different practices.

Seeing and doing things in a new way is not always easy. It brings into play the concept of change, and change is hard. It can reveal teacher classroom processes, as well as a teacher's depth of self-efficacy. Levels of change, commonly known as first- and second-order change, enable the identification of classroom habits and practices and encourage reflection (Ertmer, 2005). For example, low-level or first order change uses of technology are generally associated with teacher-centered practices, and high level or second order change tends to be associated with student-centered, or constructivist, practices (Becker, 1994; Becker & Riel, as cited in Ertmer, 2005).

In a world where immediate response is becoming more necessary to meet the needs of people, Michael Fullen (1991) reminds us that change is a process and not an event. Pajares (1992) suggests that if and when conceptual change takes place, newly acquired beliefs must be tested and found effective, or they risk being discarded. He refers to the Guskey (1986) findings that staff development programs are usually

unsuccessful in bringing about attitude and belief change, but when teachers can be talked into using a procedure and find it successful in improving student achievement; tremendous attitude change often is reported. This change, however, does not materialize when teachers do not use the technique or, more importantly, when they do use it but notice no improvement in their students.

The influence of taking action or the practice of a new concept prior to believing led Guskey (1986) to conclude that change in beliefs follows, rather than precedes, change in behavior. Still, because beliefs may be strongly influenced by early experiences (Pajares, 1992) they become highly resistant to change. They are not only hard to change, but new experiences are also molded around them. Pajares (1992) states it succinctly when he says, "there is the self-fulfilling prophecy - beliefs influence perceptions that influence behaviors that are consistent with, and that reinforce, the original beliefs" (p. 317).

Research may add light to the reason why change is so difficult and takes so long to occur in the educational setting. Kagan (1994) suggests that teachers' beliefs appear to be relatively stable and resistant to change, and also tend to be associated with a congruent style of teaching that is often evident across different classes and grade levels.

How teachers change their beliefs is important to consider during any new initiative, but most important with technology. Even in the face of contradictory evidence, such as reason, time, or experience, change is difficult (Pajares, 1992). Schools are settings steeped in tradition, standards, and an environment that has, for centuries, enabled individuals to control classrooms based on their personal beliefs and capabilities. Research indicates that the earlier a belief is incorporated into the belief structure, the

more difficult it is to alter. It is the newly acquired beliefs that are most vulnerable to change (Abelson, 1979; Clark, 1988; Lewis, 1990; Munby, 1982; Nespor, 1987; Nisbett & Ross, 1980; Posner et al., 1982; Rokeach, as cited in Pajares, 1992). Pajares (1992) goes further and suggests that belief changes during adulthood are a relatively rare phenomenon, the most common cause being a conversion from one authority to another or a gestalt shift. Individuals tend to hold on to beliefs based on incorrect or incomplete knowledge, even after scientifically correct explanations are presented to them (Pajares, 1992). According to Pajares (1992), beliefs about teaching are well established by the time a student goes to college. This essentially means that teacher beliefs about teaching are formed early, are difficult to change, and may not be based on rationality or the latest educational research. Lortie discusses how teachers learned to teach. She writes, "Teachers are thus said to have learned about teaching while they themselves were students" (Lortie, as cited in Nespor, 1987). Lanier (1984) also stresses that teachers acquire many of their practices in the course of teaching. If Lortie is correct, it seems entirely understandable why teachers resist technology; they have no experiences to build upon and no beliefs to measure against which may lead to understanding its value.

The theory of conceptual change is a useful tool to improve our understanding of how learners learn and bring their prior knowledge and experience to address new thought or explain existing phenomena. Jonassen (2006) describes concepts as mental representations of categories of objects, events, or other entities. Concepts are the basis for meaning making and communication, as well as the processes for conceptual change. They are used to build new concepts, much like building blocks from which we construct new, more complex concepts (Jonassen, 2006). Given this, it would seem that asking

teachers to use technology without time to process and inform their own cognitive awareness is akin to building a house on a faulty foundation. The new actions are temporary, and teachers may eventually return to their original and more comfortable states of prior knowledge.

Conceptual change occurs when learners change their understanding of the concepts they use and how they are organized within a conceptual framework (Jonassen, 2006). The process of conceptual change has many theories, ranging from a gentle Piagetian accommodation and synthesis model to what Peirce (Hildebrant, 1996) would suggest as pure genuine doubt; an uncomfortable state in which a person's beliefs are seriously challenged and where he or she reaches a point and recognizes the need for change. However, as we know cognitive conflict is not always sufficient for engaging conceptual change (Jonassen, 2006).

Based on constructivist principles conceptual change is more than acquiring new knowledge. Conceptual change is the replacement or reinterpretation of prior concepts that provide new perspectives for investigating and observing the world around us. This takes time to process and is often uncomfortable. If new concepts, like technology, are thrust on teachers, this may adversely affect their self-efficacy. It may also explain resistance to classroom technology integration.

Classroom Technology Use

Why do or don't teachers use technology? In hindsight, it was always assumed if teachers were given the equipment and support they would naturally integrate technology (Yan & Zhao, 2006). But this assumption has been seriously questioned by recent findings (Cuban, Kirkpatrick, & Peck, 2001; Russell, Bebell, O'Dwyer, & O'Connor,

2003; Solomon & Wiederhorn, 2000; Zhao & Frank, as cited in Yan & Zhao, 2006). Yan and Zhao (2006) suggest that technology adoption lies with the compatibility of teachers' goals, the compatibility with their sense of control, and more important, their perceptions of each. In their study, they found that teachers are most concerned about the negative impact of technology as opposed to the positive influence. In other words, Yan and Zhao (2006) suggest they could not get over the efforts needed and the change experienced by using laptops in the classroom. Their results suggest that maintaining the status quo and avoiding disturbance have a higher priority on the hierarchy of teachers' goals after balancing the costs and benefits of using technology (Yan & Zhao, 2006).

People's beliefs in their personal efficacy play a paramount role in how they organize, create, and manage the environment that affects their developmental pathways (Bandura, 1997). They may also influence their abilities to interpret their success in these areas, as well as the tools they use. Equally important, Bandura (2000) states, "there is no emergent entity that operates independently of the beliefs and actions of the individuals who make up a social system" (p. 76). Social learning and school culture are important to the individual teacher, especially when dealing with the changes technology can present in the classroom and in school culture.

The rapid growth of technology in schools has, along with its increased potential for learning, developed many instructional barriers. Extensive research testifies to the reality of environmental and management influences that make using technology more difficult for teachers. A practical and effective way to categorize barriers, from the perspective of the individual, is to use the paradigm of first- and second-order barriers (Brickner, 1995; Ertmer, 1999). First- and second-order change identifies intrinsic and

extrinsic barriers to technology use. Environmental or institutional issues, resources, and training are considered first-order barriers and are also known as extrinsic factors. The connection to a teacher's personal instructional beliefs and strategies is identified as a second-order barrier change. These are internal beliefs, personal experiences, and personal relationships. Teachers find these changes most difficult because they involve intrinsic reasons for decision-making and will most probably alter established classroom practices (Ertmer, 1999). Teachers often cite first-order barriers as reasons for not using technology. In support of this, Cuban, Kirkpatrick, and Peck (2001), and Bauer and Kenton, (2005) cite time to learn and prepare instruction as barriers in their research. Poor professional development (Koehler & Mishra, 2005) and access to equipment (Yan & Zhao, 2006) also contribute to first order or extrinsic barriers.

Kopcha (2010) writes that researchers Levin and Wadamy (2006, 2007); Snoeyink and Ertmer (2001–2002); and Zhao et al. (2006) have found that teachers adopt technology at different rates depending on factors such as their beliefs about technology and their individual skills with technology. Also, each barrier plays a role in the severity of the other barriers (Hew & Brush 2007; Hinson et al. 2006; Lim & Khine 2006; Zhao & Frank 2003). For example, Hew and Brush (2007) suggested that teachers' beliefs, knowledge, and skills could positively or negatively impact each other and other barriers that teachers face (as cited in Kopcha, 2008). Zhao and Frank (2003) suggested that the process of technology integration is an evolutionary one, and that teachers' beliefs, pedagogy, and technology skills slowly build upon each other and co-evolve as technology is introduced and assimilated into the school culture.

Literature on how teachers' beliefs shape the implementation of school reform initiatives indicates that teachers will tend to use technology in ways that are consistent with their personal perspectives about curriculum and instructional practice (Cuban, 1986). Additionally, teacher beliefs are generally not affected by reading or educational research (Kagan, 1999). Despite the increase availability of technology in schools, Cuban et al. (2001) suggest that instruction has changed little. Zahorik (as cited in Kagan, 1999) states that teachers obtain most of their ideas from actual practice, primarily from their own practice, and then from the practice of fellow teachers. Further, if and when technology is used, it typically is not used to support the kinds of instruction (e.g., student-centered) believed to be most powerful for facilitating student learning (Cuban et al., 2001; International Society for Technology in Education [ISTE], 2008; Partnership for 21st Century Learning, 2007). Unfortunately, the barriers to technology adoption: time, support, models, infrastructure, and culture, persist and even reappear with new technologies (Brzycki & Dudt, 2005). As Ertmer and Ottenbreit-Leftwich (2009) note, issues of teacher change are central to any discussion of technology integration.

Some teachers are just more comfortable using technology. Technology research has identified instructional pedagogy, more specifically, constructivism, as a natural alignment with technology use in the classroom (Judson, 2006). Studies have suggested that "high-tech" teachers tend to hold a student-centered approach to learning, and teachers' beliefs also tend to be associated with a congruent style of teaching that is often evident across different classes and grade levels (Kagan, 1994). While technology practices tend to use constructivist pedagogy (Judson, 2006), which may alienate teachers

using traditional methods and beliefs, Zahorik (as cited in Kagan, 1999) states that teachers obtain most of their ideas from actual practice, primarily from their own practice and then from the practice of fellow teachers, suggesting that the collective may influence classroom activities. It should be noted that Kagan (1999) also suggests that teacher beliefs are generally not affected by reading or educational research. Learning is doing. Teaching pedagogy may lead to better understanding of how technology is addressed in the classroom.

Teachers' perceived efficacy is crucial to the classroom environment. Bandura (1997) writes that their belief in their instructional efficacy partly determines how they structure academic activities and shape students' evaluations of their intellectual capabilities. As a result, teachers with a strong efficacy will create an environment and activities focused on successful learning for all students, and teachers with weak efficacy will spend less time on academic instruction and give up on poor achieving students. Bandura (1997) supported this concept by highlighting an observational study by Gibson and Dembo (1984) and concluded that teachers who believe strongly in their ability to promote learning create mastery experiences for their students, but those beset by self doubts about their instructional efficacy construct classroom environments that are likely to undermine students' judgments of their abilities and their cognitive development (p. 240).

Technology, unlike prior innovational tools in education, has crossed social, economic, and global boundaries, changing how we live, students' perceptions, and students' learning styles, and it has created an imperative for teachers to change. Still, many teachers resist and others get lost in the collective. It is not uncommon to have one

or two excellent users of technology in a system that struggles to use it systematically. This can leave talented individuals performing poorly because of a weak collective agency.

Despite the enormous influence of technology in education (ISTE, 2010; NCES, 2008) and the investment of billions of dollars (NCES, 2008), as well the increasing availability of the technology in schools (NCES, 2008), instruction has changed little (Cuban et al., 2001). The evidence suggests that teacher self-efficacy influences school culture and technology use in the classroom (Bandura, 1997; Becker, 2000; Cuban, 2002; Ertmer, 2005; Kagan, 1999; Pajares, 1997). This connection between teacher belief and teacher behavior may explain why teachers find it difficult to use technology and why it has not been addressed in schools. Beliefs are personal, are difficult to address in staff development, and take time to change. Even the process of change can take years.

What causes teachers to use technology may also involve their relationship and attitudes towards the technological barriers inherent in technology's traditional deployment in schools. These barriers can reflect school culture and support a teacher's personal belief system or self-efficacy and the ultimate impact of using technology in the classroom. Barriers can also act as scapegoats. It is important to attempt to differentiate between the problem of barriers and self-efficacy. Also, because Bandura's work includes social learning or vicarious experiences to support teacher confidence (Ertmer, 2005), understanding the school as a collective agency and its influence on teacher beliefs and technology use is a natural connection and relationship.

The attainments of a school, as a group, are the products not only of the shared knowledge and skills of its different members, but also of the interactive, coordinative,

and synergistic dynamics of their transactions (Bandura, 2000). Given this, the school culture and teacher self-efficacy become critical parts of the equation for change and for the successful use of technology in the classroom. The option not to use technology in the classroom ignores the cultural reality of its daily use and may, in the end, limit student experiences to those of the 20th century.

Because our actions or human agency are mediated by self-efficacy, our choices, our effort, our emotions, and our persistence when facing adversity are influenced by our efficaciousness (Pajares, 1997). This transcends into classroom technology activities and instruction by way of teacher self-efficacy, thus making teacher beliefs determinants in teacher behavior. By logical extension, student achievement can be directly related to teacher behavior or teacher self-efficacy. By understanding teacher behavior and decision-making, we have the potential to design student experiences and balance programs to provide students with learning options that maximize their learning engagement and extend their understanding, thus enabling connections and analogies, and an ability to offer environments that offer environments and experiences to challenge existing thought and address the needs of students and their 21st century education.

CHAPTER III

METHODS

The preceding literature review demonstrates that teacher's self-efficacy is a powerful and influential variable related directly and indirectly to the collective efficacy of a school and classroom technology use. This chapter describes the research design, mixed method description, challenges, and strengths and weaknesses, as well as the study framework and description. An explanation of all the variables and strategies employed during the process are shared.

Research Design

An examination of recent social and behavioral research reveals that mixed methods are being used extensively to solve practical research problems (Tashakkori & Teddlie, 2003). It also enables the researcher to provide significance enhancement or maximize the researchers' interpretations of data as well as data triangulation seeking convergence and corroboration of findings from different methods that study the same phenomenon (Onwuegbuzie & Leech, 2007). Towards that end this research also uses a mixed method design (Creswell, 2007). Data will be collected through electronic online surveys and in-person one to one interviews, which will use random nested sampling. Merging the quantitative and qualitative data sets (Plano Clark, Garrett, Leslie-Pelecky, 2010) and using a paradigmatic concurrent mixed method design the researcher will examine the relationship between teacher self-efficacy, a school's collective efficacy, and the use of classroom technology for teaching and learning. Inherent in the study are the technological barriers that teachers face on a daily basis in the school environment. For example, teachers need time to learn how to use the hardware and software, time to plan,

time to collaborate with other teachers, and time to incorporate technology into their curriculum (Wachira & Keengwe, 2010). Acknowledging these and other barriers contributes towards the understanding of the variety of realities technology introduces in the classroom.

A mixed method process enables the use of quantitative information to measure the perceived impact of the self- and collective efficacies on technology use, while the qualitative information will describe individual perceptions and experiences. Thus, the quantitative data provide a general picture of the self- and collective efficacies and technology use in the school. The qualitative data and its analysis will refine, explain, and corroborate those data results by exploring participants' views in more depth. Both types will develop a more complete understanding of the participants' perceptions and by dynamically merging both sets of data they become greater than the sum of their parts (Plano Clark, et al., 2010).

The design consists of two distinct phases occurring within the same short timeframe. The purpose is to collect, analyze, and finally, integrate the quantitative and qualitative data within one phase of the research to provide corroborating or complementary information (Greene, Caracelli, and Graham 1989; Creswell et al. 2003; Teddlie and Tashakkori 2009 as cited in Plano Clark, et al., 2010). In the first phase, the quantitative data will be collected using a web-based survey to discover schoolteacher's beliefs concerning their self-efficacy, school collective agency, and classroom technology use. In the second phase, a qualitative case study approach will be used to collect text data through individual semi-structured interviews and elicitation materials to help explain and corroborate the survey results of the first phase.

The priority in this design is given to the quantitative method, as the quantitative research represents the major aspect of data collection and analysis in the study, focusing on the larger population of respondents. The smaller qualitative component focuses on in-depth responses to interview questions aligned with the survey content. Results from both phases are analyzed separately, thus meeting Greene et al. (1989) criteria for triangulation that seeks convergence and corroboration of findings from different methods that study the same phenomenon (Onwuegbuzi & Johnson, 2006). It will also allow for an initial understanding of the two databases before implementing merging strategies and allow the researcher to obtain separate and independent results that could be compared for purposes of corroboration, before advancing to more integrative analyses such as merging in a discussion and data transformation (Greene, 2007; Teddlie and Tashakkori, 2009).

Subjects for this study will include teachers in schools from New Jersey, the state the researcher worked as a Director of Technology. The number of subjects could range between ten and several hundred participants. Teacher participation will be identified in kindergarten to twelve-grade settings and obtained by personal contact with district administrators. Each district and school building will have a separate data ID thus controlling for organizational structure of the schools and allowing for a constant approach to collective efficacy measurement. Teachers will be identified numerically to protect their anonymity. The qualitative interviews will be coded and analyzed using Dedoose, a program specifically designed for mixed method research. A non-probabilistic, purposive sampling approach will be used to obtain data from both expert and non-expert users of technology in the classroom. The interview sample that will best

reflect the shared perception, belief, or behavior among the relatively homogeneous group will range between three and six. The actual sample sizes were determined by a review of literature combined with the realities of school time and available researcher resources. A study by Guest, Bunce, and Johnson (2006) cited only seven sources that provided guidelines for actual sample sizes. Of these, depending on the type of research, sample sizes ranged from six to several hundred. For example, Creswell (as cited in Guest et. al, 2006) recommended between five and twenty-five interviews for a phenomenological study and twenty-thirty for a grounded theory study. The more similar participants in a sample are in their experiences with respect to the research domain, the sooner one would expect to reach saturation (Guest, Bunce, and Johnson, 2006). Ryan and Bernard (2004) asserted that when and how saturation is reached depends on several things: (1) the number and complexity of data, (2) investigator experience and fatigue, and (3) the number of analysts reviewing the data (as cited in Guest, Bunce, and Johnson, 2006). A concern of the researcher is the district variable and its willingness to provide time for teachers to participate in the study.

Mixed Methods

By definition, mixed method designs utilize both qualitative and quantitative research and include both approaches in the data collection, analysis, integration, and the inferences drawn from the results (Creswell, 2007). Johnson & Onwuegbuzi (2004) define mixed methods research as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study. The rationale for mixing both kinds of data within one study is that neither quantitative nor qualitative methods are sufficient, by themselves, to

capture the trends and details of a situation (Ivankova, Creswell, & Stick, 2006). It also allows for multiple approaches (similar to qualitative and quantitative pathways) concurrently or closely in sequence, and examines a variety of sources of evidence in decision-making (Tashakkori and Teddlie, 2010).

As people solve their everyday problems using multiple approaches, seeking, evaluating, organizing, and interpreting the evidence, so too does mixed methods. As such, it parallels everyday human problem solving that qualitative or quantitative research cannot accomplish alone (Tashakkori & Teddlie, 2010). In other words, mixed methods utilize those skill sets that people use when they face problems or decisions in everyday life. For example, if a vehicle is being purchased the price is important, so too are the opinions of friends and experts. When used in combination, quantitative and qualitative methods complement each other and allow for more complete analysis (Green, Caracelli, & Graham and Tashakkori & Teddlie as cited in Ivankova, 2007). According to Creswell, Hanson, Plano Clark, & Morales (2007) mixed methods also advance a synergistic approach in which two or more options interact so that their combined effect is greater than the sum of the individual parts and balances objectivity with subjectivity. By using more than one method a more complete picture of human behavior and experience can be obtained (Morse, 2003).

In a mixed methods approach, researchers build knowledge on pragmatic grounds (Creswell, 2003; Maxcy, 2003) asserting that truth is "what works" (Howe, 1988 as cited in Ivankova, 2007). In other words, they choose approaches as well as variables and units of analysis, which are most appropriate for finding an answer to their research question (Tashakkori & Teddlie, as cited in Ivankova, 2007). Johnson & Onwuegbuzie

(2004) extol the pragmatic philosophies of Peirce (1878), James (1907), and Dewey (1920) when they suggest the empirical and practical consequences when judging ideas. A major tenet of pragmatism is that quantitative and qualitative methods can work together. Thus, both numerical and text data, collected sequentially or concurrently, can help better understand the research problem (Ivankova, 2007).

According to Newman, Ridenour, Newman & DeMarco, (2003) choosing a mixed method design, however, begins with the understanding of the study purpose and all its complexities to identify the appropriate methodology. They suggest that the research typology might lead to both a process for developing good research questions and in making subsequent effective methods decisions.

Challenges

Collins (et al., 2007) describes the four challenges of representation, legitimation, integration, and politics that researchers should address in a mixed method study. Representation problems are the consequences of using two different methods in one research project given that qualitative and quantitative designs have their own set of sampling decisions and methodology. To address representation in mixed methods research there are two significant problems to address. The first is the sampling size. If the sample size is too small detecting statistically significant differences or relationships is problematic and the utilization of nonrandom samples prevents effect-size estimates from being generalized to the underlying population (Onwuegbuzie, Jiao, & Bostick 2004 as cited in Collins, et al. 2007). Romney, Batchelder and Weller (1986:326) calculated that samples as small as four individual's can render extremely accurate information with a high confidence level (.999) if they possess a high degree of competence for the domain

of inquiry in question (1986:326 as cited in Guest, 2006). Guest et al. (2006) suggest if the goal is to describe a shared perception, belief, or behavior among a relatively homogeneous group, then a sample of twelve will likely be sufficient. However, they highlight that the more similar participants in a sample are in their experiences with respect to the research domain; the sooner one would expect to reach saturation. As Johnson (1998:153 as cited in Guest et al., 2006) reminds us, "It is critical to remember the connection between theory, design (including sampling), and data analysis from the beginning, because how the data was collected, both in terms of measurement and sampling, is directly related to how they can be analyzed."

The second problem is the difficulty in capturing (i.e., representing) the lived experience using text in general and words and numbers in particular (Collins, et al., 2007). The legitimation challenge involves assessing the trustworthiness of both the qualitative and quantitative data and subsequent interpretations (Johnson & Onweqbuzie, 2004). In mixed research legitimation should be seen as a continuous process rather than as a fixed attribute of a specific research study (Onwuegbuzie and Johnson, 2006). Legitimation is commonly referred to as validity in quantitative statistics. Onwuegbuzie and Collins (2007), suggests the reconceptualization of traditional validity concepts with a different nomenclature. Table 2 displays the parallels between the qualitative description and the quantitative concept description. To use the nomenclature of Lincoln and Guba (1985), the challenge of legitimation refers to the difficulty in obtaining findings and/or making inferences that are credible, trustworthy, dependable, transferable, and/or confirmable.

The intent of trustworthiness is to support the argument that the inquiry's findings

are “worth paying attention to” (Lincoln & Guba, 1985). It encompasses credibility, transferability, dependability, and confirmability. Credibility is an evaluation of whether or not the research findings represent a “credible” conceptual interpretation of the data drawn from the participants’ original data (Lincoln & Guba, 1985). Transferability is the degree to which the findings of this inquiry can apply or transfer beyond the bounds of the project. Transferability also depends on the similarity between the original situation and the situation to which it is transferred (Hoepfl, 1996). Using different school district’s and the same grade level may allow for some generalization of this at the end of the project. Dependability is an assessment of the quality of the integrated processes of data collection, data analysis, and theory generation. Strategies to accomplish this include triangulation, peer examination, dense description, or a dependability audit. Confirmability is a measure of how well the inquiry’s findings are supported by the data collected (Lincoln & Guba, 1985). In this research creditability is addressed using triangulation and by establishing a project audit trail of the notes, surveys, and documents. A confirmability audit or reflexivity would also accomplish it. Because this is a mixed method study the advantage is the combining of information and data from both a qualitative and quantitative perspective.

Table 1

Qualitative & Quantitative Characteristics

Qualitative Concept	Quantitative Concept
Credibility	Internal validity
Transferability	External validity
Dependability	Reliability
Confirmability	Objectivity

Lincoln and Guba (1985)

Integration refers to the weight and questions about the research design and to the extent that combining approaches can adequately address the research goals, purpose, and questions. It requires the researcher to ask and answer preliminary questions concerning sample size, distributed weight of data, which is more important the quantitative or qualitative component, and, in the final analysis, if the findings contradict each other, what should the researcher conclude (Onwuegbuzie & Collins, 2007).

Politics refers to the tensions that arise as a result of combining quantitative and qualitative methods and the difficulty in persuading the consumers of mixed methods research, including stakeholders and policy makers, to value the findings stemming from both the qualitative and quantitative phases of a study (Onwuegbuzie & Collins, 2007).

For mixed methods research to maximize its credibility as a paradigm, it is essential that the four previously stated challenges of representation, legitimation, integration, and politics, be addressed (Collins, Onwuegbuzie, and Jaio, 2006), and the best way to do this is to start with sampling. Making decisions concerning the sampling

scheme (s) and sample size is a pivotal step for addressing simultaneously the four challenges (Collins, et al., 2006).

Strengths and Weaknesses

Johnson and Onwegbuzie (2005) suggest that the strengths outnumber the weaknesses of mixed method study. A key reason for the author to use mixed method is personal experience. Educators see how teachers, unintentionally, say one thing and do another. For example, on survey's teachers will suggest they are constructivists but class observation indicates less facilitation and more direct instruction. This also happens with skill measurements. Most teachers will over rate or under rate their experience and abilities. Mixed methods permit a corroboration of the survey responses with the interview data to strengthen the final analysis.

Study Framework

Using a slightly modified version of a design process developed by Johnson & Onwuegbuzie (2004), one that addresses multiple data sets, as opposed to a singular set of data, Figure 1 describes the eight steps in this research project. It employs a mixed method concurrent design using convenience and nested samples for the quantitative and qualitative components of the study. The data will be analyzed concurrently, thus allowing for triangulation.

Creswell et al., (2007) describe integration within a concurrent design as merging the quantitative and qualitative data. The value of integration in concurrent approaches surpasses the mere summation of qualitative and quantitative evidence; it is in the dynamic merging of the two forms of data that they become greater than the sum of their parts (Plano Clark, 2010). Therefore, the value of concurrent mixed methods designs can

be realized only if researchers apply effective merging strategies in their practice.

Triangulation is defined as the combination of the results of two or more rigorous studies conducted to provide a more comprehensive picture of the results than either study could do alone (Moorse, 2003), will be utilized to assess the collected data. Triangulation will also strengthen the validity of inquiry results (Green, Caracelli, & Graham, 1989). Inherent in the design is the awareness that each method yields its own set of bias. When two or more methods, that have offsetting biases, such as in triangulation, are used to assess a given phenomenon, and the results of these methods converge or corroborate one another, then the validity of inquiry findings is enhanced (Green, et al., 1989). The intention is to seek convergence and corroboration of results from different methods and, as Olsen (2004) suggests, to also seek a deepening and widening of one's understanding. Key (1997) points out that the purpose of corroboration is not to confirm whether people's perceptions are accurate or true reflections of a situation but rather to ensure that the research findings accurately reflect people's perceptions, whatever they may be. The purpose of corroboration is to help researchers increase their understanding of the probability that their findings will be seen as credible or worthy of consideration by others (Stainback & Stainback, 1988 as cited in Key, 1997). Understanding how teachers decide to use technology in the classroom will potentially identify staff development and other environmental issues that can be addressed by administrators and staff.

The study is a triangulation study that utilizes concurrent analysis of both the qualitative and quantitative data. The project uses the online program called Dedoose as the analytical tool for both data sets, qualitative and quantitative. Dedoose is a paid

subscription statistical program designed to meet the needs of mixed method research, as well as a collaborative tool for multiple researchers. It calculates and presents both a pooled Cohen's Kappa for inter-rater reliability across all codes in the project and a Cohen's Kappa for each individual code. For code weighting/rating, Dedoose calculates Pearson's correlation coefficient and other diagnostics on relative agreement. Also it has an intuitive and powerful filtering via Boolean operators and sorting features allowing easy examination of results from any number of perspectives. The researcher can combine excerpts or resources into subgroups based on any combination of filters (e.g., by type of resource, user, participant characteristics, code, or quantitative data on individuals or groups) and move seamlessly back and forth between the results, excerpts, and resources. The program offers a seven layer of security identified as the following.

Table 2

Dedoose Security Details

Encrypted SSL tunnel is established for communication between Dedoose client and server
Login username/password is then encrypted
The owner/project administrator sets security via the Security Center
The Dedoose Data Center requires multiple forms of identification for access to the facility
All backups are encrypted with AES internally, and encrypted a second time
Server login is accessible only by a private VPN connection with its own SSL tunnel
Server login is protected by windows secure login authentication

Study Description

The data collection will begin with a convenience sample of the schools participating in the study. The interviews will be a random nested sample to obtain in-depth knowledge from those closest to the research, the teachers. The primary source of data collection will be a web-based questionnaire that includes both closed- and open-items and interview data collected within the same time frame; thus, collecting the quantitative and qualitative data concurrently. An online survey was chosen because (1) there are limited resources available for the study, (2) electronic data would more easily be inserted to the analysis program, (3) it would provide teachers with an easy way to participate, one that had less steps to perform.

Interview item data will be collected from a sampling of each participating school via an open invitation on the survey and suggestions from local administrators. These questions were aligned with the online questionaire and reviewed by experts in the field.

Research Questions & Hypothesis

The theoretical drive (Morse, 1991, as cited in Morse 2003) of the project is inductive using both qualitative and quantitative data to understand the meaning of efficacy on technology decisions. The study also seeks to understand how people in schools influence each other with regards to classroom technology use and efficacy.

Research Questions

H1: What is the effect of teacher self-efficacy on technology use in the classroom?

H2: What is the effect of collective efficacy on technology use in the classroom?

H3: What is the relationship among teacher self-efficacy, collective efficacy, and technology use in a K-12 classroom in setting?

Null Hypothesis

Ho 1: Teacher self-efficacy is not associated technology use in the classroom.

Ho 2: Collective efficacy is not associated with technology use in the classroom.

Ho 3: There is a negative relationship between all three variables, teacher self-efficacy, collective efficacy, and technology use in the classroom?

Target Population and Sample

A convenience sampling of school districts, grades K-12, in New Jersey, will be contacted by telephone and in person for participation. A thirty-six-question survey, discussed in Phase I and II, will be distributed electronically to all teachers in each school. The goal of the survey is to obtain objective data about beliefs concerning their self-efficacy, the school's collective efficacy, and their use of technology in the classroom. Self-efficacy and collective efficacy will each have twelve questions. The technology use survey will have six questions and demographic data will be addressed in five of the questions.

Procedures

School Superintendent's or Principal's who are colleagues of the researcher will be contacted in person by phone or email to request participation of their school in the study. The purpose and content of the research will be shared and distribution options discussed. It would be preferable that the survey and informed consent form be explained in person by the researcher and filled out electronically at a staff meeting. This will provide a face to the research and a real person for the staff to observe and ask questions. Subjects will be asked in the survey to participate in the interviews. Additionally, the researcher will ask the Principal or Director of technology to identify

three to six individuals to be asked for an interview. All of these names will be randomized for selection. Interviewee's will be contacted and interviewed at their convenience. Per IRB protocol all participation is voluntary. The school names will be modified for the final report but identified on the survey. The first page of the electronic survey will indicate that participants may opt out of the project; all information will remain confidential and coded with an anonymous ID; and all responses will be analyzed as aggregated data. Additionally, the informed consent will need to be read to proceed to the questionnaire. An example is pictured in Figure 2.

Exit this survey

Efficacy and Technology Research

***1. CONSENT TO PARTICIPATE IN A RESEARCH STUDY**
(to participate you must click yes at the bottom of the page and then hit next)

TITLE: Self-Efficacy and Technology - Does one lead to the other? Evaluating the effects of teacher and school efficacy on technology use in the classroom.

INVESTIGATOR: Elaine Studnicki - 20 Sand Hill Road
Flemington, NJ 08822 908-455-1114

ADVISOR: Dr. David Carbonara. In partial fulfillment of a Doctorate of Education in Instruction Technology

SOURCE OF SUPPORT: No funding resources

PURPOSE: You are being asked to participate in a research project that seeks to investigate the influence of teacher beliefs on the use of technology in the classroom and to ascertain the type of influence the collective efficacy of staff has on an individual teacher's decision to use technology in the classroom. Inherent in the study are the technological barriers that teachers face on a daily basis in the school environment.

YOUR PARTICIPATON: Teachers in K-12 schools will be invited to take a 34-question survey. Two to six interviews will be held in each of the participating school buildings. A fifteen-minute introduction during a faculty meeting will be requested at each school. The online survey will be taken at the teacher's leisure, at a computer of their choosing, within one week of the request. It will last approximately 20 minutes. All subject's will be required to verify voluntary participation and project knowledge by clicking on an agree statement prior to entering the survey. It is the only mandatory question in the survey. A school administrator will send an email to staff with the survey link. The interviews will take no more than 35 to 42 minutes or one school period and occur in a place of the teacher's choosing. Teachers will be asked to volunteer for the interviews on the survey or be asked by the principal to participate. Identical information will also be provided on an informational handout during the introduction.

RISKS AND BENEFITS: There are no known risks beyond those of everyday life.

COMPENSATION: There is no compensation for survey participation. Interviewee's will receive $25.00 for participation.

CONFIDENTIALITY: All survey responses will be anonymous. Individual names, specific grade levels, subjects, email addresses, codes and IP addresses will not be collected. The only identifier will be the school name, enabling collective efficacy data analysis. However, the school name will not be identified within the report or at anytime. It will be coded and removed from data sets when the data has been prepared for analysis. Interviewee's names will be coded with numbers. When the tapes are transcribed, all identifiers will be removed, both in reference to the subject and in reference to anyone subjects talk about. The data will be locked in the researchers home for five years and then destroyed. Personal names will be coded in the analysis and final report.

Figure 2 Consent to Participate

Phase I – Quantitative Strand

Teacher Self-Efficacy

A Teachers' Sense of Efficacy are the beliefs in their capability to make a difference in student learning, to be able to get through even to students who are difficult or unmotivated (Tschannen-Moran & Woolfolk, 2001). To measure teacher self-efficacy the Teacher Efficacy Scale (TES) will be used (Appendix A). For example, teachers will be asked how much can they do to help their students value learning and how much can they use a variety of assessment strategies? Developed by Megan Tschannen-Moran from the College of William and Mary and Anita Woolfolk Hoy from The Ohio State University, the scale measures three important teacher efficacies. They are efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management. The Teacher Sense of Efficacy Scale asks teachers to assess their capability concerning those instructional strategies, student engagement, and classroom management. In a classroom these three domains are the foundation for good teaching. A belief in these will address the strategies and tools, i.e. technology, a teacher utilizes for effective instruction and student learning. After rigorous methodical work the authors succeeded in developing a valid and reliable (.90) measurement for teacher efficacy (Tschannen-Moran & Woolfolk, 2001). The reliability for the 12-item survey is .90. The construct validity for instructional strategies is .84, classroom management is .79, and student engagement is .85.

Collective Efficacy

Collective efficacy will be measured using the Collective Efficacy Survey (CES)

(Appendix B). Building on Bandura's social cognitive theory (1997) and in response to his repeated calls (Bandura, 1982, 1993, 1995, 1997) for systematic study of the measurement of collective efficacy, a team of researchers at the University of Michigan and The Ohio State University conducted a study in which they developed a 21-item scale and subsequently a 12-item scale to measure collective efficacy (Goddard, Hoy, & Woolfolk Hoy, 2000). This study will use the 12-item scale to minimize the survey time for subjects.

The model is consistent with the notion that efficacy perceptions are unique among other self-regarding constructs because they are both "task- and situation specific" (Pajares, 1996 as cited in Goddard, Hoy, & Woolfolk Hoy, 2000). The model acknowledges that expectations for attainment depend both on-perceived competence to perform a given task and the context in which the task will take place. In other words, collective efficacy depends on the interaction of these two factors. The internal consistency of scores on the 12-item scale has been tested with Cronbach's alpha (.94), and a test of predictive validity using multilevel modeling has also been achieved (Goddard, Hoy, & Woolfolk Hoy, 2000). All items in the Collective Efficacy Scale are directed at the group, not at the individual level.

Bandura developed social cognitive theory to explain that the control that individuals and groups exercise through agentive actions is powerfully influenced by the strength of their efficacy perceptions. For schools, collective efficacy refers to the perceptions of teachers in a school that the efforts of the faculty as a whole will have positive effects on students (Goddard, Hoy, & Woolfolk Hoy, 2000).

Technology Use Survey

The opinions of technology experts will be gathered to identify key questions for the technology use survey (Appendix C). These experts are current high school and K-8 grade level technology directors. They will receive an email requesting their insight and suggestions concerning the attached survey. A key research component, the technology use survey includes questions concerning classroom use for student learning and teacher instruction, influences on decision-making and use, and student priorities. It is a nine-question survey and part of the total thirty-six-question survey for teachers. Expert opinion will be sought to inform question content and validity, as well as alignment with realities of school use and teacher- and collective efficacies. Experts will be asked to review and comment on the questions and suggest additions or changes. Reliability will be tested once the questions are returned.

Phase II – Qualitative Strand

This study uses an emergent, exploratory, inductive qualitative approach. Qualitative data collection will include a six-question interview (Appendix D) with two to twelve teachers in each of the participating schools. Interviews will be held with individual teachers. Administrators will identify teachers in their schools to participate in the interviews. The interview questions have been gleamed from belief and technology use research. They address self and collective efficacies and technology use. The interviews will be audio-taped and kept confidential. All of the data will be coded using open coding, thematic development, and actively searching for contradictory evidence. Because of the interpretative nature of the qualitative research, the investigator may introduce her bias into the analysis of the findings. However, the sessions will be recorded and those interviewed will be asked to review the transcripts.

Data Analysis

The quantitative data will be gathered using an online survey instrument called Survey Monkey. Security for Survey Monkey is listed in Appendix E. Those results will be downloaded and imported into Dedoose, an online program created to specifically for integrating qualitative and quantitative methods. The qualitative data from the interviews will be coded and also added to Dedoose. Responses to the surveys will be analyzed using both descriptive and inferential statistics. Descriptive statistics includes means, standard deviations, and ranges across all efficacy scales and technology use survey. Demographic data will be disaggregated across gender, experience, grade level and subjects taught. Group comparisons between self-efficacy and collective efficacy will be made using Analyses of Variance (ANOVA). Analysis of the qualitative data will use three merging strategies: in a discussion, with a matrix, and by data transformation (Creswell et al., 2007).

The researcher functions as the primary instrument for data collection and analysis. My involvement in education as a teacher and particularly as a Technology Director over the past twenty-five years provides a background with valuable insight into how schools work. These experiences will also provide a greater awareness when analyzing the data and interpreting/coding the interviews. However, my experiences do introduce a possibility for subjective interpretations of the phenomenon being studied and create a potential for bias (Locke, Spirduso & Silverman, 2000). But extensive verification procedures, including triangulation, member checking, and a careful audit by participating interviewees' should minimize bias influence.

Research Permission and Ethical Considerations

Ethical issues will be addressed at each phase in the study. In compliance with the regulations of the Institutional Review Board (IRB), the permission for conducting the research will be obtained and identify project type, principal investigator Form will be filed, providing information about the principal investigator, the project title and type, type of review requested, number and type of subjects. A description of the project and its significance, methods and procedures, participants, and research status will be submitted with the application for research permission. This project will be requested an expedited status, since the interviews with the participants will be audio taped, though the study will be conducted in a normal social setting, its topic does not fall in the sensitive category, and the age of the subject population is over nineteen.

The informed consent form will state that the participants are guaranteed certain rights, agree to be involved in the study, and acknowledge their rights are protected. A statement relating to informed consent will be on the first page of the web survey and reflect compliance by participation. It will outline the rights of the participants as required by federal guidelines. They include the following items. 1. An explanation of the purpose of the research, the expected duration of the subject's participation, and a description of the procedures. 2. A description of any foreseeable risks or discomforts. 3. A description of any benefits reasonably to be expected. 4. A description of the alternatives to participation, where appropriate. 5. A description of how confidentiality or anonymity will be maintained. 6. A statement of whether compensation for harm is available. 7. Indication of whom to contact for answers to questions about the research subject's rights. 8. Indication that participation is voluntary, that refusal to participate will involve no penalty or loss of benefits to which the subject would otherwise be

entitled, and that the subject may discontinue participation at any time.

Participant names will not be requested and the responses kept confidential to protect all participants. The individual interviewees will be assigned numerical identification for use in their description and reporting the results and matching the quantitative and qualitative data into one subject record. All study data, including the survey electronic files, interview tapes, and transcripts, will be kept in locked safely in the researcher's home and destroyed after one year. Participants will be apprised of the research publication but the results will not be traceable to participating individuals or schools.

CHAPTER IV

RESULTS

This study examined the effects of teacher self-efficacy, collective efficacy, and technology barriers on technology use in a New Jersey K-8 school district. A Likert scale survey gathered data regarding teacher demographics, teacher self-efficacy, the collective efficacy of school, and how technology is used and supported for instruction. Interviews provided a deeper understanding of the school environment and technology use in the classroom.

This chapter presents the results of the analysis of quantitative and qualitative data seeking to understand three study questions. The first research question is: What is the effect of teacher self-efficacy on technology use in the classroom? This effect was measured using both the self-efficacy and technology surveys. The second study question is: What is the effect of collective efficacy on technology use in the classroom? The collective efficacy scale survey, technology questions, and interview discussions were used to measure this effect. The third study question is: What is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting? This question uses the three survey assessments and interviews for analysis.

The discussion has been divided into three sections. Project organization discusses research development and instruments. Quantitative analysis describes demographics, teacher self-efficacy, and collective efficacy survey data. The research questions will be used as a framework for interpreting the results. Technology survey

results are infused into this framework. Qualitative analysis of the interview responses is presented in the last section of the chapter.

Project Organization

Initially three districts, two high schools, and one K-8 elementary school, were contacted to participate in the study. Only the K-8 district completed the communication processes and agreed to ask their teachers to contribute to the study. The study was designated to begin in early October; however, it was delayed until the middle of December. The significance of this delay is discussed in chapter five.

The K-8 school district has four buildings, which have been identified as Building K-1, Building 2-3, Building 4-6, and Building 7-8. Teachers in each building were asked to participate in an online, 36-question survey and volunteer for a seven-question interview.

Anonymous survey data was collected between December 9, 2011, and January 16, 2012. Of the 110 teachers in the district, 43 responded to the survey. Four subjects were removed from participation in the study because they did not respond to any of the questions. Four additional responses were removed because data was missing from at least three survey questions. Three of these subjects omitted entire sections of the survey. Of the remaining 39 teachers, 35 were selected for the final pool of subjects, resulting in a 31 percent expected response rate. Interviews were conducted within three weeks after the survey was closed.

The survey (Appendix D) begins with two demographic questions, which were designed to collect data on teaching experience and gender.

Megan Tschannen-Moran of the College of William and Mary and Anita Woolfolk Hoy from Ohio State University designed the 12 questions, comprising the teacher sense of efficacy scale, which was deemed to be a valid and reliable measurement of teacher efficacy (Tschannen-Moran & Woolfolk, 2001). The reliability coefficient is .90. The teacher sense of efficacy scale measures three classroom dynamics: (a) classroom management, (b) student engagement, and (c) instructional strategies, all of which provide data describing how teachers manifest their beliefs via classroom actions. The construct validity for each of these variables is as follows: instructional strategies, .84; classroom management, .79; and student engagement is .85. The alpha is .90.

Dr. Wayne Hoy of Ohio State University designed the 12-question collective efficacy survey. The internal consistency of scores on the collective efficacy 12-item scale has been tested with Cronbach alpha (.94). A test of predictive validity using multilevel modeling has also been achieved (Goddard, Hoy, & Woolfolk Hoy, 2000).

The last nine questions on the 36-item survey address technology use. They align with the literature review concepts of self-efficacy, collective efficacy, and classroom technology. The technology survey was reviewed by technology experts in the field for content validity and, also, tested for reliability during the evaluation phase. A superintendent, two technology directors, one educational technology consultant and teacher, and one State Department representative reviewed the questions. All but one has a doctorate in education. The team of experts suggested three minor changes that were included in the current survey. Data analyses of the technology questions indicate an initial Cronbach Alpha score of .825. SPSS analysis identified one question with a corrected item-total correlation of -.358. Deleting this question would increase the Alpha

score; it was deleted to improve internal consistency. The question was one of three that were specifically designed to evaluate technology self-efficacy. However, the importance of the survey reliability was prioritized to provide overall confidence in the measurement tool. The two remaining questions, overall efficacy scores, and interview data was implemented in data analysis. The reliability analysis of the technology survey demonstrated a .880 alpha, 2.23 mean, and a standard deviation of 0.27.

The seven interview questions (Appendix E) align with the literature review concepts of self-efficacy, collective efficacy, and classroom technology. The questions addressed peer influence, first and second order barriers, collective efficacy, technology use, and characteristics of technology users.

Quantitative Analysis

Demographics

Thirty-five complete responses were collected from participants in four buildings in the same district. Seven responses each were obtained from the K-1 and the 2-3 buildings; twelve from the 4-6 building, and nine from the 7-8 building.. Of the thirty-five subjects, twenty-six were female, and nine were male.

Teaching experience was calculated in terms of years. Two subjects had one-to-two years of teaching experience, four had three to seven, and, eleven had 7 to 12, seven had 13 to 20, and eleven had over 20 years of experience.

Research Question 1

What is the effect of teacher self-efficacy on technology use in the classroom?

The teacher self-efficacy survey results (Appendix N) identify the building and district means and standard deviation scores for self-efficacy (Table 3). This is a nine-

item survey. The overall self-efficacy score for each building and the district indicate a high sense of teacher self-efficacy.

Table 3

Teacher Self-Efficacy Scores

Building	Mean	*SD*	η
K-1	8.03	.111	7
2-3	7.62	.038	7
4-6	7.63	.052	12
7-8	7.40	.108	9
District	7.66	.077	35

Note: 9 point scale

The results of the factor analysis (Table 4) reveal the correlated factors of efficacy in student engagement, instructional practices, and classroom management. In order to determine the subscale scores of these three factors, the unweighted means of the items that load on each factor were computed. The teacher self-efficacy scores indicate that teachers possess a strong sense of self-efficacy in each of the three factors: student engagement, instructional practices, and classroom management.

Table 4

Teacher Self-Efficacy Sub-Scale

Building	Student Engagement		Instructional Practices		Classroom Management		
	Mean	*SD*	Mean	*SD*	Mean	*SD*	η
K-1	7.94	.715	7.86	.902	8.36	.503	7
2-3	7.26	.965	7.75	.946	7.80	.304	7
4-6	7.32	.931	7.86	.733	7.61	.426	12
7-8	6.88	.857	7.75	.684	7.58	.342	9
District	7.36	.917	7.81	.774	7.82	.416	35

9 point scale – 1 = Nothing, 2, 3 = Very Little, 4, 5 = Some, 6, 7 = Quite a Bit, 8, 9 = A Great Deal

Four items on the technology survey were specifically designed to gather information about a teacher's propositional beliefs (Bandura, 1997) towards technology use, as well as the strongest influence on teachers' acceptance of it (Table 5). The first two questions use a five- point Likert scale and examine whether or not a teacher believes she can use technology and how well she believes she can implement it in the classroom. The third question asked teachers to identify who or what group of people had the most influence on their use of technology. These selections included peers, the principal, the curriculum director, the technology director, students, the Board of Education, and the teachers themselves. The "You or yourself" option was an important one because self-influences operate deterministically on behavior in the same way external influences do

(Bandura, 1997). Similarly, the fourth question asked if a teacher's personal beliefs inhibited her from using technology for instruction. Its focus is on the role of self-influence on courses of action taken. The inclusion of the teacher self-efficacy scores in Table C provides a visual relationship among the elements in the district. All of the items demonstrate a fairly strong level of efficacy.

Table 5

Technology Survey Efficacy Items

Building	I can teach with technology **		How well can you implement technology strategies in your classroom? **		What influence do the following people have your use of technology: (Yourself) **		Identify the extent in which the following categories inhibit you when using technology for instruction? Personal Beliefs. *		Self -Efficacy ***	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
K-1	4.14	.378	2.86	1.34	4.00	1.00	3.43	.787	8.03	.111
2-3	4.43	.787	2.71	1.70	3.71	1.11	3.29	.756	7.62	.038
4-6	4.50	.798	3.92	1.24	4.25	1.05	3.33	1.07	7.63	.052
7-8	4.56	.527	3.67	1.22	4.22	.833	3.22	.833	7.40	.108
District	4.43	.655	3.40	1.39	4.09	.981	3.31	.867	7.66	.037

Note: * = 4 point scale ** = 5 point scale *** = 9 point scale

Research Question 2

What is the effect of collective efficacy on technology use in the classroom?

To calculate collective efficacy, the survey data for each of the twelve questions was averaged (Hoy et al., 2000). To achieve a school-wide collective efficacy score, this average was summed and divided by twelve. The average collective efficacy score for each school should be between one and six, with six being the highest collective efficacy score and one, the lowest score. Results for the district and each building indicate a strong sense of collective efficacy (Table 6). The item results are listed in Appendix O.The first technology question that correlates with collective efficacy uses a six-point Likert scale and explores the extent to which the school, as a collective, encourages teachers to use technology. Bandura (1977,p. 6) states, "Social structure not only imposes constraints but, also, provides resources for personal development and everyday functioning." The human factor influences can be equally important as access to equipment.

Table 6

Collective Efficacy and Technology Collective Encouragement Question

Building	Collective Efficacy		To what extent does the school, as a collective, encourage you to use technology?	
	Mean	*SD*	Mean	SD
K-1	5.34	.588	4.57	.535
2-3	5.21	.370	4.57	1.39
4-6	5.00	.227	5.08	.669
7-8	4.84	.339	4.89	.782
District	5.07	.381	4.83	.844

Note: 6-point scale

The second survey question used to evaluate the collective's relationship with technology evaluated who provides the greatest influence on a teacher's technology use. The teachers were asked to rate the selections using a five-point Likert scale, measuring the range from no influence to the most influence. As indicated by the district mean scores, the teachers rated themselves as having the most influence. Students have significant influence, and peers and administrators have some to moderate influence on their actions.

Table 7

Who Influences Your Technology Use

Building	Peers (other teachers)		Principal		Curriculum Director		Technology Director		Students		Board of Education		Yourself	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
K-1	2.57	.976	2.14	.900	1.86	.690	2.29	1.13	3.00	1.15	1.43	.535	4.00	1.00
2-3	2.71	1.11	3.57	1.27	3.43	1.13	2.86	.690	3.29	1.1	2.57	.976	3.71	1.11
4-6	2.75	1.13	2.58	1.31	2.58	1.37	2.92	1.08	3.92	1.08	2.33	.985	4.25	1.05
7-8	2.78	1.09	1.56	.726	1.44	.726	2.44	.882	3.11	1.26	1.33	.707	4.22	.833
District	2.70	1.07	2.46	1.05	2.32	.979	2.62	.945	3.33	1.14	1.91	.800	4.04	.998

Note: five point scale

Research Question 3

What is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting?

Question three of the technology survey asked teachers how often they used technology for teaching and instruction (Table 8). Time is often an indicator of priorities. The district mean for how often teachers use technology for instruction was 4.86, suggesting that technology is being used at least once a week to several periods a week. The 4-6 building was the only school to use it several periods a week, and no one school used it on a daily basis.

The evaluation of the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting utilized all of the study data. Understanding this complicated question involves assessment of technology utilization, student applications, instructional strategies, institutional barriers, pedagogical tendencies, and teacher and collective efficacy.

Table 8

How often do teachers use technology for teaching and instruction?

	Mean	SD	η
K-1	4.00	1.732	7
2-3	4.89	1.215	7
4-6	5.42	.996	12
7-8	4.78	1.481	9
District	4.86	1.37	35

Note: Scale Scores: 1=not at all, 2=monthly, 3=every other week, 4=once a week, 5=several periods a week, 6=on a daily basis

A comment field on question three also asked teachers what they would need to use more technology in the classroom. Thirteen of the 35 subjects made suggestions regarding time, access, and training. Nine of the thirteen responses indicated time was a factor, two wished for more training, and eleven stated access to working equipment as being a problem.

How student's use technology is a second indicator to better understand technology in the classroom. Using a five-point Likert scale the teachers identified how often students used technology in their classroom for particular activities (Table 9). The data illustrates that occasionally to frequently teachers are teaching when students use technology and that students spend the most time writing with technology. District-wide analysis suggests that presentations and research were the second and third highest experiences for students. However, buildings K-1 and 2-3 identified the second most

used activities are skill and drill.

Table 9

Student Technology Use in the Classroom

Building	Unison with Instruction		Presentation		Writing		Research	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
K-1	3.29	.951	2.71	1.38	2.43	1.51	2.29	1.11
2-3	3.43	1.51	2.43	1.51	2.57	1.39	1.86	1.06
4-6	3.75	1.21	3.25	1.28	3.50	1.24	3.17	1.26
7-8	3.44	1.13	3.00	1.41	3.11	1.26	3.44	1.01
District	3.51	1.20	2.91	1.39	3.00	1.35	2.80	1.11

Note: 1-never, 2-rarely, 3-occasionally, 4-frequently, and 5-almost daily

Table 10

Student Technology Use in the Classroom

Building	Experiments		Skill and Drill		Collaborative Projects		Creativity	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
K-1	1.29	.488	3.00	1.00	1.86	1.21	2.29	1.11
2-3	1.29	.488	3.00	1.73	2.14	1.67	1.86	1.57
4-6	2.50	1.24	2.50	1.08	3.00	1.12	3.08	1.31
7-8	2.11	1.45	2.11	1.05	3.00	.866	2.89	1.16
District	1.91	.916	2.60	1.21	2.60	1.21	2.63	1.28

Note: 1-never, 2-rarely, 3-occasionally, 4-frequently, and 5-almost daily

Instructional philosophy and pedagogy are often aligned with classroom organization and activities. The next question asked teachers to prioritize three instructional strategies: behaviorism, cognitivism, and constructivism. Table 10 illustrates how the three instructional pedagogies, with regard to frequency, are used across the district and within each building. Results indicate that all three practices are used sometimes throughout the district.

Table 11

Instructional Pedagogy in the Classroom

Building	Behaviorism		Cognitivism		Constructivism	
	Mean	*SD*	Mean	*SD*	Mean	*SD*
K-1	2.14	.378	2.57	.535	2.57	.535
2-3	1.71	.488	2.43	.535	2.71	.488
4-6	2.25	.622	2.17	.389	2.00	.603
7-8	1.89	.622	1.89	.389	2.67	.603
District	2.03	.568	2.25	.490	2.42	.608

Note: 3 pt scale: Rarely, Sometimes, Most Used

Another data point is a practical assessment of those daily events in school that can make or break instruction in the classroom. The first technology survey question addressed those school elements that inhibit a teacher from using technology (Table 11). Reverse coding was used to align with other survey question responses. Personal beliefs and peer pressure had very little to no influence on why teachers did not use technology. Instructional strategies are also seen as less of an inhibitor to teachers. However, time, training, and equipment access were rated between great extent to somewhat a problem. Technical support is also somewhat of a problem for teachers, especially in building 2-3.

Table 12

Inhibitors to Technology Use by Teachers

Building	Equipment Access		Timely Technical Support		Peer Pressure		Administrative Support	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
K-1	1.86	.690	1.86	.378	3.71	.488	3.14	.690
2-3	2.00	.577	1.86	.690	3.71	.488	3.43	.535
4-6	2.42	1.16	2.58	1.08	3.83	.389	3.17	.937
7-8	2.44	.527	2.22	.972	3.56	.726	3.00	1.00
District	2.23	.843	2.20	.901	3.71	.519	3.17	.822

Note: Four-point scale 1- To a Great Extent, 2 - Somewhat, 3 – Very Little, or 4 - not at all

Table 13

Inhibitors to Technology Use by Teachers

Building	Training		Time		Personal Beliefs		Instructional Strategies	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
K-1	2.29	.951	1.86	.378	3.43	.787	2.71	.756
2-3	1.71	.756	1.86	.690	3.29	.756	3.14	.690
4-6	2.42	.900	2.17	1.03	3.33	1.07	3.17	1.03
7-8	2.11	1.16	2.00	1.00	3.22	.833	2.56	.882
District	2.17	.954	2.00	.840	3.31	.867	2.91	.887

Note: Four-point scale 1- To a Great Extent, 2 - Somewhat, 3 – Very Little, or 4 - not at all

Qualitative Analysis

Interviews

This section is organized by the seven interview questions (Appendix D). Three teachers from three different buildings shared their views about technology in the district and their own school. Each data source was analyzed independently by the researcher for patterns, coded inductively, and sorted for emerging themes. Data was coded as belonging to one theme (category) only.

1. What is important to know about your school and technology?

Teacher A: There is not enough access to it, it's available to every teacher, but you don't have access to it every day. So it's not reliable access and is shared instead of a constant resource.

Teacher B: There is a focus on it in the district and school. The emphasis is on integration at the district and building level. Certain teachers are apt to use and integrate it. If the push is enough, and there are no options, people have to use it. If it's the law of the land, people adapt. However, math testing is a good representation and shows how technology can be an intrusion. It interrupts the schedule. ASK is going to compute the math scores, but in the long run, the testing may be a good thing. However nine days to administer a test that can take one day in a written format is not a good thing.

Teacher C: The district is always trying to bring in technology to make things more efficient and suited to students. It is supposed to streamline things. Collecting data is a priority. We're supposed to be part of the 21st century and this helps.

2. Tell me about the influence other teachers have on your technology practices.

Teacher A: They push me in a good way to learn.

Teacher B: It depends on whom you are working with. There are negative people but also colleagues who are excited, and, then, it is helpful, if enough people take the lead. The tech dept. has turned a lot of people off. They are know it all's and don't emphasize teachers but punishment.

Teacher C: They are a lot of influence. Younger teachers seem more empowered and trained. It is easier for them. My generation should definitely emulate them. It's good.

3. Barriers like time and access frustrate many teachers. What are your experiences, and to what extent do these barriers interfere with classroom technology use?

Teacher A: Again it is shared resources. Sometimes, the lap carts won't be charged, and keys are missing.

Teacher B: Right now, I am doing a research project; it's two weeks with research on the computers and typing. The laptop carts are not always working or not charged and wasting kid time and, sometimes, an entire period to get it working. Books would work faster and not be a headache. So, if teachers have adequate time and instruction, it's ok. If technology is added on, it is not a priority. If there is not a clear end, then, incentive is lacking.

Teacher C: Lack of training and support. I've asked so many times in the past for help, and it just doesn't happen. Training should be differentiation of instruction for teachers, too. Show me, let me try it, and watch. Hands-on practice is needed. Teachers are no different than students; they need training at the level they understand it and can translate it to classroom practice.

4. Help me understand how the school at large uses technology? Is it a focus for teachers?

Teacher A: Overall, it is not a focus for all. There are software compatibility issues making sharing with home difficult. However, people are using the Wiki more.

Teacher B: There are laptop carts, labs, and Smart boards. Some teachers don't use them even though they are there. The district is pushing the iPads. Very few teachers use the advance tech cart because they don't understand the application. Wiki's are used most, but a lot are not. Rubicon will be great once everyone gets on board.

Teacher C: It is definitely a focus for teachers. Smart boards are more interesting to students like the senteo's is. They, the administrators, come to see if we are using it. Teachers want the students involved and to learn in different ways.

5. In your discussions with other teachers, in what activity do they use technology the most?

Teacher A: They use it for assessment, review, and Jeopardy on the Smart board, especially math.

Teacher B: They use word, Keynote, library databases, and video sites. No one uses the senteos anymore.

Teacher C: They use Everyday Math, lots of streaming, Ed heads, RazKids, Reading A-Z on the Smart boards.

6. It seems that every school has teachers who are stand out users of technology? If this is true here, can you characterize them for me, what are they like?

Teacher A: They understand what's there and how they can use it; they are flexible, adaptive, and innovative. It is one thing to use technology or a wiki but using it in a meaningful way for learning is different.

Teacher B: They are comfortable, and technology is part of what they do; they want to know what is new, can explain to others, don't get frustrated easily, and are patient.

Teacher C: The younger generation uses it more and has an understanding of it.

Do you have any other comments?

Teacher A: As a teacher, you are always looking to improve. It does make it easier, but there are a lot of things I would do if I had it everyday. You would use it differently. There is no vision at all.

Teacher B: I think the more guidelines and clear message of expectations and what should be used, then everyone can get on board.

Teacher C: It's a personal thing, and technology is a wonderful thing. We used the iPads today. I wish we had more differentiated training. I want to use it more. Our tech leaving was a huge loss.

The interview data was initially to be entered and analyzed using Dedoose, an online mixed-methods data program. However, because of the timeframe and lower number of interviews, a coding and thematic table was used for analysis (Appendix O).

The interview analysis suggests an underlying apprehension concerning technology implementation. For example, positive statements are immediately followed by verbiage that undermines this affirmative position. An example is the comment that there is a focus on technology in the district. It is followed by comments concerning its intrusion. Another example is the use of technology for data collection, followed by the sentence suggesting that it is "supposed" to streamline things.

The comments concerning barriers and usage align with survey data. Barriers identify specific issues with equipment malfunctions and lack of access. Interview data, asking how technology is being used, also, aligns with survey data. The use of presentation software, word processing, and one-to-one software programs align with standards that identify lower end technology use. This would align with Level 2 on the level of technology integration scale, a survey instrument developed by Dr. Chris Moersch. Clearly, the interviewees wanted to be somewhat positive in their responses, but the overall analysis suggests a struggle to use technology. An example of this is the comment suggesting that teachers are being watched and lack of technology vision in the district.

The results of these surveys and interviews indicate teacher tendencies toward a belief in using technology but a lack of productivity or transference of that belief into classroom practice. Chapter five describes these results and identifies possible future research.

CHAPTER V

CONCLUSIONS

The purpose of this study was to investigate the effect of teacher self-efficacy and collective efficacy on technology use in the classroom and to better understand relationships between them and the technological barriers that teachers face on a daily basis in the school environment.

Summary of Findings

Research Question One

What is the effect of teacher self-efficacy on technology use in the classroom?

The self-efficacy survey data describe teachers in each building and the district as having a high sense of teacher self-efficacy. The teacher self-efficacy scores, also, identify teachers as having a strong sense of self-efficacy in each of the three factors for student engagement, instructional practices, and classroom management. Teachers engage students, know how to teach, and can manage their classrooms. This staff believes in their ability to produce outcomes. This is good news. Research suggests a teacher's level of self-efficacy is directly related to productive teaching practices (Goddard, et al., 2004). Numerous studies recognize that a high level of self-efficacy aligns with trust, openness, and manifestation of classroom activities that are better planned and organized (Goddard, et al., 2004).

When asked if they can teach with technology, teachers responded with a mean score of 4.41 out of five across the district. They believe strongly that they can teach with technology. However, the teachers weren't sure about their abilities to implement

technology strategies in the classroom. It is a question that bridges the belief in technology to an action with technology. Using a five-point scale, district teachers scored a 3.38 mean with a low score of 2.71 in the 2-3 building, which means that they could implement technology strategies not-to-well to well in the classroom. This outcome may mirror Bandura's warning of generalizing self-efficacy assessments (Bandura, 1997). Pajares (1996) suggests specificity of self-efficacy assessment and correspondence with criterion tasks. However, multiple items were used to examine technology beliefs. Teachers have a high self-efficacy and believe they can use technology but struggle with implementation strategies.

This belief is reflected in another response item. Teachers indicated the person that most influences their use of classroom technology is themselves and not the principal, curriculum, or technology director, Board of Education, or even their peers. The students were the second most influential group to determine use of technology in the classroom. Teachers are suggesting that they determine technology use in the classroom. How this relates to the collective agency, or school goals, is undetermined, but it is known that teacher beliefs about their potential will have an influence on their subsequent performance expectancies (Pajares, 1996).

Schools are organized by priorities, goals, objectives, or outcomes. It is important for students to reach academic milestones based on abilities and age, and schools address this in the form of priorities. Objectives and goals are identified that align with curriculum best practices and these become the collective agency. For example, reading and writing are important priorities in schools. They receive time, training, and funding to succeed. Technology is expensive and considered a 21st century goal, but this does not

always translate into agency or use. The mean frequency of reported technology use in the district is once a week to several periods a week. This does not align with 21st century practices and standards and contrasts with the high level of teacher self-efficacy about their abilities to use technology. But, it does align with the teachers who need to learn technology strategies. In other words, the lack of technology use aligns with the high need to learn technology strategy response by teachers.

The dichotomy of believing in technology and poor usage may be a result of Ertmer's (1999) first- and second-order barriers. First-order barriers are extrinsic to teachers and include poor access or, as previously noted, a lack of training on instructional strategies. Second-order barriers are intrinsic to teachers and include their belief systems about teaching and learning as well as their teaching practices. If teachers are having difficulty with extrinsic barriers, it may prohibit their use of technology.

The conditional relationships between efficacy beliefs and outcome expectancies, also, may explain why teachers are self-efficacious about technology but don't use it in class. People take action when their self-efficacy beliefs and outcome expectations will produce the desired results (Bandura, 1997). They will avoid pursuits that will invite trouble for them but will actively pursue activities that they perceive will be successful for them. For example, if a teacher wants to use the technology but knows that the laptops won't be charged or may not connect to the network, they will avoid the expected negative consequences. This is different from someone who doesn't believe they can use the technology, but it still has the same outcomes.

High teacher self-efficacy levels are corroborated by the technology survey question concerning barriers. It identifies that the barrier having the least impact on

technology use was the teacher's personal beliefs. The data indicate it is not teacher beliefs that inhibit use but barriers of training, technical support, instructional strategies, and time. These barriers do influence the use of technology, one way or the other. All three interviews corroborated first order barriers, such as time, access, and technology support as elements that influenced their behavior toward using technology.

Research Question Two

What is the effect of collective efficacy on technology use in the classroom?

"Human behavior is determined by the individual rather than solely by the environment" (Bandura, 1997, p. 9). Yet, these two dynamics, the individual and group, share a dependency that determines functionality and success. In fact, "group pursuits can be as demanding of personal efficacy as individual pursuits"(Bandura, 1997, p. 32). Collective efficacy is the shared belief of people in their capabilities to produce effects together.

The research data indicate a high collective efficacy across the district. Mean scores range between 4.84 and 5.31 on a six-point scale. This means that teachers in each of these schools, as well as within the district, believe they can work together to have a positive effect on students (Goddard et al., 2004). Goddard et al. suggests, "the perceived collective efficacy is a potent way of characterizing the strong normative and behavioral influence of an organization's culture on teachers' professional work and, in turn, student achievement" (p. 8).

Teachers responded that the school, as a collective, occasionally to very frequently encourages technology use. This question does not isolate classroom technology as a focus but does indicate teachers are being encouraged to use technology.

How this translates to classroom teacher action remains questionable, especially given the poor usage data.

When asked who influences teachers the most in using classroom technology, the teachers selected themselves first. Students were second; Peers were third and, interestingly, administrators were the least influential. It is clear that the people who establish policy and program in the district have the least influence on classroom technology. This is a red flag. School leadership is a critical factor in facilitating teacher change and creating a supportive environment with a shared vision for technology use (Ertmer, et al., 2009). Does this compromise the collective efficacy levels?

Research Question Three

What is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting?

This question was designed to investigate the influence of the teacher, the collective, and the organizational services or possible barriers that could impact technology use. Results include technology utilization, student applications, institutional barriers, pedagogical tendencies, and teacher and collective efficacy**.**

How teachers make decisions is important. Knowledge, skill, and even prior attainments are poor indicators of action because of the powerful influence of a person's beliefs on his/her behaviors (Pajares, 1996). Bandura's reciprocal determinism suggests that personal factors in the form of cognition, affect, and biological events, as well as behavior and environmental influences, create interactions based on how individuals interpret their performance. It is efficacy beliefs that help determine how much effort people will expend on an activity, how long they will persevere when confronting

obstacles, and how resilient they will prove to be in the face of adverse situations (Pajares, 1996). This results in a greater effort, persistence, and resilience in teachers. Because of the high efficacy levels, this could suggest teachers would use technology more in the classroom. But, beliefs don't always translate into action. While technology use is greatly influenced by beliefs, Ertmer & Ottenbreit-Leftwich (2009) suggest that these beliefs are heavily influenced by the subject and school culture.

The district mean describing how often teachers use technology for instruction was 4.75, suggesting that technology is being used at least once a week and close to several periods a week. When asked how well technology strategies could be implemented in the classroom, the teachers responded with a 3.38 mean with a low score of 2.71 in the 2-3 building, using a five-point scale. These scores do not identify a priority and conflict with the teachers' high response in their belief to use technology.

Also, it was important to understand how students were using technology in the district. The data indicates that occasionally to frequently teachers are teaching when students are using technology. This means that teachers are actively involved in the class. Teachers selected between the categories of presentation, writing, research, experiments, skill and drill, collaborative projects, and creativity to demonstrate how they used technology. Within these categories, the data results indicate that students engaged in these activities rarely to occasionally in the classroom. There was not one category that occurred most frequently. One teacher commented that she used tables and graphs occasionally. Time on task becomes another important observation, and students are not using technology often during their day.

Instructional strategies and pedagogy often influence daily practices and classroom organization. In technology, the use of constructivist principles has an enormous research base. Constructivist teachers use those student-centered practices that align with high levels of technology use (Judson, Roehrig, as cited in Ertmer et al., 2009). In this district, constructivism is used most, by the slightest of margins. One building uses cognitivism more than the others, and behaviorism is a close second to the more hands-on student-centered approach. In support of this perspective, teachers, also, identified the student practices of writing, presentation, and skill and drill, as the highest forms of technology use. Collaborative projects were ranked third. This type of student output suggests individual work by students. These activities have their place in education, but when aligned with pedagogical principles, they fail to support constructivist practices.

The last data point addresses systemic barriers. Beyond instructional nuances, leadership influences, or collective goals, the practical use of a technology system still depends on bytes, bits, batteries, applicable software, training, support and more. Teachers identified a lack of training, insufficient technical support, and time to accomplish expected goals as barriers to technology use in the classroom. Time, training, access, and instruction strategies were identified as the biggest barriers to teachers, which were corroborated by the interview data.

Summary / Implications/ Further Study

What are the effects of teacher self-efficacy and school collective efficacy on technology use in the classroom? Does one lead to another? Data analysis suggests that

a high self- and collective efficacy has no effect on technology use in the classroom, and a belief in technology does not lead to the use of technology.

This study highlighted teachers' strong beliefs about their self- and collective efficacy, as well as technology. However, as research supports, belief does not always translate into technology use (Ertmer, P., Ottenbreit-Leftwich, A., & York, 2005; Pajares, F., 1996). This is illustrated in the lack of time using technology, the low level uses, such as writing and presentation, and the pedagogical tendencies in the district. Overall, the results of the surveys and interviews indicate strong teacher tendencies towards a belief in using technology but a lack of productivity or transference of that belief into classroom practice. There may be several reasons why this is true.

Because technology is often associated with a constructivist teaching style, it was important to understand these tendencies. The results indicate district pedagogical practices are closely divided between behaviorism, cognitivism, and constructivism, which could explain the low-level student applications in the classroom and lack of use. Teacher's high sense of self- and collective efficacy did not reflect a preference toward an instructional style of practice, and regardless of the pedagogy, teachers were efficacious. Additional research could explain to what extent pedagogical practices influence technology use in the classroom and whether or not this is also a barrier for teachers. The lack of constructivist pedagogy leads to further questions. What influence, if any, does training have on teacher practices and beliefs? Is changing a teacher's pedagogy possible? It is not clear, despite research suggesting that constructivist teachers use technology more, that other pedagogies interfere with technology use. Unless the first order barriers are eliminated this question remains open to research.

The finding that teachers use technology once a week illustrates that teachers do not spend a lot of time using technology for instruction. Together, the barriers, instructional practices and pedagogy, and time, are influential factors in determining technology use. It, also, highlights the traditional tendencies in the district for technology implementation, training, and usage. These barriers are decades old and have been acknowledged for as long as technology has been in the classroom. Why these barriers continue to exert a strong influence requires additional research. The systemic issues confront the systemic practices. If they are not addressed, the same events will happen again and again.

There is a high sense of collective efficacy in the district, which means that teachers believe they can work together to attain successful goals. This is important. Schools with high collective efficacy exercise empowering influences on students (Pajares, 1996). Several studies documented strong links between perceived collective efficacy and student achievement (Goddard, et al., 2004). Additionally, the collective efficacy influence on self-efficacy is critical. When collective efficacy is strong, it enhances teacher self-efficacy; and if it is weak, it will undermine it (Goddard, et al., 2004). The data suggest that the district has this high sense of efficacy, but it is not clear if everyone is in agreement about technology use. A critical outcome of the survey was how teachers identified who influenced their technology use. The administrators were the least influential on teacher practices. If this is so, how can there be such a high sense of collective efficacy? Does a high collective efficacy always translate into high productivity? These questions require additional research.

Exceptional users of technology seem to transcend school barriers, such as equipment access, timely technical support, training, and time. However, these teachers are the exception. Many teachers are easily overpowered by daily barriers and, as Bandura (1996) suggests, will seek to use strategies that are less confrontational and upsetting. The district barriers reported in the survey data were poor leadership, a lack of vision, equipment failure, and time, and each were corroborated by interview data. Additionally, the data identified time on task as poor and the types of use align with the low technology instructional strategy response by teachers. Teachers clearly believe that they can use technology but, once again, they are not sure how to do that.

Do issues with time, support, and access override self- and collective efficacy? In other words, do the day-to-day practices, for better or worse, play a larger role than efficacy in technology use? The unfortunate and sad conclusion in this district is that it does. Despite thirty years of technology in education, the use is limited and bound by the same barriers that existed at the inception of technology use in the classroom. Additionally, the higher levels of use normally associated with a constructivist and collaborative learning environment is not evident. The majority of time computers are used for writing, presentation, skill and drill, and research.

Several more questions emanate from the study results that require further study. The first concerns the strong efficacy results and the pedagogical outcomes. The influence of teacher control, or active participation, in class is less affiliated with constructivism than the two pedagogies of behaviorism and cognitivism. Does this control influence teachers' perceptions of self-efficacy? In other words, do teachers identify teacher control with good teaching practices; and does technology, and the

tendency towards constructivism, jeopardize or challenge these beliefs? It, also, is fair to ask the question, do teachers know what they don't know? If teacher beliefs do not influence technology use in the classroom, is the acquisition of knowledge the answer?

Additionally, are teachers capable of true self-reflection and candor when they are analyzing their own work? This is hardly a statement concerning solely these teachers but one of human behavior. There is a general tendency to want to submit the right answer in any survey. Do these clear-cut questions concerning beliefs, barriers, and teacher productivity challenge human behavior and indirectly "set-up" teacher responses?

The teacher responses overwhelmingly identified extrinsic barriers as impediments to technology use. Teachers identified themselves as the most influential person determining use of classroom technology, above students, peers, administrators, or even the collective. Can or do teachers make decisions about classroom activities in isolation? If so, what influence does this have on the system and student learning?

How much influence does the collective agency have on teacher behavior in this school? Specifically, at what point in a teacher's decision-making does the collective agency override personal beliefs, and what are the characteristics that contribute to this conflict and submissive behavior?

In future research, it is important to infuse additional qualitative research tools in similar research to corroborate teacher responses and minimize bias. For example, classroom visitations, use of historical data, and additional interviews with school stakeholders would strengthen research findings.

This study was not intended to be a case study; but, as a result of circumstances during implementation, it could be seen as such. The systemic perspective of using

several intrinsic and extrinsic variables supports this perception. The in-depth analysis of technology use and the activities supporting exploration, descriptive, and explanatory facets of technology use align with this method. However, the author suggests even more on-site analysis to strengthen the case study perspective. Still, this alignment is helpful when generalizing results. The replication of this study would support generalizations of these outcomes. However, current research also suggests that the generalization of the theory that technology decisions are not based on self- or collective efficacy corroborates the current analysis (Ertmer, Ottenbreit-Leftwich, Sadık, Emine, & Sendurur, 2012).

The inclusion of the entire staff, as opposed to just teacher technology leaders, is a small point to make toward the generalization of these findings. Often, similar research will address those teachers with constructivist tendencies and who have already embraced technology in the classroom. The purpose of this research was to address the school as a system, each classroom as a focal point, each teacher as representative, and each student technology activity as important to data analysis of the system. The holistic approach addresses these points and minimizes only the elite perspective. Yet, it is important to research this group to better understand their characteristics and implementation strategies. Interview responses suggest that the elite uses of technology were not very different than non-elite users. This data could be used as a script or template for an examination of these differences and similarities in the future.

The contribution of this study illustrates the systemic beliefs of the author. The combination of self- and collective efficacies and technology may be the first time they have been studied together (W. Hoy, personal communication, August 7, 2012). If schools are going to continue to spend resources on technology, they should take a close

look beyond the superficial and quick products of technology and reflect on the systemic utilization, needs, and productivity, technology can offer. This includes the collective agency and beliefs of staff.

School districts should address how technology offers new and improved methods of work and operations. For example, the school schedule has a great influence on technology use and student learning. If it doesn't change, the risk of having the same barriers continue to produce frustration in the future exists. The discussions should focus on school culture, habits, and the environment to maximize the potential of technology in the 21st century and shift the priority and focus to students first, and always first in all decisions.

Finally, education cannot ignore the influences of technology on culture and daily habits. In the few short decades since computer inception in schools, people are talking about eliminating books when it took hundreds of years to get them printed and used by the masses. Technology has quickly changed the rules of learning. Current practices have not kept pace with student and teacher needs. With careful thought, one should identify the fundamental changes needed in education to provide students and teachers with the support they need to be successful.

Limitations

1. Because the nested sampling will be used in the quantitative phase of the study, the researcher cannot say with confidence the sample will be representative of the population (Creswell, 2002).
2. In the quantitative phase of the study, there is a potential risk of a non-response error, i.e., problems caused by differences between those who respond and those

who do not in the event of a low response rate (Dillman, 2000).

3. The results of discriminant analysis have limited generalizability. Usually they generalize only to those populations from which the sample was obtained (Tabachnick & Fidell, 2000).
4. Due to the nature of qualitative research, the data obtained in the second phase of the study may be subject to different interpretations. The sessions will be recorded, and those interviewed, will be asked to review the transcripts.
5. Because of the interpretative nature of qualitative research, the investigator may introduce her bias into the analysis of the findings. To mitigate bias, the sessions will be recorded, and those interviewed will be asked to review the transcripts.
6. There is a potential for bias in the qualitative results interpretation, because the researcher is a recently retired technology director and, as such, may have influential opinions and experiences.
7. Data was collected prior to and after the winter break in the district. Because of the nature of the season, the timing most likely impacted the number of participants. The subjects taking the survey represented 31 percent of the entire district staff.

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APPENDICES

Appendix A: Principal Letter

DUQUESNE UNIVERSITY
600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

Dissertation Title: Beliefs and technology – does one lead to the other? Evaluating the effects of teacher self-efficacy and school collective efficacy on technology use in the classroom

Date

Dear Principal,

Thank you for your support. I sincerely appreciate the opportunity to collect data from teachers based in your building. I am confident that the study will contribute to research and provide a better understanding of technology use in the classroom. Below is a synopsis of the project and the anticipated impact on teachers.

The process includes your involvement in two ways. Because I cannot attend a faculty meeting, I ask that you read a statement concerning the research study to your staff. Also, to address staff spam and public access issues I ask that you forward an email to your teachers with the survey link.

The purpose of this study is to better understand the influence teachers have in their classroom and on each other pertaining to technology use and practices. It will identify the relationship between a teacher's self-efficacy, the school collective efficacy, and classroom technology practices. It will also inform us how technology barriers influence teacher technology plans and usage. Hence, the study provides a systemic perspective and a possible guideline for schools to better understand how their organization influences technology practices in the classroom.

The teachers will be asked to complete an online digital 15-minute 36-question survey. At the end of the survey volunteers will be asked to participate in an interview that will last no longer than 30 minutes and will take place over the telephone. I will use a randomization tool to select the final pool of interview subjects. There will be two-six interviews per district. These volunteers will receive a $25.00 stipend. There is no stipend for those taking the survey only.

The survey is anonymous. Survey Monkey will automatically issue a numeric code identifier. The interview candidates will initiate contact with me via email. The subject's name will be removed after their approval of the transcript. There will be no personal or district identities in the final report. Specific grade levels and subjects, and IP addresses will not be collected. Secure socket layer protocol, commonly known as SSL, is a cryptographic protocol that provides communication security over the Internet. This

digital certificate will be used to increase Internet data security. Survey Monkey will issue a code to identify this study as my study and a code to identify the building. The building code will be used to group responses into building collectives. All school names will be coded in the final report.

Please let me know when I can call to discuss the details of the research.

Warm Regards,

Elaine Studnicki

Appendix B: Principal Script

Principal Script

A graduate student from Duquesne University, Elaine Studnicki, is requesting your participation in her dissertation study.

The purpose of this study is to better understand the influence teachers have in their classroom and on each other pertaining to technology use and practices. It will ask you to identify your beliefs about teaching, instruction, and the school as a collective with regards to technology barriers and use in the classroom.

It includes a fifteen-minute anonymous thirty-six-question survey. Our survey will have our school initials in the link address. This identifier will be removed in the final report. She will also ask people to participate in a seven-question telephone interview. There is no payment for the survey but interview volunteers will receive $25.00.

Please look for an email that I will send to you with a link to the survey and further explanation of the study.

This title and questions are:

Evaluating the effects of teacher self-efficacy, school collective efficacy, and technology barriers on technology use in the classroom.

1. What is the effect of teacher self-efficacy on technology use in the classroom?
2. What is the effect of collective efficacy on technology use in the classroom?
3. What is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting?

Remember you can choose to participate or not and you may withdraw from the study at any time. If you do respond affirmatively, you can take the survey anywhere and anytime within a month of my sending you the link.

Appendix C: Teacher email link

DUQUESNE UNIVERSITY
600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

Date

Dear Principal,

Thank you for agreeing to participate in my graduate research project. I have provided a short description of the project below and attached a link to the online survey. Please forward this email to all of your teachers.

With Appreciation,

Elaine Studnicki

Survey Link: (Link)

Dear Teachers,

You are being asked to participate in a graduate research project. The purpose of this study is to better understand the influence teachers have in their classroom and on each other pertaining to technology use and practices. It will identify the relationship between a teacher's self-efficacy, the school collective efficacy, and classroom technology practices. It will also inform us how technology barriers influence teacher technology plans and usage. Hence, the study provides a systemic perspective and a possible guideline for schools to better understand how their organization influences technology practices in the classroom. It includes a fifteen-minute thirty-six-question survey. I will also ask people to participate in a seven-question interview. There is no payment for the survey but interview volunteers will receive $25.00.

The survey is anonymous. Only the first survey question is mandatory because it is the consent form for the study. This is a requirement of research protocol. Each school will receive a secure unique survey link with their school initials in the address. The purpose for the initials is simply for organization and efficiency. The survey is identical for all participants. All school names will be coded in the final report.

The interview will be audio recorded and over the telephone. Candidates will be asked to initiate contact and provide their name and email address. Names will be removed from the interview transcript and contact information deleted upon transcript approval by the subject.

There will be no personal or district identities in the final report. Specific grade levels, subjects, and IP addresses will not be collected. A secure Internet link will be used for the survey.

You are under no obligation to participate and may choose to end your participation at any time. To proceed with the survey you must click yes on the first question.

The study title is "Evaluating the effects of teacher self-efficacy, school collective efficacy, and technology barriers on technology use in the classroom." The study questions include the following:

1. What is the effect of teacher self-efficacy on technology use in the classroom?
2. What is the effect of collective efficacy on technology use in the classroom?
3. What is the relationship among teacher self-efficacy, collective efficacy, and barriers that inhibit technology use in a K-12 classroom setting?

If you have any questions you may call Dr. Joseph Kush, Chair of the Duquesne University Institutional Review Board (412.396.1995), Elaine Studnicki, (estudnicki@gmail.com) or her advisor, Dr. David D. Carbonara, (412.396.4039).

Thank you very much for your help.

Happy Holidays,

Elaine Studnicki
Duquesne University

Survey Link: "LINK"

Appendix D: Electronic Survey Consent, Questions, & Interview Request

Appendix D: Survey Consent Form, Survey Questions, and Interview Request Statement
1. TITLE: Evaluating the effects of teacher self-efficacy, school collective efficacy, and technology barriers on technology use in the classroom.
INVESTIGATOR: Elaine Studnicki 20
Sand Hill Road, Flemington, NJ 08822
ADVISOR: Dr. David Carbonara. In partial fulfillment of a Doctorate of Education in Instructional Technology
PURPOSE: You are being asked to participate in a research project that seeks to investigate the influence teachers have on their use of technology in the classroom and on other teachers' use of technology in classrooms. It will identify the relationship between a teacher's self-efficacy, the school collective efficacy and also inform us of classroom technology practices and how technology barriers influence teacher technology plans and usage.
YOUR PARTICIPATION: All teachers are invited to take a 36-question 15minute digital online survey. The survey will be taken at the teacher's leisure at a computer and location of their choosing within one month of the request.
All subjects will be required to verify voluntary participation and consent knowledge by clicking a mandatory yes statement on the first question of the digital survey.
RISKS AND BENEFITS: This survey asks about your belief's concerning instruction, your building's use of technology, and how you use technology in the classroom. Asking about work may influence your responses, however, the intent is to learn how individual beliefs, as well as those of the collective organization influence technology use. A systemic perspective of technology use for instruction is important to understand and relational to the individual experience.
COMPENSATION: There is no compensation for survey participation.
CONFIDENTIALITY: All survey responses will be anonymous. Specific grade levels and subjects, names, and IP addresses will not be collected. School names are collected to analyze the collective efficacy of the building. Each school will receive a secure unique survey link with their school initials in the address. The purpose is simply for organization and efficiency. The survey is identical for all participants. All school names will be coded in the final report.
The data will be locked in the researcher's home for five years and then destroyed.
RIGHT TO WITHDRAW: Potential subjects may refuse to participate or withdraw from the study at any time.

SUMMARY OF RESULTS: A summary of the results will be available upon request for the professional staff of the participating school districts.
VOLUNTARY CONSENT: I have read the above statements and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.
I understand that should I have any further questions about my participation in this study, I may call Dr. Joseph Kush, Chair of the Duquesne University Institutional Review Board

(412.396.1995). If I have any questions I may contact Elaine Studnicki at elainestudnicki@gmail.com or her advisor, Dr. David D. Carbonara (412.396.4039).
SIGNATURES: By clicking on the YES statement below you are officially volunteering to participate in this study.
CLICK YES & NEXT TO CONTINUE
OR
NO & NEXT TO EXIT THE SURVEY
YES
NO

1. Please enter the following gender information:
2. Years Teaching:
Female
Male
12
36
712
13-20
20+

Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential. There are 12 questions on this page.

1. Teachers in the school are able to get through to the most difficult students.
2. Teachers here are confident they will be able to motivate their students.
3. If a child doesn't want to learn teachers here give up.
4. Teachers here don't have the skills needed to produce meaningful student learning.
5. Teachers in this school believe that every child can learn.
6. These students come to school ready to learn.
7. Home life provides so many advantages that students here are bound to learn.
8. Students here just aren't motivated to learn.
9. Teachers in this school do not have the skills to deal with student disciplinary problems.
10. The opportunities in this community help ensure that these students will learn.
11. Learning is more difficult at this school because students are worried about their safety.
12. Drug and alcohol abuse in the community make learning difficult for students here.

1 Strongly Disagree
2 Disagree
3 Somewhat Disagree
j4 Somewhat Agree
5 Agree
6 Strongly Agree

Directions: Please indicate your level of agreement with each of the following statements about your school from strongly disagree to strongly agree. Your answers are confidential. There are 12 questions on this page.

1. How much can you do to control disruptive behavior in the classroom?
2. How much can you do to motivate students who show low interest in schoolwork?
3. How much can you do to get students to believe they can do well in schoolwork?
4. How much can you do to help your students value learning?
5. To what extent can you craft good questions for your students?
6. How much can you do to get children to follow classroom rules?
7. How much can you do to calm a student who is disruptive or noisy?
8. How well can you establish a classroom management system with each group of students?
9. How much can you use a variety of assessment strategies?
10. To what extent can you provide an alternative explanation or example when students are confused?
11. How much can you assist families in helping their children do well in school?
12. How well can you implement alternative strategies in your classroom?

1 Nothing
2
3 Very Little
4
5 Some
6
7 Quite a Bit
8
9 A Great Deal

Directions: These questions are designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below.
Each one is unique and different. Please read them carefully.

1. Please identify the extent in which the following categories inhibit you when using technology for instruction?
Equipment Access
Timely
Technical Support
Peer Pressure
Administrative
Support
Training
Time
Personal Beliefs

Instructional Strategies
Not at all Very Little Somewhat To a Great Extent

2. Using technology I can be a better teacher.
Disagree
Undecided
Agree
Strongly Agree
Strongly Disagree

3. How often do you use technology for TEACHING/INSTRUCTION?
Please DO NOT confuse this with administrative functions such as grading, attendance, or emails.

4. What influence do the following people have on your use of technology?
Your Peers (other teachers)
The Curriculum Director
The Technology Director
The Students
Board of Education
Yourself
No Influence Some
Influence
Moderate
Influence
A great Deal of Influence
The most Influence on me

I would use technology more often if I had:

5. I can teach with technology.
Not at all
Monthly
Every Other Week
Once a week
Several periods a week
On a Daily basis

6. Please identify your student's current use of classroom technology.
Please check the appropriate response.
In unison with Instruction
Presentation
Writing
Research
Experiments
Skill and Drill

Collaborative Projects
Demonstrate Creativity
Never Rarely Occasionally Frequently Almost Daily

7. To what extent does the school, as a collective, encourage you to use technology?
Strongly Disagree
Disagree
Undecided
Agree
Strongly Agree
Other (please specify)

8. We often use different teaching strategies to accomplish our goals.
However, inherently, we lean towards one that is most comfortable. Please prioritize your instructional strategies below.
Rarely Sometimes Most Used
Behaviorism: Based on observable changes in behavior. Behaviorism focuses on a new behavioral pattern being repeated until it becomes automatic.
Cognitivism: Based on the thought process behind the behavior.
Changes in behavior are observed, and used as indicators as to what is happening inside the learner's mind.
Constructivism: Based on the premise that we all construct our own perspective of the world, through individual experiences and schema.
Constructivism focuses on preparing the learner to problem solve in ambiguous situations.
Never
Very Rarely
Rarely
Occasionally
Very Frequently
Always

9. How well can you implement technology strategies in your classroom?
Not Well At All
Not Too Well
Well
Pretty Well
Very Well

Interviews are part of this study. If you would like to be interviewed please contact Elaine Studnicki at elainestudnicki@gmail.com.
Subjects will receive $25.00 for participation. The interview will be conducted over the telephone and will last approximately 30 minutes.
Thank you for your participation.

Appendix E: Interview Questions

Interview Questions

Thank you for agreeing to be interviewed. Your perspective is truly appreciated and will be held in strict confidence. I will record your responses, transcribe them, and send them to you for validation. After you respond all personal contact information will then be replaced by a numeric code or a pseudonym. There is no stress here. At any time you can refuse to answer a question or stop the Interview. No problems. Let's get started with this first question.

1. What is important to know about your school and technology?

2. Tell me about the influence other teachers have on your technology practices.

3. Barriers like time and access frustrate many teachers. What are your experiences and to what extent do these barriers interfere with classroom technology use?

4. Help me understand how the school at large uses technology? Is it a focus for teachers?

5. In your discussions with other teachers, in what activity do they use technology the most?

6. It seems that every school has teachers who are stand out users of technology? If this is true in your building or district, can you characterize them for me, what are they like?

7. Do you have any other comments?

Appendix F: Interview Communication

Thank you for volunteering to be interviewed. I appreciate your time and input for the study. To proceed there are four simple steps to be taken.

1. You have to officially consent to the interview. Please click on the following link, read the consent information. It is one page and very similar to the survey consent form. "LINK"

2. Please identify a time and date so I may call you. I will do my best to make myself available at your convenience and sent that to me in an email.

3. Please give me your home address so I can send you the $25.00 stipend.

4. Respond to this email with the requested information.

Process

The interview process includes the audio taping of our conversation. The interview dialogue will be transcribed, stripped of all identifying names and returned to you for verification.

When you receive the transcript I will ask you to review it, acknowledge the verification of information, and send it back to me. When I receive it back I will remove your name. The only identifying name will be your school district and it too will be coded in the final report.

For security purposes I will not use your school email address. If you have a private email address I will use that or send it to your home via US Mail. A private email address is one that is not associated with the school. An example of a private email address is mine, elainestudnicki@google.com. However, it can be a variety of other email hosts.

For those using US mail, a return stamped envelope will be included to return an initialed document verifying agreement to the transcript and any changes you made to the document. The email recipients will acknowledge content agreement by checking a statement in the return email.

There are seven questions that will take approximately 30 minutes.

Please contact me with any questions. Remember, you can leave the conversation at any time. You are under no obligations to complete our conversation.

Thank you,
Elaine

Appendix G: Interview Consent Form

DUQUESNE UNIVERSITY
600 FORBES AVENUE ♦ PITTSBURGH, PA 15282

TITLE:	Evaluating the effects of teacher self-efficacy and school collective efficacy on technology use in the classroom.
INVESTIGATOR:	Elaine Studnicki 93 Lake Forest Place Palm Coast, Florida 32137
ADVISOR:	Dr. David Carbonara. In partial fulfillment of a Doctorate of Education in Instructional Technology
PURPOSE:	You are being asked to be interviewed for a research project that seeks to investigate the influence teachers have on their use of technology in their classroom and on other teachers' use of technology in classrooms. It will identify the relationship between a teacher's self-efficacy, the school collective efficacy, and classroom technology practices and also inform us how technology barriers influence teacher technology plans and usage. The interviews will be audio taped and transcribed.
YOUR PARTICIPATON:	All subjects will be required to verify voluntary participation and consent knowledge by signing a mandatory digital consent form. The interviews will take approximately 30 minutes and occur over the telephone at a time of your choosing. Teachers will be asked to volunteer for the interviews via the survey and asked to contact the Co Investigator. The interviews will occur within one month of the start of the project.

The interview consists of seven questions. Participants will be asked to review the interview transcripts for accuracy.

RISKS AND BENEFITS: These interview questions ask about your belief's concerning instruction, your building use of technology, and how you use technology in the classroom. Asking about work may influence your responses, however, the intent is to learn how individual beliefs, as well as those of the collective organization influence technology use. The goal is to provide a systemic perspective of how technology is used. Additionally, at one time the Co Investigator was previously employed by Clinton Township School District. This may also influence your decision to participate in the study.

COMPENSATION: Interviewee's will receive $25.00.

CONFIDENTIALITY: Interviewee's names must be recorded for communication purposes only. Once the communication process is completed the names will be replaced with numeric or a pseudonym. When the audiotapes are transcribed all identifiers will be removed, both in reference to the subject and in reference to anyone identified within the conversation. All interview data is strictly confidential.

RIGHT TO WITHDRAW: Potential subjects may refuse to participate or withdraw from the study at any time.

SUMMARY OF RESULTS: A summary of the results will be available upon request for the professional staff of the participating school districts.

VOLUNTARY CONSENT: I have read the above statements and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any further questions about my participation in this study, I may call Dr. Joseph Kush, Chair of the Duquesne

University Institutional Review Board (412.396.1995). I may also contact Elaine Studnicki, (elainestudnicki@gmail.com) if I have any questions or her advisor, Dr. David D. Carbonara, (412.396.4039).

SIGNATURES: Both the researcher and subject should sign, and each should hold a copy with original signatures.

Participant's Signature_____Date_____

Researcher's Signature_____Date_____

Appendix G: Interview Consent Form

Appendix G Interview
Consent Form
1. TITLE: Evaluating the effects of teacher self- efficacy,school collective efficacy, and technology barriers on technology use in the classroom.
INVESTIGATOR: Elaine Studnicki 20
Sand Hill Road, Flemington, NJ 08822
ADVISOR: Dr. David Carbonara. In partial fulfillment of a Doctorate of Education in Instructional Technology
PURPOSE: You are being asked to participate in a research project that seeks to investigate the influence teachers have on their use of technology in the classroom and on other teachers' use of technology in classrooms. It will identify the relationship between a teacher's self-efficacy, the school collective efficacy, and also inform us of classroom technology practices and how technology barriers influence teacher technology plans and usage.
YOUR PARTICIPATION: All teachers are invited to participate in a seven-question interview. The interview will take place via telephone for approximately 30 minutes. The subject will choose the time and date within one month of the request. All subjects will be required to verify voluntary participation and consent knowledge by clicking a mandatory yes statement located below.
RISKS AND BENEFITS: This interview asks about your beliefs concerning instruction, your building's use of technology, and how you use technology in the classroom. Asking about work may influence your responses, however, the intent is to learn how individual beliefs, as well as those of the collective organization influence technology use. A systemic perspective of technology use for instruction is important to understand and relational to the individual experience.
COMPENSATION: There is a $25.00 compensation for the interview participation.
CONFIDENTIALITY: All interview responses will be highly confidential. All personal names will be removed from the transcript. All school names will be coded in the final report. The data will be locked in the researcher's home for five years and then destroyed.
RIGHT TO WITHDRAW: Potential subjects may refuse to participate or withdraw from the study at any time.
*
SUMMARY OF RESULTS: A summary of the results will be available upon request for the professional staff of the participating school districts.
VOLUNTARY CONSENT: I have read the above statements and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.
I understand that should I have any further questions about my participation in this study, I may call Dr. Joseph Kush, Chair of the Duquesne University Institutional Review Board (412.396.1995). If I have any questions I may contact Elaine Studnicki at elainestudnicki@gmail.com or her advisor, Dr. David D. Carbonara (412.396.4039).

SIGNATURES: The subject should click on yes to officially agree to participate.
CLICK YES TO AGREE
OR
NO TO EXIT

Appendix H: Interview Data Verification

US mail interview verification statement

☐ I have read the interview transcript and commented on the points I thought needed clarification. By initialing this statement I hereby verify the information and consent to its use within the study.

Email interview verification statement

☐ I have read the interview transcript and commented on the points I thought needed clarification. By checking this statement I hereby verify the information and consent to its use within the study.

Appendix I: Transmittal Form

Date of Submission: _____
Protocol Number: _____
Review Category: ☐ **Exempt**

DUQUESNE UNIVERSITY INSTITUTIONAL REVIEW BOARD

PROTOCOL FOR PROTECTION OF HUMAN SUBJECTS IN RESEARCH

TRANSMITTAL FORM

Title of Study: Evaluating the effects of teacher self-efficacy, school collective efficacy, and technology barriers on technology use in the classroom.

Name of Principal Investigator: Dr. David Carbonara

School/Department: School of Education, Instructional Technology

Address: 600 Forbes Ave. 327A Fisher Hall Pittsburgh, PA 15282

Phone: 412.396.4039 E-mail: carbonara@duq.edu

Is this a Student Project: x **YES** ☐ **NO**

Name of Student Co-Investigator (if applicable) Elaine Studnicki

Phone: 908-455-1114 **E-mail:** elainestudnicki@gmail.com

Mailing Address : 20 Sand Hill Road, Flemington NJ 08822

Names of Other Co-Investigators:

_____

Intended sponsor/funding agency:

_____

Date of submission: _____

If you have submitted this protocol to another IRB, give the following information:

Name of institution: ___-

_____

Date Submitted:

_____

Approval status: (Check one.)

□Approved (attach copy of letter)
□ Pending (date of expected review) _____
□ Disapproved (attach copy of letter)

Will subjects receive money, course credit or gifts in exchange for their participation?

x YES (specify)
□ NO

Interviewee's will receive $25.00.

HIPAA

1. Does your research involve the collection, use, and/or dissemination of health (either physical health or mental health) data?
   □ **YES** If YES, proceed to question 2
   x NO If NO, proceed to the next section

2. Is the data from a healthcare provider (hospitals, doctors' offices, health departments, and many others who transmit patient health information electronically), clearinghouse, and/or healthcare plan?
   □ **YES** If YES, proceed to question 3
   x NO If NO, proceed to the next section

3. Does the healthcare provider, clearinghouse and/or healthcare plan do one or more of the following transactions using electronic media:

   (Transaction means the exchange of information between two parties to carry out financial or administrative activities related to health care. It includes the following types of information exchanges):

   1. Health care claims or equivalent encounter information (insurance forms).
   2. Health care payment and remittance advice (patient bills).
   3. Coordination of benefits.
   4. Health care claim status.

5. Enrollment and disenrollment in a health plan (selecting health insurance).
6. Eligibility for a health plan.
7. Health plan premium payments.
8. Referral certification and authorization.
9. First report of injury.
10. Health claims attachments.
11. Other transactions that the Secretary may prescribe by regulation.

□ **YES** If YES, complete **5 HIPAA FORMS**
x **NO** If NO, proceed to the next section

Category of Review Requested: (Check one.)
□ Exempt
x Expedited
□ Full (studies that do not meet criteria for Exempt or Expedited must be reviewed by the full IRB at one of the regularly scheduled meetings)

If seeking ***Exemption*** complete this section by checking the number of all that apply.

1. □ Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special educational instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

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

3. □ Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b) (2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

4. □ Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner

that subjects cannot be identified, directly or through identifiers linked to the subjects.

5. □ Research and demonstration projects which are conducted by or subject to the approval of Department or Agency heads, and which are designed to study, evaluate, or otherwise examine: (i) Public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

6. □ Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

If seeking ***Expedited*** Review complete this section by checking the number of all that apply.

1. □ Clinical studies of drugs and medical devices only when the drugs or devices have been approved for marketing and are used as prescribed.

2. □ Collection of blood samples by finger stick or venipuncture from non-pregnant healthy adults in amounts less than 550 ml in an eight-week period and no more than twice per week.

3. □ Prospective collection of biological specimens by non-invasive means (e.g. hair and nail clippings, extracted teeth, excreta and external secretions, uncannulated saliva, placenta removed at delivery, amniotic fluid obtained at rupture of membrane prior to or during delivery, dental plaque and calculus, mucosal and skin cells collected by swab and sputum collected after saline mist nebulization.)

4. □ Collection of data through non-invasive procedures routinely employed in clinical settings, excluding x-rays or microwaves (e.g. physical sensors that do not shock or invade the subject's privacy, weighing or testing sensory acuity, magnetic resonance imaging, EEG, EKG, moderate exercise or strength testing with healthy non-pregnant subjects.)

5. □ Research involving data, documents, records or specimens collected for non-research purposes, such as medical records.

6. **x** Collection of data from audio or visual recordings.

7. **x** Research on individual or group characteristics when considering the subject's own behavior (including perception, cognition, motivation, identity, language, communication, socio-cultural beliefs, practices or behavior) or research

employing survey, interview, oral history, focus group or program evaluation measures for purposes of research.

~~~~~~

If seeking ***Full*** Review, check the categories that apply to your subjects or methods.

1. □ Subjects under the age of 18
2. □ Pregnant women subjects
3. □ Frail elderly subjects
4. □ Incarcerated subjects or persons under a correctional sentence (parolees)
5. □ Mentally impaired subjects
6. □ False or misleading information to subjects
7. □ Withholding information such that subjects' consent is in question
8. □ Procedures for debriefing subjects (specify)
9. □ Biomedical procedures (If checked, answer the following)

(a) Are provisions for medical care necessary?
□ YES (give details)

(b) Has a qualified MD participated in planning the study?
□ YES (attach letter)
□ NO

(c) Will the study involve drugs, chemical agents, recombinant DNA, genetic research, ionizing radiation, non-ionizing radiation, microwaves, lasers, high-intensity sound, stem cells
□ YES (specify and describe)

10. □ Procedures that are novel or not accepted practice (if this category applies, explain in the abstract and consent forms how provisions are made to correct, treat or manage unexpected adverse effects)

11. □ Risky procedures or harmful effects, including discomfort, risk of injury, invasive procedures, vulnerability to harassment, invasion of privacy, controversial information, or information creating legal vulnerability (if this category applies, explain in the abstract and consent forms how harmful effects will be addressed and how benefits outweigh risks)
~~~~~~

12. □ Other conditions that might affect IRB approval (specify)

Signatures:

Dr. David Carbonara **Date:** _____

Principal Investigator Typed or Printed Name

_____ **Date:** _____

Signature

Student Co-Investigator (if applicable):

Elaine Studnicki **Date:** _____

Typed or Printed Name

_____ **Date:** _____

Signature

Co-Investigator (if applicable):

_____ **Date:** _____

Typed or Printed Name

_____ **Date:** _____

Signature

Co-Investigator (if applicable):

_____ **Date:** _____

Typed or Printed Name

_____ **Date:** _____

Signature

Co-Investigator (if applicable):

_____ **Date:** _____

Typed or Printed Name

_____ **Date:** _____

Signature

IRB representative (one signature for Exempt and Expedited, two signatures for Full review):

1. _____ **Date:** _____

Typed or Printed Name

_____ **Date:** _____

Signature

2. _____ **Date:** _____

Typed or Printed Name

_____ **Date:** _____

Signature

Complete this form with original signatures,
and include all attachments prior to delivering to the
IRB Office (424 Rangos Building).

Appendix J: Collective Efficacy Permission

Friday, August 19, 2011 1:43 PM
Page 1 of 2
Subject: FW: Collective efficacy
Date: Friday, August 19, 2011 1:42 PM
From: Elaine Studnicki <elainestudnicki@gmail.com>
To: Elaine Studnicki <elainestudnicki@gmail.com>
Collective Efficacy Survey Permission
From: Wayne Hoy <whoy@me.com>
Date: Wed, 25 May 2011 13:18:50 -0400
To: Elaine Studnicki <elainestudnicki@gmail.com>
Subject: Re: Collective efficacy
Dear Elaine--
You have my permission to use the collective efficacy scale in your research. You will find the instrument and its psychometric properties on my web page
[**www.waynekhoy.com <http://**
www.waynekhoy.com>].
Best wishes in your research.
Wayne

Wayne K. Hoy

Appendix K: TSES Permission Letter

College of Education Phone 614-292-3774
29 West Woodruff Avenue www.coe.ohio-state.edu/ahoy FAX 614-292-7900
Columbus, Ohio 43210-1177 Hoy.17@osu.edu
Anita Woolfolk Hoy, Ph.D. Professor
Psychological Studies in Education

Dear

You have my permission to use the *Teachers' Sense of Efficacy Scale* in your research. A copy of both the long and short forms of the instrument as well as scoring instructions can be found at:
http://www.coe.ohio-state.edu/ahoy/researchinstruments.htm

Best wishes in your work,
Anita Woolfolk Hoy, Ph.D.
Professor

Appendix L: Dr. Carbonara NIH

Completion Certificate

This is to certify that

David Carbonara

has completed the **Human Participants Protection Education for Research Teams** online course, sponsored by the National Institutes of Health (NIH), on 06/28/2005.

This course included the following:

- key historical events and current issues that impact guidelines and legislation on human participant protection in research.
- ethical principles and guidelines that should assist in resolving the ethical issues inherent in the conduct of research with human participants.
- the use of key ethical principles and federal regulations to protect human participants at various stages in the research process.
- a description of guidelines for the protection of special populations in research.
- a definition of informed consent and components necessary for a valid consent.
- a description of the role of the IRB in the research process.
- the roles, responsibilities, and interactions of federal agencies, institutions, and researchers in conducting research with human participants.

Appendix M: CITI Results

Elaine Studnicki (Member ID: 2256671)
CITI Collaborative Institutional Training Initiative
Introduction Optional -
Belmont Report and CITI Course
Introduction Taken 05/21/11 100
Students in Research Taken 05/21/11 100
History and Ethical Principles - SBR Taken 05/22/11 100
Defining Research with Human
Subjects – SBR Taken 05/22/11 100
The Regulations and The Social and Behavioral Sciences – SBR Taken 05/23/11 100
Assessing Risk in Social and Behavioral Sciences – SBR Taken 05/23/11 100
Informed Consent - SBR Taken 05/23/11 100
Privacy and Confidentiality - SBR Taken 05/23/11 100
Research with Prisoners - SBR Taken 05/23/11 100
Research with Children - SBR Taken 05/23/11 100
Research in Public Elementary and
Secondary Schools - SBRTaken 05/23/11 100
International Research - SBR Optional -
International Studies Optional -
Internet Research - SBR Taken 05/23/11 100
1 of 2 10/28/11 10:55 AM
Human Subjects Research at the VA Optional –
Research and HIPAA Privacy Protections Taken 05/23/11 100
Vulnerable Subjects – Research Involving Workers/Employees Taken 05/23/11 100
Hot Topics Optional -
Conflicts of Interest in Research Involving Human Subjects Taken 05/23/11 100
The IRB Member Module - "What Every New IRB Member Needs to Know"
Taken 10/28/11 100
Optional Modules https://www.citiprogram.org/members/learnersII/optionalmodules....
2 of 2 10/28/11 10:55 AM

Appendix N: Hoy Communication

Page 1 of 2
Subject: Re: Dissertation question
Date: Thursday, August 11, 2011 10:03 AM
From: Wayne Hoy <whoy@me.com>
To: Elaine Studnicki <elainestudnicki@gmail.com>
Hi Elaine--
Sorry, but I don't know of other studies that have combined all self efficacy and collective efficacy with the domain of technology.
Wayne!
!
Wayne K. Hoy!
Fawcett Professor of !
Education Administration!
hoy.16@osu.edu!
www.waynekhoy.com <http://www.waynekhoy.com> !
On Aug 10, 2011, at 4:21 PM, Elaine Studnicki wrote:
Dissertation question
Dr. Hoy,
Thank you for your time. I am writing my dissertation to better understand teacher self-efficacy, the school collective efficacy, and classroom technology use. I know you're busy so I will be brief. Do you know of any other study that has combined all self efficacy and collective efficacy with the domain technology? I have been looking for them but cannot find something with all three criteria.
Thank you for your permission to use your short form!
Page 2 of 2
Thank you very much,
Elaine Studnicki

Appendix O: Coding and Thematic Table

	Common Words	Compare/Contrast	Inferences
1. What is important to know about your school and technology?			
Teacher A		Focus/intrusion	If it's the law people have to use it
Teacher B			No reliable access
Teacher C			Always trying to bring in tech to make things more efficient
2. Tell me about the influence other teachers have on your technology practices.			
Teacher A			Depends on whom you are working with
Teacher B	Good		They push me in a good way.
Teacher C	Good		My generation should emulate younger teachers
3. Barriers like time and access frustrate many teachers. What are your experiences, and to what extent do these barriers interfere with classroom technology use?			
Teacher A	Laptops not working		Incentive lacking
Teacher B	Laptops not working		Shared Resources Broken
Teacher C			Lack of training and support
4. Help me understand how the school at large uses technology? Is it a focus for teachers?			
Teacher A	Wiki		Some don't use it even though it is there
Teacher B	Wiki	Not a focus	Compatibility issues
Teacher C		Definitely a focus	They come to see if we are using it.
5. In your discussions with other teachers, in what activity do they use technology the most?			
Teacher A	SmartBoards		No one uses Senteo's
Teacher B	SmartBoards, Math		
Teacher C	SmartBoards, Math		

6. It seems that every school has teachers who are stand out users of technology? If this is true here, can you characterize them for me, what are they like?			
Teacher A			
Teacher B			Using it in a meaningful way for learning is different.
Teacher C			The younger generation uses it more and more and have an understanding of it.
7. Do you have any other comments?			
Teacher A	Clearer message		Then everyone can get on board
Teacher B	No vision		
Teacher C			It's a personal thing. Our tech leaving was a huge lost