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Teacher Efficacy & Institutional Change with 1:1 Technology Initiatives in East Asia

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Teacher Efficacy & Institutional Change with 1:1 Technology Initiatives in East Asia

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CERTIFICATE OF APPROVAL

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Abstract

The purpose of this study was to explore the relationship between teachers' sense of efficacy and a change initiative that challenged teachers' current classroom practice. This study focused on 1:1 technology implementations in international schools from the East Asia Regional Council of Overseas Schools (EARCOS). The study also explored the relationship between teachers' sense of efficacy and their perceptions of the effectiveness of certain professional development formats. Teacher efficacy was defined using Tschannen-Moran and Woolfolk Hoy's (1998) integrated model, which included teachers' ability to control the outcomes and their self-perceived competency to accomplish the desired outcomes.

Data was collected from 234 participants in 14 EARCOS schools located in China, Japan, and South Korea. Participants were currently teaching at least one class of students in grades 6-12 with 1:1 technology access. The Teachers' Sense of Efficacy Scale was used to measure teacher efficacy in classroom management, instructional strategies, and student engagement.

The data analysis was separated into two strands. The first strand considered the relationship between teacher efficacy and experience, and the second evaluated teacher efficacy in relation to the perceived effectiveness of professional development formats. In regard to experience, multiple regression analysis evaluated significant relationships between teacher efficacy and the independent variables of 1:1 technology classroom teaching experience, age, general classroom teaching experience, gender, grade level(s) taught, passport nationality, subject(s) taught, and the type of 1:1 technology device in the classroom. In regard to professional development, multiple regression analysis and a one-way ANOVA was used to evaluate relationships between teacher efficacy and the perceived effectiveness ratings of the identified professional development formats.

The findings indicated that more experienced teachers demonstrated stronger teacher efficacy in instructional strategies and student engagement during a 1:1 technology implementation. The findings also showed that women had stronger efficacy in classroom management and student engagement than men. The multiple regression analysis found a strong significance between the perceived effectiveness of hands on workshops and teacher efficacy. The one-way ANOVA found significant relationships with 5 of the 8 professional development formats. The study also noted that many professional development formats were absent from teachers' experience.

Chapter One

The rapid changes of the 21st century are creating dynamic cultures of continuous improvement in schools around the world as new innovations and reform efforts are introduced to educational environments. Educational leaders face the challenge of prioritizing school improvement efforts and balancing multiple initiatives across an organization. Schools seek to improve their academic programs through the professional development of their teachers, yet run the risk of demoralizing them if expectations become overwhelming. Teacher efficacy, defined as teachers' self-perceptions of their ability to teach effectively and their perception of control over the learning outcomes of their students, plays a pivotal role in teachers' adoption of change initiatives.

Teacher Efficacy

After two decades of research around teacher efficacy, Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) combined two strands of thought to develop an integrated model of teacher efficacy. The first strand explores the extent to which schools could overcome external factors such as socio-economic variables, and the extent to which teachers could affect learning outcomes in classrooms through instructional decisions. This first strand was concerned with teachers' locus of control and the attribution of outcomes. The second strand of thought regarding teacher efficacy was developed from the theories of Bandura (1977), who identified teacher efficacy as a sub-category of self-efficacy. In this second strand, teacher efficacy developed from four different sources to determine the extent to which teachers felt they could accomplish a given task. Those sources of efficacy include a) mastery experiences, b) vicarious

experiences, c) social (or verbal) persuasion, and d) physiological arousal. Tschannen-Moran et al.'s integrated model represents the prevailing model of teacher efficacy in the research literature.

Teacher efficacy research has indicated positive relationships with student achievement, teacher performance, leadership, and school context. High teacher efficacy has shown a relationship with high student achievement (Ross, Hogaboam-Gray, & Hannay, 2001; Timperley & Phillips, 2003). The research literature lacks comprehensive experimental studies that investigate the exact nature of the relationship between student achievement and teacher efficacy. Teacher performance has documented links to teacher efficacy, and teacher performance relates to increased student achievement (Haycock, 1998; Marzano, 2003; Wright, Horn, & Sanders, 1997). Teachers with a strong sense of efficacy demonstrated a greater receptivity to change (McKinney, Sexton, & Meyerson, 1999; Poole & Okeafor,1989; Ross & Bruce, 2007), placed higher expectations on students' academic abilities (Deemer, 2004; Ross & Bruce, 2007), persisted despite challenges (Guskey & Passaro, 1994; Poddell & Soodak, 1993; Ross & Gray, 2006; Tschannen-Moran & Gareis, 2004; Tschannen-Moran & McMaster, 2009), and showed a greater ability to manage stress (Poole & Okeafor, 1989; Ross & Gray, 2006; Tschannen-Moran & Gareis, 2004). Teacher efficacy appears as a mediating factor affecting leadership and its impact on student achievement (Ross & Gray, 2006). School context refers to the organizational culture and climate of a school, and also demonstrates a relationship with teacher efficacy (Hoy & Woolfolk, 1993). Additional research on student achievement and school context has focused on collective teacher efficacy (Goddard, 2001; Goddard, Hoy, & Woolfolk, 2000) but is beyond the scope of this study, which focuses specifically on individual teacher efficacy.

Teacher efficacy, as defined by Tschannen-Moran et al.'s (1998) integrated model, has demonstrated an association with the length of classroom experience. A strong sense of efficacy has been noted in pre-service teachers, followed by drops in efficacy during the first year in the classroom (Woolfolk Hoy & Spero, 2005). Some researchers hypothesize that if teachers do not raise their efficacy early in their career, they will leave the teaching profession (Tschannen-Moran & McMaster, 2009). Experienced teachers of more than three years tend to have higher efficacy than novice teachers with less than three years of teaching experience (Tschannen-Moran & Woolfolk Hoy, 2007). Additionally, veteran teachers appear to have more stable efficacy with less need for supportive services than novice teachers (Klassen & Chiu, 2010; Tschannen-Moran & Woolfolk Hoy, 2007). Another research study identified no variation according to overall teaching experience (Mueller, Wood, Willoughby, Ross, & Specht, 2008).

Researchers have a limited understanding of changes in efficacy after teachers' initial induction to classroom instruction. Woolfolk and Spero (2005) found that the level of support for new teachers correlated to their drops in efficacy. Support acted as a mediating factor on the changes to teacher efficacy. Woolfolk and Spero suggested that the mismatch between performance and teachers' self-imposed standards may be the reason for dips in teacher efficacy at the outset of teaching. They suggest the complexity of teaching may be greater than new teachers anticipate. Although research in this area remains vague and unexplored, these findings raise the question of how other major changes affect teacher efficacy.

The findings of studies such as Woolfolk and Spero (2005) strongly suggest that when classroom practice is required to change, a corresponding change to teacher efficacy occurs, regardless of the teacher's career point. Based on Tschannen-Moran et al.'s (1998) integrated model, major shifts in classroom practice can be defined in two ways. First, it refers to any shift

in the control over learning outcomes. Second, it causes a reevaluation of self-perceived competencies, as often exemplified in a new implementation. Examples of major shifts might include the implementation of specific programs or strategies that require new teaching techniques or classroom practices.

Technology Innovation

The increased integration of technology into instructional practice is a significant innovation that has characterized schools over the last decade (Bebell & O'Dwyer, 2010; Fleischer, in press). Many institutions have spent enormous fiscal resources to accomplish ambitious technological goals. Technology integration models vary by school systems, influenced by institutional resources and specific program needs. The one laptop for each student (1:1) model represents one of the ideal technology integration models because laptops provide every student with the richest array of tools for learning (Newhouse, 2008). Whether it is due to the financial costs of a full 1:1 laptop implementation or the increased capability of tablets with recent technological advances, many schools are implementing 1:1 tablet programs, using products such as Apple's iPad, Samsung's Galaxy Tablet, Motorola's Zoom, or similar devices. Some schools pursue technology integration by moving mobile carts of laptops or tablets from classroom to classroom as needed, while others use a computer laboratory model where students go to a stationary laboratory.

Although many new initiatives can cause major shifts in classroom practice, technology integration exemplifies one of the most disruptive shifts occurring in modern classrooms. Technology integration into the classroom environment, particularly with one device for every student (1:1), forces change in educational paradigms and lesson designs (Apple, 2007; Bebell &

O'Dwyer, 2010). The learning processes, instructional activities, and student interactions in technology-rich classrooms engage students within the physical classroom as well as extending beyond the classroom walls via internet resources. As teachers shift to project-based learning or other student-centered approaches with real world applications, traditional brick-and-mortar buildings or scheduled class periods no longer constrain the learning experience (Apple, 2007; Newhouse, 2008). These new learning environments result in fundamentally different learning experiences and opportunities than those offered by traditional models.

Regardless of the specific technology integration model adopted, research studies examining technology integration point to its positive effect on instructional practices (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Lowther, Strahl, Zoblotsky, & Huang, 2008; Matzen & Edmunds, 2007; Morrison, Ross, & Lowther, 2007; Ross, Lowther, Wilson-Relyea, Wang, & Morrison, 2003). Traditional classrooms often exhibit teacher-centered instructional practices (Ertmer et al.; Ravitz, Becker, & Wong, 2000). The physical resources within the traditional classroom, primarily textbooks, limit the learning tools and information available to students. Although a shift towards student-centered instruction has occurred without technology present in some reform efforts (Ravitz, Becker, & Wong, 2000; Rivard, Follo, & Walsh, 2004), more student-centered instruction has resulted from the availability and implementation of technology tools (Ertmer et al., 2012; Lowther et al., 2008; Ross & Lowther, 2007).

Educators hold a responsibility to continuously adapt and learn new skills as they enter the second decade of the 21st century. This state of constant change in school environments can be threatening to teachers (Evans, 1996; Gregoire, 2003; Howard, 2009). Some teachers are apprehensive because their lack of technology skills threatens their perceived competence as a

teacher. Thus, the introduction of new technology into the classroom situation proves a useful context to examine changes in teacher efficacy in response to changes in the educational environment.

Professional Development

As schools adopt new innovations, professional development plays an important role in changing teachers' beliefs and practices (Ertmer, 2005). Numerous research studies have documented the effects of professional development on teachers' instructional practices and successful implementation of new initiatives (Haney, Wang, Keil, & Zoffel, 2007; Lowther et al., 2008; Matzen & Edmunds, 2007; Rivard et al., 2004; Ross & Bruce, 2007; Shidler, 2009; Tschannen-Moran & McMaster, 2009). Effective technology initiatives must be accompanied by ongoing professional development support (Corn, Tagsold, & Patel, 2011; Holcomb, 2009; Inan & Lowther, 2010; Lawless & Pellegrino, 2007; Lowther et al., 2008; Matzen & Edmunds, 2007). Given the effect of teacher efficacy upon teachers' practices, effective professional development should incorporate the development of teacher efficacy (Ertmer et al., 2012).

Several innovation, adoption, and diffusion models and theories have been proposed over the years and shape current thought around the adoption of new initiatives in schools, particularly related to technology. Rogers's (1962) Theory of Innovation Diffusion laid a broad conceptual foundation upon which other theorists based their ideas. Educational institutions have frequently devised new implementations on Hall's (1974) Concerns-based Adoption Model (CBAM), which gave leaders guidelines to facilitate the change process. Davis's (1989) Technology Acceptance Model (TAM) introduced the role of individual perception into the adoption process. In order to more adequately understand the complexity of the adoption

process and its diffusion, the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003) was introduced. Although these models and theories are applicable to many innovations, this progression of thought informs 1:1 technology adoptions in schools.

As schools contemplate the introduction of new programs and initiatives such as technology implementations, school leaders need to understand the likely effects on teacher efficacy. In order to willingly commit to a major change, teachers must realize their potential for success (Guskey & Passaro, 1994). Targeted professional development designed to improve teacher confidence with adapting to and using new technology can be expected to play an important part in maintaining teacher efficacy during a change initiative, and, by extension, enhance student outcomes.

Purpose of the Study

The purpose of this study was to examine how a required change in pedagogy resulting from the introduction of new technology such as 1:1 laptops or tablets in the classroom affects teacher efficacy. It examined how factors, including length of classroom teaching experience, age, gender, and nationality, relate to levels of teacher efficacy in this specific change environment. The study used a 1:1 technology initiative, referring to the implementation of one technology device for every student, as an example of a school innovation requiring significant professional change.

The study also examined the perceptions of teachers regarding the effectiveness of certain professional development formats in relationship to teacher efficacy. It explored the forms of professional development that teachers experienced in their professional training. It also

gathered their perceptions regarding the most effective training formats to prepare them to teach in a 1:1 technology classroom. These professional development formats were linked to Bandura's (1997) sources of efficacy and can inform school leaders on how professional development can be used to influence teacher efficacy.

Conclusions from Previous Research

Based upon the previous literature around teacher efficacy, the researcher anticipated that teacher efficacy may dip in the initial stages of a major change. However, teacher efficacy should return to previous teacher efficacy levels prior to the change as a successful adoption takes place. The researcher expected all teachers to experience a similar dip in teacher efficacy regardless of their general classroom teaching experience.

The literature also suggests that professional development is a mediating factor that can affect the degree to which teacher efficacy decreases during a given change. Professional development can affect the amount of time required for teachers to return to their previous levels of teacher efficacy before the innovation was introduced. These theories stem from the previous research although the literature base around veteran teachers and change is lacking. More research is needed to understand the relationships between teacher efficacy, teaching experience, and professional development during change initiatives.

Research Questions

The study focused on teachers in schools that have transitioned to a 1:1 technology classroom environment. The following questions guided the study:

1. When confronted by the need to adapt instruction to a 1:1 technology classroom, does a relationship exist between teachers' sense of efficacy and classroom teaching experience and if it exists, is it a stronger relationship than other factors such as age, gender, grade level(s) taught, nationality, subject(s) taught, and the type of 1:1 technology device?
2. Do teachers confronted by the need to adapt instruction to a 1:1 technology classroom perceive their teacher efficacy as being affected by the provision of professional development and training in methods of effectively employing the technology for improved student learning?

Significance

As schools engage in continual school improvement and implement reform initiatives, school leaders need to consider teacher efficacy in their professional development plans. The technology focus of the study makes its conclusions immediately applicable to schools initiating 1:1 technology initiatives. Extending beyond technology, the findings of the study may inform educational leaders how professional development and change interact with teacher efficacy during any significant change initiative. Additionally, the study informs school leaders of teachers' perceptions regarding effective forms of professional development. Given the importance of teacher perceptions during a new initiative, the results of the study demonstrate a teacher perspective to consider in professional development decisions (Corn et al., 2011). The outcomes of the study have implications for the recruitment and hiring of teachers as well as the formation of differentiated professional development plans for existing faculty. The findings of the study can also inform the implementation of teacher education programs.

Since existing research has failed to adequately study experienced teachers' efficacy, the proposed study brings the research literature together in a new way. One previous study found that experienced teachers had higher levels of efficacy than novice teachers (Tschannen-Moran & Woolfolk Hoy, 2007). Another study found no difference in efficacy based on classroom teaching experience (Mueller et al., 2008). Research on experienced teachers' efficacy lacks depth and quantity to draw definitive conclusions.

Additionally, several researchers have called for more qualitative studies to explore teacher efficacy and its sources (Hipp & Bredeson, 1995; Labone, 2004; Tschannen-Moran & Woolfolk Hoy, 2007; Wheatley, 2005). Although this study does not provide qualitative data, it provides more information regarding the relationships around teacher efficacy and may provide useful information to guide qualitative research in the future.

Limitations

The results of this study reflect several limitations. Perhaps the most prominent limitation is that the study does not explain causality. Although it measures the relationship between classroom teaching experience and teacher efficacy, other factors may play a role in that relationship that are not included in the research. In the same way, self-perceptions of professional development effectiveness were explored in relation to teacher efficacy. However, direct links between professional development and teacher efficacy levels were not directly addressed.

The design of the study called for the digital collection of data from teachers. This form of data collection may result in a response bias to teachers that are more comfortable using technology. Since the study is examining teachers' ability to adopt technology as part of the

change process, this factor could bias the outcomes of the study. However, the benefits of digital data collection outweigh its potential limitations.

The collection of self-reported data also creates a limitation in the design of the study. While teacher efficacy inherently measures self-perceptions, other data may be more subjective than it first appears due to self-reporting. For example, passport nationality provided descriptive data on participants, but passport nationality may not fully describe a participant's actual culture. Participants' cultural tendencies may be outside those implied by their passport nationality and unrepresented by the data collected. In addition, self-reporting on participation in professional development and its effectiveness ratings may result more from an availability heuristic than actual participation. The self-reporting of data was necessary for the design of this study, but its limitations should be recognized as well.

The study only examined one example of a change initiative through technology adoption in a limited population of international schools. Although the findings reflect the relationship between change and teacher efficacy, more research is needed to corroborate these findings with other change efforts as the data is only generalizable to international schools with 1:1 technology programs in China, Japan, and South Korea. The researcher viewed the benefits of the design and outcomes of the study to outweigh the limitations. More research needs to be done around teacher efficacy and these limitations represent areas for future study.

Definition of Terms

Teacher efficacy: Teacher efficacy in this dissertation is defined by Tschannen-Moran and Woolfolk Hoy's (1998) integrated model of teacher efficacy. It refers to the extent which

teachers perceive that they control the outcomes in their students. It also refers to teachers' self-perception of their abilities to successfully implement a skill or task.

Classroom Management: Classroom management is defined as a component of teacher efficacy that refers to teachers' abilities to manage classroom behavior during instructional time. For the purposes of this study, it is tied to teacher efficacy and inherently reflects teachers' self-perceptions.

Instructional Strategies: Instructional strategies are defined as a component of teacher efficacy that refers to teachers' abilities to implement instructional techniques and methodology within their classrooms. For the purposes of this study, it is tied to teacher efficacy and inherently reflects teachers' self-perceptions.

Student Engagement: Student engagement is defined as a component of teacher efficacy that refers to teachers' abilities to interest students in the pedagogical content of their course. For the purposes of this study, it is tied to teacher efficacy and inherently reflects teachers' self-perceptions.

Middle school teachers: In this study, middle school teachers are defined as teachers currently teaching at least one course in grades 6 to 8.

High school teachers: In this study, high school teachers are defined as teachers currently teaching at least one course in grades 9 to 12.

1:1 technology: This study defined 1:1 technology as classroom environments where all students in a class maintained daily access to laptops, tablets or stationary computer laboratory stations. The participants in this study were teachers in 1:1 technology classrooms, and teachers without 1:1 technology classrooms, non-teaching administrators and support personnel did not meet the criteria for participation.

General classroom teaching experience: This term referred to the total years of teaching experience a teacher had at the time of the study, inclusive of the current school year.

1:1 technology classroom teaching experience: This term referred to the total years of teaching experience a teacher had at the time of the study, inclusive of the current school year, in a 1:1 technology classroom.

East Asia: For the purposes of this study, East Asia was defined as China, Japan, and South Korea. The participants in the study were currently teaching in international schools in one of these three countries.

East Asia Regional Council of Overseas Schools (EARCOS): Participation in the study was limited to EARCOS schools. EARCOS member schools use English as the primary language of instruction and are accredited by a recognized accrediting body, most often in North America. EARCOS membership was used to define international schools for the study.

Chapter Two

Literature Review

The following chapter will explore theories and research studies that have direct relevance to the following research questions:

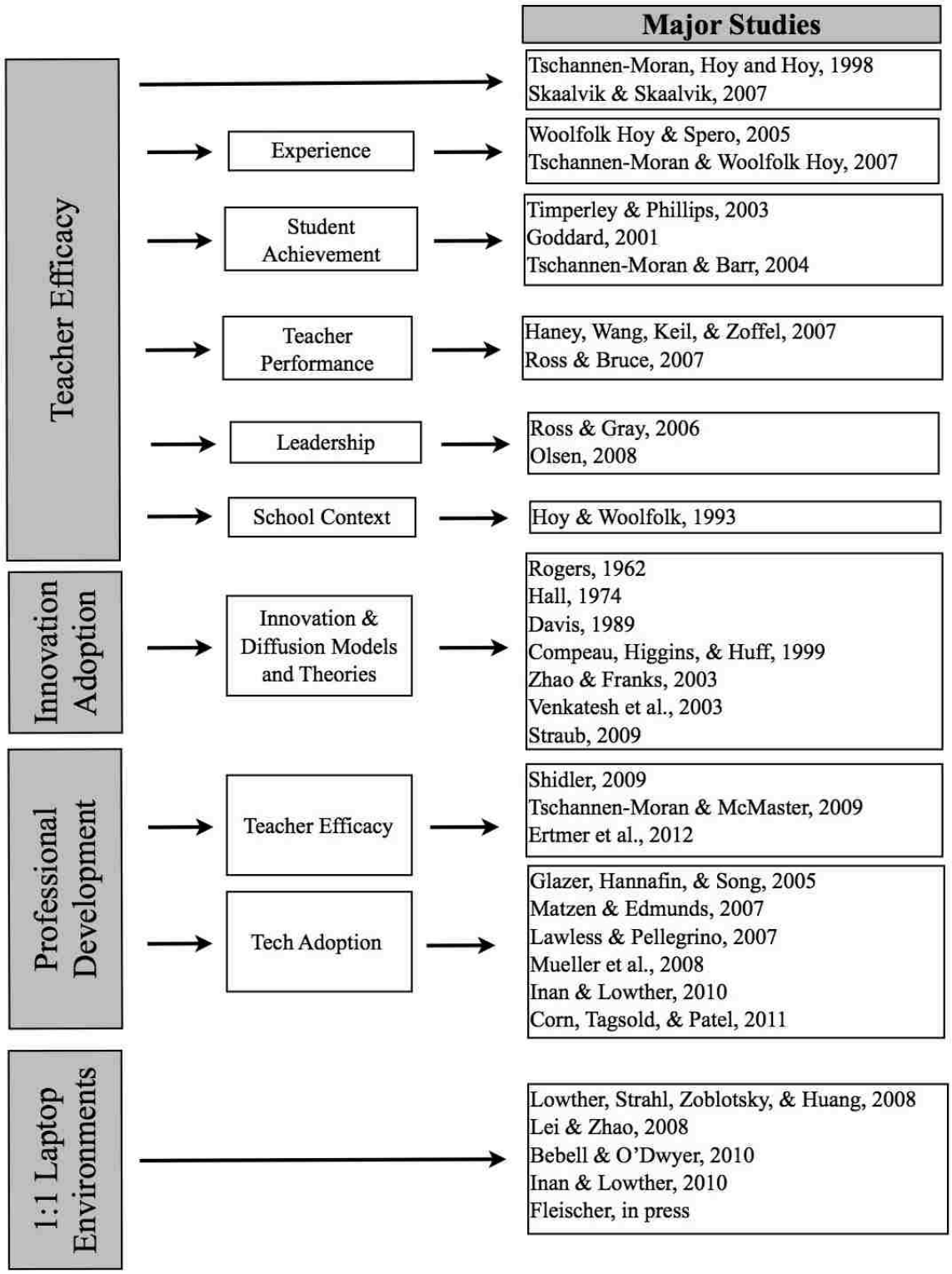
1. When confronted by the need to adapt instruction to a 1:1 technology classroom, does a relationship exist between teachers' sense of efficacy and classroom teaching experience and if it exists, is it a stronger relationship than other factors such as age, gender, grade level(s) taught, nationality, subject(s) taught, and the type of 1:1 technology device?
2. Do teachers confronted by the need to adapt instruction to a 1:1 technology classroom perceive their teacher efficacy as being affected by the provision of professional development and training in methods of effectively employing the technology for improved student learning?

The following review is divided into three sections in relation to teacher efficacy: innovation adoption, professional development, and 1:1 technology environments. Innovation adoption provides the foundation for teachers' acceptance of change and intersects with professional development efforts as schools implement reform initiatives. The models and theories of innovation adoption also highlight the inherent role of school leaders as decision-makers. As schools seek change, professional development provides the main focus for school leaders to accomplish their goals (Guskey, 1986). The growth of 1:1 technology initiatives in recent years (Bebell & O'Dwyer, 2010; Fleischer, in press) provide a good example of an innovation adoption that requires sustained professional development efforts. Strong teacher

efficacy is an integral component of successful change efforts such as the implementation of 1:1 technology programs.

The progression of research from the 1960s to the present-day informed the methodology and research questions of this study. Embedded throughout the efficacy research, relevant connections to leadership and organizational culture will be highlighted to show the wide-ranging influence of teacher efficacy on school improvement initiatives. Although the research to date is extensive, it is not exhaustive, exhibiting gaps and lacking depth in specific areas. Figure 1 provides an outline of major studies that inform the literature review around teacher efficacy and the related variables.

Figure 1. Outline of Major Studies Relating to Teacher Efficacy



Sources of Efficacy

While teacher efficacy originally focused on the locus of control, Bandura's (1997) application of social cognitive theory to social learning theory expanded the focus of teacher efficacy to explore other factors that potentially affected teacher efficacy. Bandura argued that the environment interacts with an individual to determine outcomes, a process he termed reciprocal determinism. He stated that multiple factors such as the environment, self-perceptions, and behaviors were interconnected factors influencing behaviors. No one factor dominated the others. Moreover, Bandura suggested four sources of self-efficacy: mastery experiences, vicarious experiences, social (or verbal) persuasion, and physiological arousal.

Bandura's (1997) four sources of efficacy became a major component of teacher efficacy definitions. Bandura's assertions created a much deeper, robust definition of teacher efficacy that has endured the last decade. In addition to providing a critical part of Tschannen-Moran, Woolfolk Hoy, & Hoy's (1998) integrated model, which is considered the prevailing definition of teacher efficacy, these sources of efficacy have become the object of study and professional development program evaluations (Tschannen-Moran & McMaster, 2009; Tschannen-Moran & Woolfolk Hoy, 2007). In this study, Bandura's sources of efficacy provided the framework to consider the effectiveness of professional development and form the conceptual framework for the various professional development formats described in the survey instrument. The study gathered data on the perceived effectiveness of various professional development formats, considering teacher perceptions in light of teacher efficacy.

Teacher Efficacy

In their landmark review of the theoretical and conceptual thinking around teacher efficacy, Tschannen-Moran et al. (1998) traced the progression of teacher efficacy thought from 1974 to 1997. They reviewed every article, conference paper, and book they could find that used the term *teacher efficacy* in that time frame. Tschannen-Moran et al. identified two strands of research around teacher efficacy. The first strand focused on attributional analysis—whether the teachers' locus of control was internal or external. Attributional analysis developed from Rotter's (1966) work with social learning theory, which stated that people learn through their social context by observing others' behavior. The Research and Development (RAND) Corporation initiated the research on teachers' locus of control when they conducted a program evaluation for a reading program implementation in selected Los Angeles minority schools (Armor et al., 1976). In the second strand around teacher efficacy, Bandura (1977; 1997) identified teacher efficacy as a subset of self-efficacy, describing it as the degree to which people felt they could accomplish a certain task, which stem from the four sources of efficacy discussed in the previous section.

Grounded in their analysis of the theories and research around teacher efficacy, Tschannen-Moran et al. (1998) proposed an integrated model that combined how teachers attributed outcomes and teachers' self-perceptions of their ability to accomplish success. Tschannen-Moran et al.'s model suggests that as teachers experience a source of efficacy, they process it in view of their perceived skill levels and their perceived ability to control the outcomes. Since efficacy develops from experience and interactions with others, a reciprocal relationship forms between new sources of efficacy and existing perceptions. According to the integrated model, this process exists as a continual cycle, and new sources of efficacy cause

reflection and the development of new efficacy beliefs. Because their model coherently merged the two major strands of teacher efficacy thought, Tschannen-Moran et al.'s integrated model has become the prevailing explanation to define and explain teacher efficacy since 1998.

Despite the foundation for research provided by Tschannen-Moran et al.'s (1998) integrated model, Labone, writing in 2004, suggested that research undertaken subsequent to 1998 was very limited in scope, and the heavy focus on quantitative research missed the necessary depth into the context of teacher efficacy. As a result, she called for more interpretive research to give a deeper understanding to the context and development of efficacy beliefs. She advocated for expanded research beyond traditional teacher classroom roles and their relationship with teacher efficacy. Overall, she sought a more comprehensive alternative to the theoretical model provided by Tschannen-Moran et al.

Wheatley (2005), in a review of the application of teacher efficacy understandings to teacher education practices, called for a reconceptualization of teacher efficacy research given that the current literature around teacher efficacy failed to provide practical applications for teacher education. After reviewing over 180 research documents of quantitative and qualitative studies related to teacher efficacy, Wheatley argued that teacher efficacy could not be reduced to a numerical value. Like Labone (2004), he advocated for a new focus to be placed on interpretive research for greater clarity in understanding the findings, both past and present, and more applications by practitioners. While acknowledging the complexity of teacher efficacy, Wheatley strongly argued for new directions that could be applied practically to teacher education programs and reform efforts. Therefore, he suggested future research expand its focus.

Both Labone (2004) and Wheatley (2005) identified a need for more interpretive research through qualitative studies, yet they failed to propose an adequate alternative to the integrated

model. They saw the quantitative research and the development of teacher efficacy scales that resulted from it as limiting the understanding of teacher efficacy. Despite a desire for an alternative, the integrated model continues to define teacher efficacy. Their research supports the need to explore teacher efficacy with factors such as general classroom teaching experience, 1:1 technology classroom teaching experience, and the effectiveness of professional development formats to implement change.

Skaalvik and Skaalvik (2007) adopted the research approach advocated by both Labone (2004) and Wheatley (2005) in their study of 244 elementary and middle school Norwegian teachers. They argued that teacher efficacy could not be reduced to the three areas of classroom management, instructional strategies, and student engagement delineated by Tschannen-Moran and Hoy (2001). Skaalvik and Skaalvik developed an instrument with six dimensions: instruction, adapting education to individual students' needs, motivating students, keeping discipline, cooperating with colleagues and parents, and coping with changes and challenges. Using factor analysis, their study confirmed the validity of these six dimensions and established further support that teacher efficacy is a multidimensional construct.

While Skaalvik and Skaalvik's (2007) research brought a new perspective, their findings have yet to be confirmed by other researchers. As a result, Tschannen-Moran et al.'s (1998) integrated model continues to be the foundational understanding of teacher efficacy. Skaalvik and Skaalvik's conclusions indicate that more research is needed, particularly on effect of teacher efficacy outside of the classroom. It also demonstrates teacher efficacy and its role in the school environment is not fully understood even after thirty years of research. This study will use Tschannen-Moran et al.'s integrated model as the foundation for the proposed study while still

expanding the breadth of research about teacher efficacy in change environments as suggested by these more recent researchers.

Teacher Efficacy and Classroom Teaching Experience. Woolfolk Hoy and Spero (2005) undertook a longitudinal study of the point in time when teacher efficacy is most malleable. In the context of a teacher education program, they measured efficacy beliefs with three different measures to compare efficacy scores and corroborate outcomes. They administered a pre-test to students entering the university program, another test when students completed the master's degree program, and a third test after the participants' first year of teaching. They used factor analysis to interpret responses. Although the longitudinal nature of the study and the methodology added significance to their conclusions, the findings of the study were limited to only 29 participants in one university's graduate program for education. Woolfolk Hoy and Spero (2005) reported significant increases in teacher efficacy during a teacher preparation program and significant declines in teacher efficacy in the first year of classroom teaching.

Although the increases in teacher efficacy for pre-service teachers might be considered a positive outcome of teacher preparation programs, the failure to sustain those levels of teacher efficacy when teachers are placed in the classroom are a cause for concern. The findings of this study reported a relationship between teacher efficacy and the amount of perceived support by the school. More data needs to be collected on both first-year teachers and the first year of a new initiative in relation to its effect on teacher efficacy.

Woolfolk Hoy and Spero's (2005) conclusions raise several questions addressed in this study. The beginning of a teacher's career is wrought with change as theory is put into practice. Does any major change cause a decrease in teacher efficacy or is it isolated to general classroom

teaching experience at the beginning of one's career? Similar to Woolfolk Hoy and Spero's findings of increased teacher efficacy during a teacher education program, professional development appears a component in shaping teacher efficacy during change. The proposed study explores this relationship to produce a greater understanding of the relationship between teacher efficacy and professional development.

Tschannen-Moran and Woolfolk Hoy (2007) investigated the differences between novice and experienced teachers in a similar study. They defined novice teachers as having three or less years of experience. They used a three-year breakpoint for experience because they identified a jump in teacher efficacy scores on a scatterplot at that level of experience. For their measures, they used the previously tested Teachers' Sense of Efficacy Scale (TSES) and retested it with factor analysis and reliability analysis. For the 255 teachers used in this calculation, the factors all had a reliability above .9 as calculated by Cronbach's alpha, and all three factors in a second order factor analysis accounted for 71% of the variance in teacher efficacy scores. From the 255 teachers in their sample, they found teacher efficacy in the areas of classroom management and instructional strategies to be significantly higher in experienced teachers. They found no difference in the teacher efficacy scores of student engagement between experienced and novice teachers. For novice teachers, Tschannen-Moran and Woolfolk Hoy reported a stronger positive correlation between teacher efficacy scores and teachers' perception of support with teaching resources.

The work of Tschannen-Moran and Woolfolk Hoy (2007) took a critical step forward from the conclusions of Woolfolk Hoy and Spero (2005). Tschannen-Moran and Woolfolk Hoy's (2007) study suggested the level of support expected from novice and experienced teachers differed. Therefore, school leaders should consider differentiating support and

professional development according to levels of experience. This study examined the relationship between teacher efficacy and classroom teaching experience during a change initiative. The first research question regarding classroom teaching experience furthers the findings of Tschannen-Moran and Woolfolk Hoy (2007) by adding in the role of change in relationship to experience. The second research question also examined how teachers perceive the effectiveness of various professional development formats. Tschannen-Moran and Woolfolk Hoy inform this component of the study with their finding of the correlation between the experience of teachers and the amount of support they expected.

Teacher Efficacy and Teacher Performance. Multiple research studies have found that a strong sense of teacher efficacy is positively associated with improved instructional strategies and classroom instructional practices (Haney, Wang, Keil, & Zoffel, 2007; McKinney, Sexton, & Meyerson, 1999; Poole & Okeafor, 1989; Ross & Bruce, 2007; Timperley & Phillips, 2003; Tschannen-Moran & McMaster, 2009). Given the importance of teachers' role in student achievement (Haycock, 1998; Marzano, 2003; Schwartzbeck & Wolf, 2012; Wright, Horn, & Sanders, 1997), teachers with a strong sense of efficacy adopt teacher behaviors that may have a positive influence on student outcomes.

Haney, Wang, Keil, and Zoffel (2007), in a study of middle school teachers in Ohio implementing a problem-based curricula focused on environmental health issues, reported that teachers showed increases in their sense of efficacy by the end of the two-year professional development program. Additionally, teachers self-reported an increased use of the new instructional strategies. Their study examined teacher efficacy from the integrated model proposed by Tschannen-Moran et al. (1998). They implemented a professional development program for 18 teachers in six schools that incorporated Bandura's (1997) four sources of

efficacy. Haney et al. used a pre-test and post-test research design to measure change over time. The lack of a control group with no treatment and the small sample were limitations to the findings of this study. Overall, the study demonstrated a positive shift towards the desired teacher behaviors of student-centered instruction through problem-based learning as a result of professional development efforts.

Findings from the study outlined above indicated that professional development positively affects teachers' instructional practices and teacher efficacy. The implications of this study are two-fold. First, they demonstrated that Tschannen-Moran et al.'s (1998) integrated model was effective when applied to professional development strategies. Second, it showed that professional development focused on teacher efficacy influences teacher behaviors. Teacher efficacy does not exist in isolation of other factors, making causal relationships hard to isolate. Yet, the same professional development strategies used to positively increase teacher efficacy appeared to positively increased teacher performance as measured by the degree of implementation of the new teaching strategies.

Ross and Bruce (2007) designed a four-month professional development program that incorporated Bandura's (1997) four sources of efficacy in order to raise elementary math teachers' sense of efficacy. The professional development began with a full day in-service and continued over the four months with three two-hour sessions after school. The study included 106 sixth grade teachers from all elementary schools in one Canadian school district. They measured teacher efficacy with an adaptation specifically for math teachers from the Teachers' Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001). They used a pre-test and post-test research design with a control group. They found that the treatment group of teachers outscored the control group in all three measured areas of teacher efficacy. From classroom

management, instructional strategies, and student engagement, only classroom management demonstrated a statistically significant difference. Ross and Bruce (2007) concluded that teachers with a strong sense of efficacy were receptive to new instructional strategies, exhibited behaviors that gave students high expectations of their academic abilities, and persisted despite challenges.

Ross and Bruce's (2007) study associated teacher efficacy with desirable teacher behaviors that improve student achievement and indicated gains in all areas of teacher efficacy from professional development. Their study connected teacher efficacy with improved teacher performance. Their study also indicated the potential effects of professional development on teacher efficacy and teacher behaviors. Although Ross and Bruce suggested that the statistically significant improvement in classroom management was due to a bias in the professional development presentations, other studies have demonstrated changes in the classroom management area of teacher efficacy more than instructional strategies or student engagement (Griffin, 2009; Tschannen-Moran & Woolfolk Hoy, 2007; Woolfolk, Rosoff, & Hoy, 1990). On the basis of their study, Ross and Bruce called for additional randomized field trials and intensive qualitative studies to further explore the effects of professional development on teacher efficacy. They also suggested that future research seek more practical applications for practitioners in the professional development of teachers and collect more data collection regarding the effectiveness of various professional development formats. These findings have particular relevance on teacher efficacy research because they used a control group to measure results from a treatment.

The findings from existing research in the areas of teacher efficacy and teacher performance suggest experience interacts with teacher efficacy. In response to the first research question examining the relationship between teachers' sense of efficacy and classroom teaching

experience, the literature suggests that experienced teachers exhibit a stronger sense of efficacy in all areas, particularly classroom management, than less experienced teachers (Griffin, 2009; Ross & Bruce, 2007; Woolfolk, Rosoff, & Hoy, 1990). Given the effect of professional development upon teacher efficacy and teacher performance, the second research question gathers more specific information on what professional development is considered effective from the teachers' perspectives.

Teacher Efficacy and Student Achievement. Timperley & Phillips (2003) examined how teacher expectations of student achievement changed as a result of professional development over a six-month period. In this New Zealand study, they provided professional development in literacy to 26 teachers in eight schools. The study administered pre-tests and post-tests to measure teachers' sense of efficacy. The study followed up the original questionnaires with interviews three months after the professional development experience and again after one year. This study focused solely on the attributional analysis strand of teacher efficacy, exploring whether or not teachers felt they controlled student outcomes. Following the professional development sessions, the quantitative data demonstrated increased student achievement in all six literacy skills they measured. After performing follow-up interviews in addition to measuring teacher efficacy, Timperley and Phillips concluded that increased expectations and improved student achievement accompanied a stronger sense of efficacy.

Timperley and Phillips' (2003) study was significant because it linked teachers' sense of efficacy with actual student achievement. It also demonstrated the effect of professional development upon teacher performance. It did not imply teacher efficacy directly increased student achievement, but it showed a simultaneous presence. The results were strengthened by the longitudinal nature of the study and the follow up interviews. The study lacked a control

group and the sample size was inadequate to make wide generalizations based on this study alone. The research literature around teacher efficacy has focused predominantly on the indirect relationship between teacher efficacy and student achievement. Additional research associating efficacy and student achievement has focused on collective teacher efficacy, which is beyond the scope of this literature review (Chong, Klassen, Huan, Wong, & Kates, 2010; Fisher, 2011; Goddard, 2001; Goddard, Hoy, & Woolfolk Hoy, 2000; Tschannen-Moran & Barr, 2004).

From the work of Timperley and Phillips (2003), the research indicates a relationship between teacher efficacy and student achievement. The relationship between teacher efficacy and teacher performance undoubtedly affects student achievement as well. Although the exact nature of the relationship between teacher efficacy and student achievement is not established, a strong sense of efficacy is associated with desirable teacher behaviors that positively affect student achievement (Tschannen-Moran and Barr, 2004). This study focuses on professional development's effect on teacher efficacy. As exemplified in the work of Timperley and Phillips, the effect of professional development directly affects teacher behaviors and indirectly affects student achievement.

Teacher Efficacy and Leadership. Leadership behaviors influence the development of teacher efficacy in schools (Hipp, 1996) through their influence on the climate and culture of organizations (Leithwood & Jantzi, 2005; Marks & Printy, 2003). For example, school leaders strengthen teacher efficacy when they exhibit transformational leadership behaviors like empowering teachers, facilitating collaboration, and sharing decision-making (Caprara, Barbaranelli, Borgogni, & Steca, 2003; Denmark, 2009; Griffin, 2009; Olsen, 2008; Walker, 2009). Empowered teachers have a strong sense of efficacy through their ownership and commitment to decisions (Hardin, 2010; Hipp & Bredeson, 1995; Ross & Gray, 2006).

According to Poole and Okeafor (1989), increased teacher efficacy resulted in more successful completions of change initiatives. Hipp (1996) connected greater shared decision-making with a strong sense of teacher efficacy.

Ross and Gray (2006) investigated the mediating influence of teacher efficacy on the relationship between transformational leadership characteristics and student achievement. In their study consisting of 3,042 teachers in 205 elementary schools from two Canadian school districts, they measured teacher perceptions of principals' transformational leadership behaviors in addition to a collective teacher efficacy score for each school. Although collective efficacy is beyond the scope of the proposed study, it reflects an aggregate of individual teacher efficacy and the collective efficacy scale (Goddard, Hoy, & Woolfolk Hoy, 2000) used by Ross and Gray closely reflects the Teachers Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001) used in this study. Ross and Gray evaluated student achievement based on the provincial standardized assessments.

Ross and Gray (2006) concluded that principals play pivotal roles in the development of teacher efficacy through all four sources of efficacy. They postulated that principals affect teacher efficacy by resourcing teachers appropriately for successful mastery experiences. Principals determine the formal interactions occurring between teachers, inherently impacting vicarious experiences. They communicate a vision of success, invoking social persuasion. As they communicate their own expectations as well as filtering district level requests, principals control stress for teachers, thus moderating physiological arousal and anxiety. As they explored these scores' relationship through a path analysis, Ross and Gray reported that transformational leadership behaviors had a positive effect on teacher efficacy. They also concluded that teacher efficacy mediates the effect of principals' leadership behaviors on student achievement. In other

words, positive leadership behaviors in a school with low teacher efficacy will have less influence on student achievement than a leader's behaviors with a faculty possessing high teacher efficacy. Ross and Gray's study was limited to a consideration of transformational leadership behaviors, and they suggested additional research into other leadership models such as instructional leadership in the future.

Olsen (2008) performed a two-phase study in a comparative cross-case analysis examining leadership behaviors, organizational supports, and teacher efficacy. In the first phase, he collected quantitative data from 20 schools in two California school districts. He measured teacher efficacy beliefs with two different efficacy scales and collected teacher perceptions of the school leadership. From the results, he identified two middle schools with differing levels of teacher efficacy for a comparative cross-case analysis. During phase two, he interviewed 28 teachers, administrators, and counselors in the two selected schools.

From the qualitative phase of the study, Olsen (2008) identified four themes to account for the differing levels of teacher efficacy. The four themes were school context, leadership, a shared vision of success, and collaboration. The school with stronger teacher efficacy exhibited greater organizational support for teachers. The study found leadership was more consistent and had a longer tenure in the school with stronger efficacy. Olsen found stronger teacher efficacy associated with a clear vision of success that did not rely on external measures for validation. He also highlighted the importance of collaboration and the principal's role in facilitating the time and focus of collaboration. Olsen's (2008) study emphasized the role of school leaders, particularly principals, in affecting teacher efficacy. In addition to corroborating the findings of Ross and Gray (2006), Olsen provided specific examples and rationale from qualitative case studies to account for different levels of teacher efficacy between schools. Case studies like

Olsen's show the complexity of teacher efficacy and the importance of collecting additional data to understand the relationships of teacher efficacy within organizations.

These studies indicate the importance of leaders' role in affecting teacher efficacy and their decision-making role in major initiatives such as a 1:1 technology implementation. Directly applicable to the data collection regarding teacher perceptions of the effectiveness of professional development formats, school leaders need to consider teacher perceptions in their professional development decisions. Although more research is needed, these studies indicate that a relationship exists between leadership style and teachers' sense of efficacy.

Teacher Efficacy and School Context. An early study of the link between teacher efficacy and school context indicated that a healthy organizational climate positively influenced a strong sense of personal teaching efficacy (Hoy & Woolfolk, 1993). Hoy and Woolfolk's study randomly selected 179 teachers in 37 elementary schools in New Jersey. Their data analysis included correlational and multiple regression analyses to determine statistical significance among the variables. Although this general finding was significant to the research, Hoy and Woolfolk's work has limited applications due to unclear definitions for teaching efficacy. At the time of their study, the major dimensions of teacher efficacy were not as clearly defined as they have been in more recent research using Tschannen-Moran et al.'s (1998) integrated model. Although school context may play a role in shaping teacher efficacy, the topic is missing from the research literature. Hoy and Woolfolk (1993) provided one of the only analyses on the relationship of these variables, implying teacher efficacy may be a sign of organizational health. Although collective teacher efficacy can resemble school context in some of its characteristics, these variables cannot be equated.

Innovation Adoption

An examination of technology adoption models and teacher reactions to technology innovations evidence a clear progression of thought associated with teacher efficacy. Rogers's Innovation Diffusion Theory (1962), while originally intended to describe a variety of innovations, has become associated with technology adoptions. Building on Rogers's theory, Hall's Concerns-based Adoption Model (1974) was developed for educational settings and has had similar applications. The Technology Acceptance Model (TAM) (Davis, 1989) was another step forward in technology adoption thought, which resulted in the United Theory of Acceptance and Use of Technology (UTAUT) from Venkatesh, Morris, Davis, and Davis (2003). Although some models and research related to innovation adoption have been omitted, the described progression focuses on the association between efficacy and innovation adoption and diffusion.

Rogers's Theory of Innovation Diffusion. Rogers's Theory of Innovation Diffusion (1962), also known as Innovation Diffusion Theory (IDT), provides a broad framework to address both the adoption and diffusion of innovations. Rogers's work outlined five stages of adoption and five attributes that influence an innovation's adoption. The five stages of adoption included the following: a) awareness an innovation exists; b) persuasion by understanding the major characteristics of the innovation; c) decision to accept or reject the innovation; d) implementation by acting on the decision; and e) confirmation by reflecting on the decision and determining whether or not to discontinue the adoption. The attributes of the innovation influenced these five stages. The attributes included relative advantage, compatibility, complexity, trialability, and observability. Relative advantage examined how an innovation improved upon previous ideas. Compatibility reviewed a new idea's congruence with previously existing schemas. The complexity referred to how easily the innovation was understood.

Trialability was the opportunity potential adopters have to test the innovation prior to making a decision. Observability examined social influence and how many others have adopted the innovation.

Rogers (1962) also described the process of diffusing innovations, meaning how ideas spread to others. A key element of Rogers' model was the bell curve of adoption. Presuming a successfully adopted innovation, this bell curve described the large percentage of mainstream adopters while a smaller percentage of people were early or late adopters. He articulated the importance of communication channels in the diffusion process. As evidenced in the attributes of an innovation, the complexity and observability influence the rate of diffusion as well as impacting the actual adoption decision.

Rogers's (1962) IDT was a foundational theory to the adoption and diffusion of innovations, and subsequent models have built on its foundation to address more specific adoption and diffusion processes. Although Rogers did not address efficacy within IDT, efficacy influences the decision, implementation, and confirmation stages of adoption. Additionally, efficacy affects the attributes of innovations through the compatibility and complexity. Although it did not explain how to facilitate the change process, IDT has helped explain the adoption process of technology in schools.

Concerns-based Adoption Model. Based on three and a half years of study in educational institutions, Hall (1974) presented the Concerns-based Adoption Model (CBAM) to describe the adoption of innovations in schools. In the CBAM, Hall noted change as a process, not a single event. He said adoption was an individual choice and a highly personal experience that grew over time. He argued for the use of operational terms to clearly define progress within his Stages of Concern (SOC) and Levels of Use (LOU). Expanding upon Rogers' (1962) five

stages of adoption, Hall's SOC described seven stages: unaware, awareness, exploration, early trial, limited impact, maximum benefit, and renewal. He pointed out that an individual might be in multiple stages of concern simultaneously, indicating a progressive continuum. Hall's seven LOU corresponded to the SOC: non-use, orientation, initial training, mechanical, independent, integrated, and renewing.

Hall's (1974) work was a major contribution to the literature around innovation adoption in schools. It expanded on the basic tenets of Rogers's (1962) theory from the perspective of the adoptee. Differing from Rogers's IDT, Hall's model gave a change facilitator a process to move change forward. However, the CBAM made a critical assumption that teachers are concerned about an innovation. It failed to account for change that may be seen as desirable by teachers. Resistance to change is assumed, which is not always the case.

Technology Acceptance Model. Extending Rogers's (1962) Theory of Innovation Diffusion and Hall's (1974) CBAM, Davis's (1989) proposal of the Technology Acceptance Model (TAM) brought the importance of individual perception and its subjectivity into the research around innovation adoption. Unlike the CBAM that focused on managing the process of adoption, the TAM focused on the innovation itself and perceptions of the innovation. The TAM presented two major components that affected adoption decisions: the perceived ease of use and the perceived usefulness. It focused on perceptions of individual adopters, not the actual ease of use or usefulness. Although applied to some educational settings, the TAM has been criticized as too basic and failing to capture the complexity of the perceptions of users (Straub, 2009).

Based on the TAM's premise that perceptions around an innovation were a key component of adoption, Compeau, Higgins, and Huff (1999) conducted a longitudinal study that

investigated the effect of computer self-efficacy on actual computer use. Of the original 2,000 people contacted, they matched responses from 394 participants over the year. Due to the low return rate, they investigated the non-respondents and determined at least some non-response bias was present in age, gender, educational background, and educational level. In the initial survey, they collected data from participants regarding their computer efficacy and expected benefits of computer use. In the follow up survey, the researchers collected data regarding attitudes towards computer use and actual computer use, including frequency and duration of use. Although their study was limited in its scope and response rate, the longitudinal nature of the study and its methodology gives credibility to its findings, which showed 18% of the variance in use was explained by self-efficacy. Based upon their findings, these researchers suggested self-efficacy could become a downward spiral and managers should act to strengthen efficacy in their employees.

The research of Compeau et al. (1999) demonstrated the importance of efficacy in the adoption process of computer-based technologies. They concluded that weak self-efficacy will not just disappear over time and managers can intervene to increase efficacy beliefs. They also acknowledged the importance of successful mastery experiences to raise self-efficacy, reiterating the reciprocal relationship Bandura (1997) articulated previously. Although their study was focused on a business population, school leaders can apply their findings to professional development and strategically planning new technology initiatives. This study showed intervention is necessary to boost the efficacy of some teachers and mastery experiences are an important component of effective intervention.

An Ecological Model. Zhao and Franks (2003) suggested the dynamic and complex issue of technology use needed a more robust framework and explanation than previously

articulated. In response, they developed an ecological perspective that absorbed some of the complexity in a metaphor. The details of their model are not germane to teacher efficacy so it will not be discussed here. However, their model brought teachers' decision-making rationale of costs and benefits to the forefront. They claimed that teachers made decisions based upon their perceptions that the outcomes would be in the best interest of their classroom. Like the TAM, Zhao and Franks argued that perception was the basis for adoption decisions, not reality. Therefore, they advocated further study and application of their model to teachers' perceptions and how those perceptions could be altered. They also suggested that a proper level of support would make the spread of technology adoptions more likely and faster among teachers.

This ecological model did not explicitly propose particular professional development formats, but it inherently implied that schools and/or school leaders can take action that influence teacher perceptions. More specifically, their model suggested certain actions sped up the diffusion and quantity of technology use. Although their framework is not without its limitations, their unique approach acknowledged the importance and malleability of teacher perceptions and teacher efficacy. It reiterated Compeau et al.'s (1999) argument that interventions could affect efficacy development.

Unified Theory of Acceptance and Use of Technology. Since the TAM left researchers seeking a more comprehensive model to explain user adoption, Venkatesh et al. (2003) set out to integrate the existing models. They compared eight common theoretical frameworks and models, including the TAM and Rogers's IDT. They examined six months of data from four different organizations representing diverse industries and types of innovations. All four organizations were in the midst of an innovation adoption at the time of data collection. Data collection was conducted at three points over a six-month period. As Venkatesh et al. applied

the different models to the data, the variables they identified in their model explained from 17% to 53% of the decision to accept and use innovations. From their analysis of these eight existing models, the Unified Theory of Acceptance and Use of Technology (UTAUT) emerged.

The UTAUT presented a more comprehensive approach to address user adoptions than the previous models and showed promising outcomes in its initial testing. The UTAUT had four direct determinants of use: performance expectancy, effort expectancy, social influence, and facilitating conditions. Venkatesh et al. (2003) identified the mediating factors to these determinants as gender, age, experience, and the voluntariness of change. Although this model is more complex than briefly described here, Venkatesh et al. indicated that self-efficacy had a role in performance expectancy; however, it was not a direct determinant on user adoption. They argued that self-efficacy was mediated by the perceived ease of use. In testing their model on the original four organizations, the new model accounted for 69% of the variance. They further tested the UTAUT with two new organizations and reported that it accounted for 70% of the variance of the users' intentions to adopt the new technology.

Implications of Innovation Adoption Models and Theories. In a review of IDT, the CBAM, the TAM, and the UTAUT, Straub (2009) argued that the research in technology adoption in schools still had many gaps. He argued that the UTAUT is a young model that still needs further testing although initial studies looked promising. In addition to reiterating several of the previously discussed findings, he suggested future research consider the effects of the continuous cycle of adoption present in modern society's constant technological progress. He suggested that usefulness needed to be more fully defined and operationalized in the research literature. He also recommended that future research examine technology adoption outside of formal organizations, focusing more on the individual.

The adoption models and assertions of Straub (2009) and others (Davis, 1989; Hall, 1974; Venkatesh et al., 2003; Zhao & Franks, 2003) create a framework for professional development planning and support needed to implement major technology changes in schools. The research presented here demonstrates that professional development can intervene and affect the adoption process of technology. The described adoption models also clearly show the importance of teacher perceptions in the adoption process. The adoption process differs by the individual, yet social interactions of the larger school community influence the individual. Since individual perceptions and social interactions are malleable to some extent, school leaders should implement interventions through professional development to create a receptive environment for new ideas. The literature in technology adoption provides the conceptual foundation to gather teachers' perceptions regarding the effectiveness of professional development formats for a 1:1 technology implementation. It also justifies the use of a 1:1 technology implementation as a valid change initiative to further understand the relationship between teacher efficacy and the change process.

Professional Development

Research shows the importance of professional development in the adoption of any new initiative. Professional development links to teachers' sense of efficacy as well as skill development during an innovation adoption. Multiple professional development formats have been used to change teachers' instructional practices. The following studies inform the proposed study of the relationship that professional development has with teacher efficacy and technology integration.

Professional Development and Teacher Efficacy. In a longitudinal study over three years, Shidler (2009) evaluated the relationship between coaching teachers in the classroom and student achievement. For the 360 students and 12 classrooms in her study, she found a significant correlation between student achievement and the amount of coaching hours during the first year. No correlation was evident in the second and third years. The first year of coaching focused on instructing with specific content and modeling techniques and instructional practices. The subsequent years of coaching were less directed and more open-ended for the coach and classroom teacher.

This study validated coaching as an effective form of professional development for an innovation adoption and raises the question of the extent to which experience affects the results of various professional development formats. The lack of consistent coaching strategies for all three years was a limitation of study. Additionally, the significance of the first year's success compared with subsequent years should be considered in conjunction with the possible effects of intervening variables. However, Shidler's conclusions inform two aspects of this study. First, Shidler's findings suggest that 1:1 technology classroom teaching experience may be more relevant than general classroom teaching experience during the implementation of a 1:1 technology initiative. Second, the documented effect of coaching on student achievement during an innovation substantiates coaching as an effective form of professional development. As a result, coaching will be included on the survey instrument to gather teacher perceptions about its effectiveness.

Tschannen-Moran and McMaster (2009) studied teachers' implementation of a new teaching strategy using the framework of Bandura's (1997) sources of efficacy. Their study examined the implementation of a new instructional framework for reading by 93 elementary

teachers across nine schools. They used an additive approach with a base professional development workshop and added supplemental professional development strategies to the base format. The initial three-hour workshop addressed verbal persuasion and communicated information. Some teachers received additional modeling of new strategies, related to vicarious experience. The third variation added a practice session, giving selected teachers a mastery experience before they went into the classroom. The last group of teachers participated in all the previous professional development formats in addition to personal coaching. The coaching was designed to enhance the mastery experience of participants and support them in the classroom with their students.

The findings of this study confirmed Bandura's (1997) conclusions about the relationship between professional development and teacher efficacy. Tschannen-Moran and McMaster (2009) found that teachers experienced the strongest effect on their self-efficacy when they received individual coaching in addition to the other professional development formats. Since the other training formats made little difference and in some cases, appeared to lead to a drop in teacher self-efficacy, they concluded that mastery experiences in classrooms with students through coaching are critical to developing teacher efficacy. They also suggested that vicarious experiences and social persuasion are more effective in conjunction with mastery experiences although further research was needed regarding the effect of these sources of efficacy.

Tschannen-Moran and McMaster's (2009) study demonstrated the effect of a new implementation upon teachers' sense of efficacy within the framework of well-planned professional development. Their findings are generalizable to other new initiatives such as technology adoptions and its associated professional development. From the professional development treatments described in their study, this study derived its list of professional

development formats for the data collection instrument. This study asked participants to rate the effectiveness of each format if they have experienced it in relationship to a 1:1 technology implementation. Tschannen-Moran and McMaster's research was used because it represented common types of professional development while addressing sources of efficacy. The types of professional development experienced by teachers and their effectiveness ratings of each format was evaluated in relationship to their teacher efficacy scores.

In their investigation of teacher beliefs, Ertmer et al. (2012) provided two findings relevant to the intersection of teacher efficacy and professional development. In their study, they conducted case studies with 12 classroom teachers that won awards for their technology integration. First, the researchers reported teachers' core beliefs acted as enabling or constraining agents to the teachers' ability to put their beliefs into practice regarding student-centered instructional practices. Resources, or the lack thereof, were not the defining parameters. Second, they suggested that professional development training should be with the same tools teachers will use with students. In considering Ertmer et al.'s study, it is important to note that teacher beliefs, in terms of pedagogical practices, represent a fundamentally different concept than teacher efficacy, the perception of one's competency and control of classroom outcomes. However, the two stated findings have particular relevance for the investigating a relationship between professional development and teacher efficacy.

Teachers' beliefs about best instructional practices inherently reflect teacher efficacy (Ertmer, 2005; Ertmer & Ottenbreit-Leftwich, 2010). In an earlier theoretical work, Ertmer (2005) postulated that changes to teacher beliefs developed from personal experiences, vicarious experiences, and socio-cultural influences. These same sources of teacher beliefs bear a significant similarity to the sources of efficacy articulated previously by Bandura (1997).

Although teacher beliefs are still distinct from teacher efficacy, the research suggests the same professional development activities affect both teacher efficacy and teacher beliefs. Increases in teacher efficacy are mirrored by the development of teacher beliefs. The implications of these conclusions give significance to the second research question of this study, which examines the effectiveness of professional development as perceived by teachers. Professional development perceived to positively affect teacher efficacy is also likely to positively influence other variables such as teacher beliefs.

Professional Development and Technology Adoption. Glazer, Hannafin, and Song (2005) proposed a collaborative apprenticeship model to increase technology integration in the classroom through four progressive phases. In the first phase of the model, a leader introduced the new skills to novices while both leaders and novices collaborated to set goals for the new initiative. During the second phase, leaders and learners worked closely together to create and plan learning activities that incorporate new technology skills. The third phase provided learners feedback on their lesson plans and instructional activities while giving them independence. The third phase also included classroom coaching. In the final stage, leaders step back from coaching roles, promoting peer relationships and collegiality without identifying clear leaders and learners. This model was based on Wenger's (1998) communities of practice model, which facilitated collegiality and collaboration from like-minded participants in informal groups. The collaborative apprenticeship model acknowledged the need for authentic mastery experiences in the classroom.

The collaborative apprenticeship model provided an example of incorporating sources of efficacy into professional development activities. This model included mastery experience, vicarious experience, and social persuasion in its various phases. The model also scaffolded

teachers' skill development, providing collegial support, intentional collaboration, and ongoing reflection. With its foundation in communities of practice, it included a social aspect to change. This model was developed in the context of technological innovation but could be applied to any change initiative. It informed this study regarding the list of professional development formats and their links to Bandura's (1997) sources of efficacy in the survey instrument.

In studying the effect of technology use on instructional practices, Matzen and Edmunds (2007) performed a mixed method evaluation of a proprietary professional development program. They collected professional development feedback, teacher interviews, teacher reflections, surveys, and a final project from the 148 elementary teachers in their study. They also conducted a collective case study of two similar schools and an individual case study of an individual teacher. They concluded that integrating technology into the classroom influenced a shift towards constructivist instructional strategies for teachers. They suggested that professional development explained some of the variance in the adoption of constructivist practices. They also found that teachers increased constructivist classroom strategies when teaching with technology, but the effect on general instructional strategies outside of technology had varying degrees of implementation. Their qualitative data showed teachers replicating the same constructivist instructional strategies modeled in the professional development sessions.

Matzen and Edmunds's conclusions align with the findings of Lowther et al. (2008) when they reported increased student-centered instruction with technology, but questioned whether that student-centered instruction extended outside of technology to general instructional strategies in the classroom. Matzen and Edmunds's hypothesis and results demonstrated the effect of professional development on teacher practices. This study focused on a new technology initiative and supported the importance of professional development during the adoption process.

Lawless and Pellegrino (2007) undertook a review of studies linking professional development and technology integration in K-12 schools. After searching four major databases for articles and eliminating ones that evaluated specific professional development programs, their review narrowed to 21 articles. Due to their parameters to eliminate any single program evaluation, they may have missed some potential lessons from individual program implementations. They concluded that the field lacked rigorous research and cited a failure to adequately define quality professional development, noting that most professional development evaluations came from teacher feedback and opinions. They claimed that very few studies actually evaluated professional development's effect on student learning and used control groups. They also noted that the research on technology integration and professional development was very limited with little concrete data to inform decision-makers.

Lawless and Pellegrino (2007) proposed a three-phase model grounded in the findings of the studies they reviewed to evaluate professional development related to technology integration in the classroom. Phase one identified the type of professional development, content of the training, technology support, and duration of the sessions. Phase two focused on teacher outcomes by documenting knowledge, attitudes and instructional behaviors by teachers. Phase two developed due to the ambiguity of outcomes present in many studies and the need to integrate technology with other professional development knowledge on how people learn. Phase three was an evaluation of student outcomes. Their proposed model provided a broad framework to raise the level of research and provide practical data for decision-makers.

Lawless and Pellegrino (2007) suggested isolating various factors in the professional development process for further study. In accordance with this recommendation, this study focuses on teacher efficacy and its relationships with professional development. The results of

this study will provide practical data for decision-makers as Lawless and Pellegrino argued was absent.

Mueller et al. (2008) set out to identify teacher characteristics and variables that distinguished between teachers who used technology into their classroom and those that do not. In a study of 185 elementary teachers and 204 middle and high school teachers, they identified seven variables that had a large effect on whether or not teachers integrated computers. They claimed that decisions to integrate computers into the classroom was based on these seven variables, which accounted for 74% of the variance in elementary teachers' use and 68% in middle and high school teachers' use. The seven variables were positive teaching experiences with computers, teachers' comfort with computers, beliefs supporting technology as an instructional tool, training, motivation, support, and teaching efficacy. Mueller et al. found that frequency of use and comfort level with technology affected teachers' integration or non-use. Using a definition of teacher efficacy that focused on teachers' perceptions of their ability to control student learning outcomes, the researchers concluded that teacher efficacy did not influence technology integration in classroom teaching.

Mueller et al.'s (2008) failure to consider a more comprehensive definition of teacher efficacy warrants a re-evaluation of their findings. They used a teacher efficacy measure from the early 1990s, focusing solely on the locus of control. If Tschannen-Moran et al.'s (1998) integrated model of teacher efficacy were applied inclusive of the sources of efficacy, teacher efficacy infiltrates many of the other seven variables such as teaching experiences, teachers' comfort with computers, training, and support. The variables of positive teaching experiences and teachers' comfort relates to mastery experiences, the most powerful sources of efficacy (Bandura, 1997; Tschannen-Moran et al.). Considering that Mueller et al.'s variables account for

68% or more of the variance in technology integration, the role of teacher efficacy on teachers' practices requires further study and exploration. The shortcomings of this study indicate that research around teacher efficacy and its effects are missing from the research literature.

Corn et al. (2011) concluded that professional development was a critical component for success in their evaluation of a 1:1 laptop initiative in 18 North Carolina high schools. They reported that the school with the largest negative response to the 1:1 initiative had the worst professional development plan. They based their criteria for evaluating the quality of professional development on qualitative analysis of teacher feedback. Their study included 9,500 students and 600 staff to determine the effect of the laptop initiative on student learning. They found a significant rise in the technology skill levels of teachers after an initial drop in the first year of implementation. The drop in reported skill levels was noted across multiple groups, regardless of overall teaching experience.

Corn et al.'s (2011) study informs this study in relation to experience and professional development. Like Shidler (2009), this study suggests that 1:1 technology classroom teaching experience may have a greater effect on teacher efficacy than general classroom teaching experience. These findings suggest that teacher efficacy may drop during the first year of teaching in a 1:1 technology environment regardless of general classroom teaching experience. Second, Corn et al. suggested that teachers need sufficient time and input into professional development opportunities. Their study emphasizes the importance of professional development within technology integration and the need to interact with teachers to provide effective professional development opportunities. This study will provide feedback to school leaders on the effectiveness of various types of professional development from the teachers' perspective.

1:1 Laptop Environments

An increasing amount of research around 1:1 laptop environments explains the expectations upon teachers and why this change initiative embodies a significant paradigm shift for teachers. In an effort to evaluate the actual effects of a 1:1 laptop implementation on schools, Lei and Zhao (2008) investigated how students used laptops, what changes in the school took place, what were perceptions of 1:1 laptops, and what were concerns with the 1:1 laptop initiative. In a mixed method research design, they collected surveys from 231 students, 28 teachers, and 44 parents over a one-year period. They also conducted in-depth interviews with nine teachers and nine students. Their methodology yielded informative feedback regarding 1:1 technology implementations. Lei & Zhao (2008) found that students used laptops most commonly for learning purposes, which included taking notes, organizing information, using computer tools to self-check, sharing notes, expanding their knowledge base through the internet, and participating in online discussions. Students reported improved communication with teachers and each other. The laptops were also used to display student work on the internet through websites and multimedia productions. In conjunction with these findings, student technology proficiency increased along with parental involvement and grade point averages (GPA). Laptops cannot be pinpointed as the sole cause of certain outcomes like increased GPA as other intervening factors also affect these outcomes.

Despite very positive perceptions of the 1:1 laptop initiative, some concerns remained after the initial implementation. At the end of the yearlong study, both students and parents gave the 1:1 laptop program high approval ratings. Teachers neared 100% support for the continued use of laptops in the classroom. At the same time, one-third of parents expressed concern about their children spending too much time on the computer. Thirty-nine percent of teachers reported

students were more distracted. Teachers also expressed concern over the school's lack of instruction in information literacy. Some teachers expressed a desire to maintain traditional teaching strategies.

Lei and Zhao's (2008) study provided empirical data and in-depth interviews that demonstrated key effects of 1:1 laptop initiatives in schools. It informs the literature regarding major characteristics from three different stakeholder groups during a 1:1 laptop initiative. However, their study had two major limitations. First, it took place in a wealthier school district with approximately 1% of the population participating in free or reduced lunch, limiting its generalizability. Second, it did not include classroom observations with teachers and students, relying only on self-reporting of information. Despite these limitations, Lei and Zhao provided a detailed list of how students used technology for learning and how teachers reacted to the 1:1 laptop change. Lei and Zhao's study provides insight into 1:1 laptop initiatives and the significance of the change to the learning environment. They informed the proposed study that 1:1 technology programs were an appropriate example of innovation adoption to examine in relationship to teacher efficacy.

In a qualitative study around the same time period, Lowther et al. (2008) made similar conclusions. These researchers participated in 267 hours of observation in 494 classrooms spread among 61 schools in Florida. They performed a baseline observation in the fall and then followed up with more observations in the spring to determine differences over the year. They used standardized observation protocols to maintain consistency across observers. They found a significant increase in the quality of questions from teachers and less individual seatwork with students. They also reported an increase in student engagement from direct observations and a

shift towards student-centered instructional practices. However, the increase in student-centered instructional practices beyond the area of technology was limited.

Lowther et al.'s (2008) study contained the classroom observations of both students and teachers that Lei and Zhao (2008) were missing in their study. These studies reinforced each others' findings. Both studies inform the literature on the potential benefits of a 1:1 technology initiative and what success may look like for schools. These researchers provided quality studies to the field, which Lawless and Pellegrino (2007) said were lacking.

Holcomb (2009) undertook a review of the literature to identify lessons learned from 1:1 laptop implementations. The criteria for her review are unclear so the comprehensiveness of her research is unknown, but unlike Lawless and Pellegrino (2007), Holcomb included program evaluations. Her compilation of the research findings from 1:1 laptop initiatives showed increases in student engagement, community support, student organization, student quality of work, student interest, and student-centered instructional practices. She reported decreases in absentee rates and behavioral issues. She concluded the method of implementation was a key component of success in addition to professional development support for teachers. She argued strongly for professional development that linked directly to classroom experiences. She cautioned school leaders not to judge 1:1 laptop initiatives by student achievement tests alone. She concluded that school leaders needed to reflect on the reasons behind their 1:1 laptop implementation because these reasons often explained programs' successes and failures.

Holcomb's (2009) review of program implementations broadened the limited perspective of Lawless and Pellegrino (2007). Her conclusions indicated that the method of implementation was more important than the actual innovation, emphasizing the importance of professional development to make teachers successful. Holcomb's compilation of research provided

practitioners with practical considerations as they identify desired outcomes of a 1:1 technology initiative. Holcomb's work informs this study of 1:1 technology initiatives as a whole and reiterates the importance of supporting an innovation adoption with professional development.

Inan and Lowther (2010) collected data from 379 teachers in 76 schools to determine factors affecting instructional use of laptops in the classroom. From the survey data, they found that teacher level factors of teacher readiness and teacher beliefs strongly predicted laptop integration. In their path analysis, they found teacher readiness and teacher beliefs were mediating factors to school level factors affecting implementation. School level factors consisted of overall support for technology use, technology support, and professional development. Their study focused solely on how much integration took place so they did not evaluate the quality of the integration.

As previously discussed with Ertmer (2005), teachers' beliefs inherently reflect teacher efficacy. Inan and Lowther's (2010) research reiterates the importance of professional development and the development of teacher efficacy during 1:1 technology initiatives. It also provides an explanation of how teacher efficacy may play a mediating role to other factors, similar to Ross and Gray's (2006) findings with leadership and teacher efficacy.

In reviewing the literature around 1:1 technology environments, multiple researchers have called for additional research and more rigorous studies (Fleischer, in press; Lawless & Pellegrino, 2007). Although this represents only a portion of the 1:1 technology research available, the work of Lei and Zhao (2008), Lowther et al. (2008), and Inan and Lowther (2010) convey the current state of 1:1 technology research as it relates to teacher efficacy. The literature emphasizes the importance of professional development planning. The implementation

strategy also has a critical role in a successful implementation. Further research is needed to consider the specific role of teacher efficacy in planning 1:1 technology implementations.

Conclusion

This literature review built a network of connections around teacher efficacy that demonstrates its complexity and broad effects upon educational settings. The literature review began by connecting teacher efficacy to classroom teaching experience, teacher performance, student achievement, leadership, and school context. From an examination of teacher efficacy and these variables, the progression of innovation adoption and diffusion models led into the role of professional development. Research around professional development is broken down into its associations with teacher efficacy and technology adoption. Finally, the major characteristics and findings from 1:1 technology implementations are discussed and related back to professional development and teacher efficacy.

Although the relationship between teacher efficacy and classroom teaching experience has been examined in past studies, the conclusions are limited and many questions remain. Grounded in the existing research (Shidler, 2009; Tschannen-Moran & Woolfolk Hoy, 2007; Woolfolk Hoy & Spero, 2005), this study examined the relationship of general classroom teaching experience and 1:1 technology classroom teaching experience with teacher efficacy. As Wheatley (2005) articulated, the research around teacher efficacy can be confusing in places and exhibit gaps in the research base. Additional study is needed to identify to what extent classroom teaching experience relates to teacher efficacy during a major change initiative.

Numerous studies have demonstrated the effect of professional development on teacher practices (Corn et al., 2011; Haney et al., 2007; Matzen & Edmunds, 2007; Ross & Bruce, 2007;

Shidler, 2009; Timperley & Phillips, 2003; Tschannen-Moran & McMaster, 2009) and affirmed the need for effective professional development to successfully complete a new initiative (Holcomb, 2009; Inan & Lowther, 2010; Straub, 2009; Zhao & Franks, 2003). A complete understanding of teacher efficacy and its relationship to innovation adoption, and particularly a 1:1 technology implementation, remains absent from the literature. In addition to examining the relationship between experience and teacher efficacy, this study collected data to evaluate the effectiveness of various professional development formats based upon teacher perceptions.

Chapter Three

Methodology

This study explored how teachers' classroom teaching experience relates to teacher efficacy during the implementation of 1:1 technology programs. It also considered teacher perceptions of the effectiveness of professional development formats intended to support their implementation of 1:1 technology in their classrooms. One-to-one technology programs provide one device to every child in the classroom to facilitate the seamless integration of technology into instruction. The following questions guided the research:

1. When confronted by the need to adapt instruction to a 1:1 technology classroom, does a relationship exist between teachers' sense of efficacy and classroom teaching experience and if it exists, is it a stronger relationship than other factors such as age, gender, grade level(s) taught, nationality, subject(s) taught, and the type of 1:1 technology device?
2. Do teachers confronted by the need to adapt instruction to a 1:1 technology classroom perceive their teacher efficacy as being affected by the provision of professional development and training in methods of effectively employing the technology for improved student learning?

The first research question examined teachers' sense of efficacy in relation to a range of variables, most importantly classroom teaching experience for teachers currently teaching in a 1:1 technology classroom in grades 6 to 12. The introduction of 1:1 technology into a classroom is a significant change to teachers' instructional strategies and classroom structures (Corn et al., 2011; Inan & Lowther, 2010; Lei & Zhao, 2008; Lowther et al., 2008; Matzen & Edmunds, 2007; Mueller et al., 2008). The Teachers' Sense of Efficacy Scale (TSES), developed by

Tschannen-Moran and Woolfolk Hoy (2001), measured teachers' sense of efficacy. Participants in the study received numerical scores between 1 and 9 to quantify their sense of teacher efficacy in each of the three areas measured by the TSES: classroom management, instructional strategies, and student engagement. The score for each area was derived from the mean of four responses within the instrument. In addition to the TSES measures, participants reported their perceptions on whether or not 1:1 technology experience increases their effectiveness in a classroom with 1:1 technology. In the last section of the instrument, teachers rated their perceptions of the effectiveness of identified professional development formats to prepare them for a 1:1 technology implementation on a numerical scale of 1 to 9.

Research Design

The study used a combination of a correlational and survey research design to explore the relationship between teacher efficacy, classroom teaching experience, and teacher perceptions. A correlational study explores the relationship between two or more variables without evaluating causality (Creswell, 2008). This study explored the relationship between classroom teaching experience, both with and without 1:1 technology, and teacher efficacy. It also examined teacher efficacy in relationship to teachers' perceptions regarding the effectiveness of the identified professional development formats. A survey research design collects data to generalize or describe a population and its characteristics or attitudes (Creswell, 2008). The survey aspect of the research design was most prominent in the second research question that collected teacher perceptions regarding professional development. While providing data for the correlational aspect of the study, the survey data also describes the participants in the study. The survey design facilitated efficient data collection from one sample at one point in time (Creswell, 2008).

Each research question maintained independence throughout the study, including the data analysis. The point of interface for the two research questions occurred during the final interpretation phase of the study. By combining the results during the interpretation phase of the research, a more holistic understanding of the findings and their implications could be examined by the researcher.

The relationships identified in each research question were analyzed independently using multiple regression analysis. In addition to classroom teaching experience with and without 1:1 technology devices, the survey instrument collected data for other independent variables including age, gender, grade level(s) taught, passport nationality, subject(s) taught, and the type of 1:1 device in the classroom. These additional variables supplied comparison data to provide a more complete picture of the participants and identify other potential relationships with teacher efficacy.

Population and Sample

The parameters for the study limited participation to teachers currently employed by full member schools in the East Asia Regional Council of Overseas Schools (EARCOS). EARCOS schools were chosen to assure English as the primary language of instruction, which is one criterion noted on the EARCOS (2010) website for member schools. In addition, schools participating in EARCOS also hold accreditation from an established accrediting agency, assuring that their students can matriculate successfully to North American universities. The most common accreditation among the EARCOS schools is the Western Association of Schools and Colleges (WASC) although other similar agencies also participate in the region. Accreditation through a major association such as WASC demonstrates an ongoing commitment

to school improvement and provides an important credential for educational institutions, denoting an external validation of the schools' educational programs.

An additional parameter limited participation in the study to EARCOS schools located in China, Japan, and South Korea, which were referred to as East Asia for the purposes of this study. Within the international schools, East Asia provided numerous international schools with similar organizational features and curriculum employing 1:1 technology programs. East Asia provided the study with a diverse population of established and new 1:1 technology programs. A range of technology devices in this geographic region is readily accessible, and technology has experienced widespread implementation in the international schools.

International schools were selected for the study because they provided an effective population to evaluate 1:1 technology implementations. In addition to the previously mentioned diversity of 1:1 technology experience in the population, international schools are motivated and financially capable of 1:1 technology implementations. As private, autonomous institutions, these schools are able to use financial resources without government encumbrances or political restrictions that many national districts may face. The relative scale of these international schools also allows rapid changes to occur. For example, the largest international school in Asia numbers approximately 5,000 students while local districts in the United States may number in the tens or hundreds of thousands. This smaller scale allows schools to focus heavily on hardware for implementation as well as professional development. Unlike national systems, attendance is voluntary and those that disagree with a particular change have the freedom to choose another educational institution. In addition, these international schools frequently contain characteristics from multiple national educational systems including Australia, Canada, New Zealand, the United Kingdom, and the United States among the most prominent. This swirl of

nationalities in international schools allowed the study to include passport nationality as an independent variable.

The population of this study consisted of middle school and high school teachers at the identified international schools. Although some middle schools start in fifth grade, sixth grade was defined as the starting grade for the study to maintain consistency across schools. The researcher chose middle and high schools because they frequently have similar structural formats with students moving from teacher to teacher for each class period. The study included teachers who were assigned to teach a minimum of one course with daily 1:1 technology access in any subject area. One-to-one technology access included laptops, tablets, or a computer laboratory. Teachers without 1:1 laptop or tablet classrooms, non-teaching administrators and support personnel did not meet the criteria for participation.

Sixty-four international schools were identified in East Asia as members of EARCOS with 29 in China, 21 in Japan, and 14 in South Korea (EARCOS, 2010). Based on an informal survey with EARCOS superintendents, the researcher anticipated at least 50% of the identified schools have 1:1 technology programs out of the 64 schools. Based on the school sizes, these schools were estimated to employ 1,500 or more teachers in their 1:1 technology classrooms. Based on a priori analyses through G*Power software with 8 independent variables dummy coded for the multiple regression analysis at 12 independent variables, a total sample size of N needed at least 131 participants to attain statistical significance (Faul, Erdfelder, Buchner, & Lang, 2009). The statistical significance was based on an alpha of .05, a medium effect size of .15, and a power of .80. The researcher chose this population to obtain a statistically significant number of participants for the study, even if a low participation rate occurred among East Asian

EARCOS schools. The actual number of teachers that qualified for the study due to teaching in classrooms from grades 6-12 with 1:1 technology is unknown as this data was unavailable.

The population in this study provided a wide variation of experience both in general classroom teaching experience and 1:1 technology classroom teaching experience. Some schools maintained long-standing 1:1 technology programs, providing veteran teachers with substantial 1:1 technology classroom teaching experience. Other schools have recently implemented 1:1 technology in classrooms. All schools provided a diversity of general classroom teaching experience.

Instrument

Participants began the survey instrument by confirming they currently teach in a 1:1 technology classroom in East Asia for grades 6-12. Only teachers meeting these criteria continued to the questionnaire. Following the initial screening of participants, respondents were asked for their informed consent to continue participating in the research. (See Appendix A for a complete copy of the instrument.)

The survey instrument consisted of three distinct sections. The first section measured teacher efficacy through the TSES, developed by Tschannen-Moran and Woolfolk Hoy (2001). The researcher administered the short form of the TSES (Tschannen-Moran & Woolfolk Hoy, 2001) to measure teacher efficacy (see Appendix B for permission to use). The TSES was selected as a previously established instrument to measure teacher efficacy with validity and reliability (see Table 1) (Tschannen-Moran & Woolfolk Hoy, 2001; Tschannen-Moran & Woolfolk Hoy, 2007). On both the short and long forms, a factor analysis identified three areas of efficacy: classroom management, instructional strategies, and student engagement. Teachers'

sense of efficacy scores can vary in each of these three areas. In this study, teacher efficacy refers to all three areas and evaluated each area individually to answer the research questions.

The researcher chose the 12-question short form for this study given the consistency and reliability between the short and long forms. From a practical perspective, the short form encouraged a higher return rate because it was easier for participants to complete. In comparing the short and long forms, Tschannen-Moran and Woolfolk Hoy (2001) found very little variation in means and the standard deviation between the two forms. Although slightly lower in the short form, the alpha coefficient remained at an acceptable .90 (Tschannen-Moran & Woolfolk Hoy), making it highly reliable (Creswell, 2008). See Table 1 for further details on the comparison between the short and long forms.

Table 1

Comparison of TSES Long Form and Short Form Statistics (Tschannen-Moran & Woolfolk Hoy, 2001)

	Long Form			**Short Form**		
	Mean	SD	alpha	Mean	SD	alpha
TSES	7.1	.94	.94	7.1	.98	.90
Classroom Management	6.7	1.1	.90	6.7	1.2	.86
Instructional Strategies	7.3	1.1	.91	7.3	1.2	.86
Student Engagement	7.3	1.1	.87	7.2	1.2	.81

The second section of the survey instrument collected data for the independent variables of each participant. The demographic questions in the second section of the survey instrument mirrored the demographic data collected on the original TSES. From the original TSES, the researcher omitted ethnicity and socio-economic questions due to irrelevance to the research questions. This section collected the critical data of general classroom teaching experience and 1:1 technology classroom teaching experience. Years of experience were rounded to the nearest

whole year and calculated as a continuous numerical variable. Additional independent variables in the study included age, gender, grade level(s) taught, passport nationality, subject(s) taught, and the type of 1:1 technology device in the classroom. The subjects taught were categorized on the survey to fine arts (music, visual arts, design), language arts (grammar, literature, writing), mathematics, science, social studies (economics, history, philosophy, psychology, religious studies, sociology), technology (basic or advanced skills, programming), and world languages. An open-ended response allowed other subjects to be listed in addition if it was outside these categories. For data analysis, these subject areas were further simplified to three categories: language arts and social studies, math and science, and other. The type of 1:1 technology device choices included laptops, tablets, both laptops and/or tablets, and a computer laboratory with stationary computers.

In the last section of the survey instrument, participants noted their agreement or disagreement with the following statement on a 5-point Likert scale of strongly disagree to strongly agree: "As I have taught in a 1:1 technology classroom, my effectiveness increases with my experience." This question explored whether teachers maintain a self-perceived link between experience and their sense of efficacy. Quantitative data analysis examined the general perception of teachers and how they perceive the importance of experience. This question gave an overview of teachers' perceptions and was not intended for further data analysis or breakdown into subgroups.

The third section of the survey instrument also contained a list of professional development formats and corresponding rating scales. Participants in the study rated the perceived effectiveness of each professional development format they had experienced. The ratings were limited to formats the respondent had experienced. The work of Tschannen-Moran

and McMaster (2009) provided the basis for the identified professional development formats, stemming primarily from their study of professional development formats for implementing a new teaching strategy for reading. Tschannen-Moran and McMaster performed four different treatments of professional development to teachers adopting a new reading strategy. For this study, their treatments were separated into the core components and linked back to Bandura's (1997) sources of self-efficacy (see Table 2). Some treatment formats were modified to provide clarity for respondents and more clearly link to a particular source of efficacy. In addition to the foundation from Tschannen-Moran and McMaster, other research studies provided the basis for the identified professional development formats in the survey instrument (Bruce & Ross, 2008; Glazer et al., 2005; Haney et al., 2007; Lawless & Pellegrino, 2007; Matzen & Edmunds, 2007; Mueller et al., 2008; Ross & Bruce, 2007; Shidler, 2009).

Table 2

Professional Development Formats and Their Links to Previous Research and Sources of Efficacy

Professional Development Format	Source of Efficacy	Research Basis
Lecture style workshop (informational or skill developmental)	Verbal Persuasion	Mueller et al. (2008) Tschannen-Moran & McMaster (2009)
Hands on style workshop where new skills are introduced and practiced (skill development)	Verbal Persuasion, Vicarious Experience, Mastery Experience	Matzen & Edmunds (2007) Mueller et al. (2008) Tschannen-Moran & McMaster (2009)
Observed demonstration of skills with adults as students in workshop (skill development & modeling)	Verbal Persuasion, Vicarious Experience	Matzen & Edmunds (2007) Ross & Bruce (2007) Tschannen-Moran & McMaster (2009)
Observed demonstration of skills with students via video or students physically attending workshop (modeling)	Vicarious Experience	Haney et al. (2007) Tschannen-Moran & McMaster (2009)
Small group reflection on classroom experiences	Verbal Persuasion, Mastery Experience	Bruce & Ross (2008) Haney et al. (2007) Holcomb (2009) Lawless & Pellegrino (2007)
Small group collaboration to practically insert new strategies into lessons and curriculum	Verbal Persuasion	Bruce & Ross (2008) Tschannen-Moran & McMaster (2009)
Individual modeling of strategies in your classroom by a trainer/coach with your students	Vicarious Experience	Bruce & Ross (2008) Shidler (2009) Tschannen-Moran & McMaster (2009)
1 on 1 coaching inside and outside the classroom through reflection and training on new skills/strategies	Mastery Experience	Bruce & Ross (2008) Glazer et al. (2005) Shidler (2009) Tschannen-Moran & McMaster (2009)

Procedure

With the approval from the Executive Director of EARCOS (see Appendix C), heads of EARCOS schools in East Asia were contacted via email to solicit the participation of their faculty (see Appendix D). Upon approval from individual heads of schools, the head of school, or a delegate, forwarded an email with a hyperlink to the survey to potential participants (see Appendix E). Participants accessed the survey instrument digitally via the hyperlink in the email. Participants provided their informed consent by continuing participation in the survey and checking a box that they consented to participate. Results from the data analysis were reported as a whole to eliminate any identifying information from countries, schools, or individuals.

Prior to conducting the data collection, a pilot survey was performed with 25 international school teachers outside of the identified population in East Asia. The pilot survey was used to evaluate questions outside of the TSES for clarity and usefulness of data. No responses gathered during the pilot survey were used within the final research. All responses to the pilot survey followed the same informed consent of the actual participants and responses were completely anonymous. Appendix F shows the pilot survey with the additional questions for the pilot participants.

The researcher, after making minor edits for clarity in the wording as recommended by participants in the pilot study, provided the same link to all potential participants so no data collected could be involuntarily traced back to an individual or a school. Participants received two emails over a four-week period of data collection. The first email provided instructions and invited participation (see Appendix D). Approximately one week before survey deadline occurred, a second email asked teachers again to consider participation (see Appendix E). The

exact timing of these emails relied on the school representative forwarding them to appropriate personnel. From start to finish, participants had 4 weeks to participate in the survey.

The data collection was conducted digitally through SurveyMonkey.com. Numerical data was exported from SurveyMonkey to Microsoft Excel. It was recoded in Excel, which included numerical conversions and the dummy coding of categorical variables. It was then imported into the Statistical Package for the Social Sciences 22.0 (SPSS) software. Once in SPSS, the researcher analyzed the data according to the identified data analysis procedures. No one except the researcher had access to the data.

Participants were expected to complete the survey in approximately 10 minutes and could exit the survey at any time. Participation was entirely voluntary. Upon completion of the survey, participants were redirected to a completely different survey site with no link to their previously submitted data. They had the option to enter their email address and name to be entered into a random selection of gift certificates to Amazon.com. No data was linked back to individual responses.

Data Analysis

Classroom Teaching Experience and Teacher Efficacy. The first research question considered the relationship between teachers' sense of efficacy and classroom teaching experience when currently teaching in a 1:1 technology classroom in grades 6 to 12 at an East Asian international school. Data analysis tested the following null hypothesis:

H_0^1 = General classroom teaching experience and 1:1 technology classroom teaching experience show no relationship with teachers' sense of efficacy.

In order to test the hypotheses for the first two research questions, the researcher used multiple linear regression. The independent variables included the following: 1:1 technology classroom teaching experience, age, general classroom teaching experience, gender, grade level(s) taught, passport nationality, subject(s) taught, and the type of 1:1 technology device in the classroom. The dependent variables were the measure of teacher efficacy in the previously established factors of classroom management, instructional strategies, and student engagement (Tschannen-Moran & Woolfolk Hoy, 2001). TSES scores ranged between 1 and 9 and were calculated from the mean responses for each area of teacher efficacy. The multiple regression incorporated both continuous and categorical independent variables in the data analysis. Categorical independent variables were dummy coded for the data analysis (see Figure 2).

Figure 2. List of independent variables and dummy codes.

1) General Classroom Teaching Experience: continuous numerical
2) 1:1 Technology Teaching Experience: continuous numerical
3) Age: continuous numerical
4) Gender: Female = 0 and Male = 1

5) Nationality: US = 0 and East Asian = 1
6) Nationality: US = 0 and Other = 1

7) Grade Levels Taught: High School = 0 and Middle School = 1
8) Grade Levels Taught: High School = 0 and Both Middle & High School = 1

9) Subjects Taught: Other = 0 and Lang Arts & Social Studies = 1
10) Subjects Taught: Other = 0 and Math & Science = 1

11) Type of Device: Laptops = 0 and Tablets = 1
12) Type of Device: Laptops = 0 and Both Laptops & Tablets = 1

Multiple regression assumes that no multicollinearity is present. If multicollinearity exists, it means two or more independent variables are strongly correlated. In order to test for multicollinearity, the researcher examined the variance inflation factors (VIF). If the VIF of two independent variables was greater than 4, then the researcher planned to further scrutinize multicollinearity within the context of the other variables (O'Brien, 2007). If the VIF was more than 10, one of the independent variables would be removed from the analysis. O'Brien suggested that researchers should evaluate multicollinearity within the context of their study because removal of independent variables due to high VIFs can have adverse affects on the intended outcomes and affect the research design. Within the data analysis, no independent variable exceeded these thresholds in their VIF, so all variables remained in the model.

Multicollinearity was a potential concern with general classroom teaching experience and 1:1 technology classroom teaching experience because general classroom teaching experience

would include the years taught in a 1:1 technology classroom within its numerical value. Age was also a potential concern for multicollinearity because it may reflect both general classroom teaching experience and 1:1 technology classroom teaching experience. However, the VIF remained below the stated threshold of 4 for these variables so no variables were removed.

The multiple regression analysis resulted in a series of statistics to determine the significance of the findings and evaluate the null hypotheses. Considering the three multiple regression analyses in total, a Bonferroni adjustment of alpha was considered so the total possibility of committing a Type I error did not exceed .05 (Mundfrom, Perrett, & Schaffer, 2006). Therefore, the alpha for each regression analyses was measured at both the .05 and .017 thresholds. According to Mundfrom et al., a Bonferroni adjustment was not required in this situation, but it was recommended to add credibility to the statistical significance. The results were considered both with and without a Bonferroni adjustment.

The rejection of the null hypotheses relied solely on the statistical analysis, yet teachers' self-perceptions of classroom teaching experience provided explanatory data or insight about the relationship between these variables from another perspective. One question on the survey instrument asked teachers if they felt that their effectiveness in a 1:1 technology classroom increased with their experience. The Likert scale resulted in a numerical score with Strongly Disagree as a 1 to Strongly Agree as a 5. The results showed the frequency of these ratings and the aggregate mean. This question and its results were descriptive in nature and provided additional information about the perceived relationship of these variables.

Teacher Efficacy and Professional Development Effectiveness. The second research question explored the nature of the relationship between teachers' sense of efficacy and teachers'

perception of the effectiveness of various professional development formats during a 1:1 technology implementation. This question considered the following null hypothesis:

H_0^2 = Teachers' sense of efficacy bears no relationship to teachers' perception of the effectiveness of certain professional development formats.

For the second research question, the independent variables were the effectiveness ratings for the eight identified professional development formats. The dependent variables were the teacher efficacy scores in classroom management, instructional strategies, and student engagement. Like the TSES section, respondents rated the effectiveness of these professional development formats on a scale of 1 (not at all) to 9 (a great deal). This rating scale was consistent from the TSES and provided numerical scores for each professional development format. Zero was used to represent the respondents that did not understand the format, had not experienced it, or left the specific format blank.

The study conducted a multiple regression analysis to determine if any relationship existed between teachers' sense of efficacy and their ratings of the effectiveness of the identified professional development formats. An a priori G*Power software analysis with eight independent variables for the identified professional development formats calculated that a minimum of 136 participants were needed to obtain statistical significance (Faul et al., 2009). This sample size was calculated based on a .15 effect size, .80 power, and an alpha level of .017 to include a Bonferroni adjustment of the normal .05 threshold. The study substantially exceeded this minimum number with 234 participants.

In addition to the multiple regression analysis, a secondary analysis removed all zeroes from the perceived effectiveness ratings of the identified professional development formats. The removal of zeroes prevented participants that have not experienced a professional development

format from skewing the data results with zeroes. A one-way analysis of variance (ANOVA) evaluated the relationship between each professional development format and the dependent variables of teacher efficacy in classroom management, instructional strategies, and student engagement.

Reliability and Validity

The study used previously established measures to evaluate respondents. Most prominently, the TSES provided a credible and widely accepted measure of teacher efficacy based upon the prevailing integrated model of teacher efficacy (Tschannen-Moran & Hoy, 2001; Tschannen-Moran, Hoy, & Hoy, 1998). The use of an established measure gives validity to the results of the study. In regard to the second research question, the researcher drew heavily from previous studies to produce a list of professional development formats that linked to specific sources of efficacy (Tschannen-Moran and McMaster, 2009). The close correlation to previous studies gives validity to the items in the survey instrument.

A pilot study was used to evaluate the entire instrument and obtain feedback on questions that had not been previously tested through other studies. Several international schools were contacted outside of East Asia to obtain 25 responses to the pilot survey. In addition to the proposed instrument, respondents were asked to provide feedback on the clarity of the questions and the length of time it took them to complete the digital survey. The pilot survey participants were international educators with many similarities to the intended population at international schools in East Asia. The use of a similar population for the pilot study assisted the researcher in obtaining relevant and reliable feedback before introducing the survey to the intended participants. The TSES was an established measure that did not need additional testing, nor was

it edited from the original. However, other components such as the list of identified professional development formats were developed for this study. The pilot study resulted in minor edits for clarity within the wording of the professional development formats. It also corrected minor errors in the survey settings so participants could move smoothly through the digital survey.

The researcher conducted a rigorous statistical analysis of the data through multiple regression analysis. The statistical thresholds to control the overall Type I error were set at the standard .05 level to obtain significance. With the three components of teacher efficacy acting as dependent variables, the researcher performed an additional analysis with a Bonferroni adjustment of each regression analysis at the .017 level to assure the aggregate did not exceed the stated .05 level. The Bonferroni adjustment added rigor and credibility to the findings. The sample exceeded the desired power of .80 and achieved a power of .96 or above for the multiple regression analysis. Some ANOVA calculations fell below the desired power of .80 and those results are clearly noted as applicable. The statistical rigor of the study ensured reliability in the findings.

The procedure and data analyses were designed to maintain data integrity and assure reliability within the results. In order to minimize any errors in data transcription, the data was exported digitally from SurveyMonkey.com to Microsoft Excel software. To the extent possible, digital substitution tools were used to convert text responses from the instrument to numerical data and assure reliable conversions occurred without human error. The dummy coding of categorical variables occurred in Microsoft Excel as well. Upon completion of the coding, the data was imported digitally into SPSS 22.0 to maintain the integrity of the data.

Chapter Four

Results

This chapter presents the results of data collection and analysis to determine the factors that affect teacher efficacy during a significant change in teaching methodology. The significant change explored in the study was the implementation of 1:1 technology classrooms. The two research questions framing the data collection and analysis are the following:

1. When confronted by the need to adapt instruction to a 1:1 technology classroom, does a relationship exist between teachers' sense of efficacy and classroom teaching experience and if it exists, is it a stronger relationship than other factors such as age, gender, grade level(s) taught, nationality, subject(s) taught, and the type of 1:1 technology device?
2. Do teachers confronted by the need to adapt instruction to a 1:1 technology classroom perceive their teacher efficacy as being affected by the provision of professional development and training in methods of effectively employing the technology for improved student learning?

Descriptive Statistics

Data was sought from teachers in 64 international schools in the East Asia Regional Council of Schools (EARCOS) located in China, Japan, and South Korea. In order to participate in the study, teachers had to teach at least one course to students in grades 6-12 in which all students had access to a technology device every day. A total of 321 respondents met these criteria and agreed to participate in the study. Incomplete surveys were eliminated, leaving a total of 234 complete surveys for analysis. While respondents were not asked to identify the schools at which they served, superintendent notifications and domain names included in the

email addresses submitted for the gift drawing at the end of the survey instrument indicated that 14 of the 64 EARCOS schools participated—8 in China, 5 in South Korea, and 1 in Japan.

Participant Characteristics. The general classroom teaching experience of the participants ranged from 1 to 42 years (see Figure 3). Participants' classroom teaching experience with 1:1 technology ranged from 1 to 15 years (see Figure 4). Within this 15-year range, 87.6% of the respondents possessed 6 or less years of experience with 1:1 technology in their classroom. Over ninety-three percent of the study's participants had 1:1 technology classrooms with laptops while only 6.4% used tablets in their classrooms. Of the 234 participants, 52.1% were female and 47.9% were male. The age of participants in the study was distributed from 25 to 68 years of age (see Figure 5).

Participants in the survey were categorized as one of three types of passport holders, which included the United States, East Asian (China, Japan, and South Korea), and other. Participants outside of the United States and East Asia included Australia, Canada, India, Mauritania, New Zealand, South Africa, Sweden, and the United Kingdom. Of the participants in the survey, 72.2% held United States' passports, 22.6% were in the other category, and 5.1% held an East Asian passport.

Figure 3. Total Years of Teaching Experience of Participants

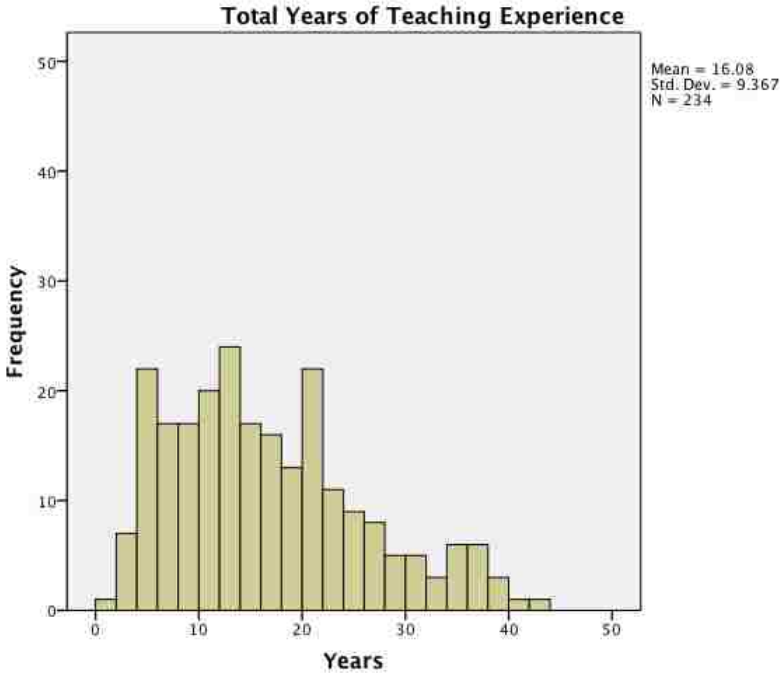


Figure 4: Total Years of Teaching Experience with 1:1 Technology

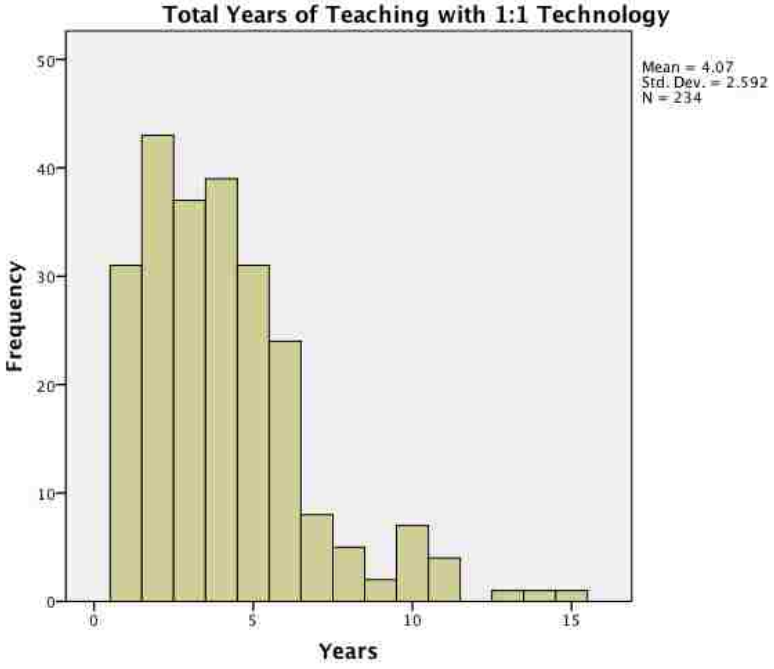
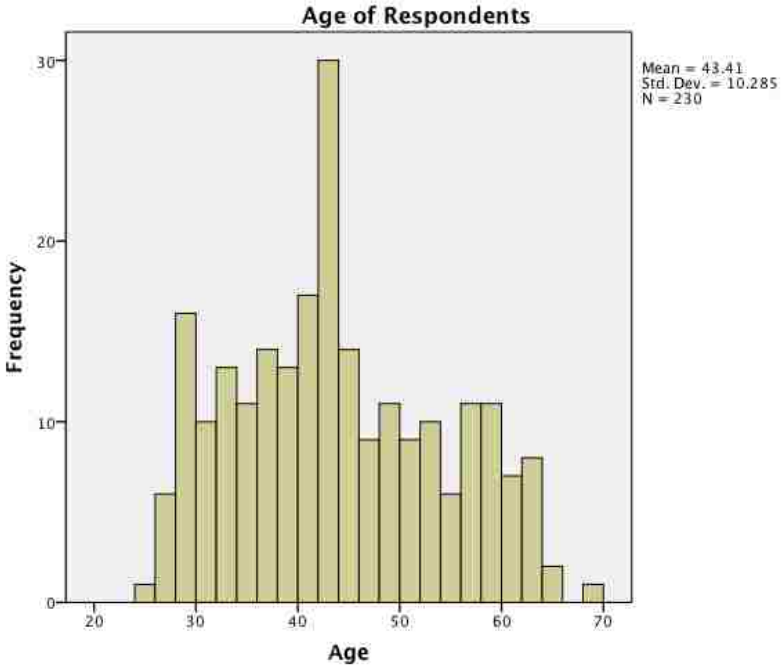


Figure 5. Age Distribution of Participants



Teachers' Sense of Efficacy Scale Scores

The 12 questions from the TSES provided scores for participants in the three areas of classroom management, instructional strategies, and student engagement. Each area had four questions associated with it, and the responses were averaged to give a final TSES score in each area. The scores were calculated on a scale from 1 to 9, with higher scores denoting a stronger sense of efficacy. Tschannen-Moran and Woolfolk Hoy (2001) reported means for instructional strategies at 7.3 and student engagement at 7.2. Classroom management was lower in their study with a mean of 6.7. Overall, scores exceeding these means could be considered signs of strong teacher efficacy and scores below these means may demonstrate weaker teacher efficacy.

Participants in this study maintained a mean score of 7.75 in classroom management, significantly stronger than Tschannen-Moran and Woolfolk Hoy (2001) reported in their study and the highest of the three identified areas. Teachers' sense of efficacy in instructional

strategies averaged 7.59 and student engagement averaged 7.07, the lowest of the three components of teacher efficacy. The participants in this study exhibited a strong sense of teacher efficacy in classroom management and instructional strategies. Student engagement was slightly below previously reported means.

Table 3

Reliability Analysis Compared to Baseline Means from Tschannen-Moran & Woolfolk Hoy (2001)

	Current Study			Baseline Measures		
	Mean	SD	alpha	Mean	SD	alpha
TSES	7.47	.80	.88	7.1	.98	.90
Classroom Management	7.75	1.1	.85	6.7	1.2	.86
Instructional Strategies	7.59	1.2	.74	7.3	1.2	.86
Student Engagement	7.07	1.3	.78	7.2	1.2	.81

Classroom Teaching Experience and Teacher Efficacy

The first research question addressed the relationship between teachers' classroom teaching experience when currently teaching in a 1:1 technology classroom and teachers' sense of efficacy. It tested the following null hypothesis:

H_0^1 = General classroom teaching experience and 1:1 technology classroom teaching experience show no relationship with teachers' sense of efficacy.

In the multiple regression analysis, the independent variables included 1:1 technology classroom teaching experience, age, general classroom teaching experience, gender, grade level(s) taught, passport nationality, subject(s) taught, and the type of 1:1 technology device in the classroom. The dependent variables were the previously established factors of classroom management, instructional strategies, and student engagement within teachers' sense of efficacy

(Tschannen-Moran & Woolfolk Hoy, 2001). This research study considered whether or not any independent variables predicted TSES scores for the three components of teacher efficacy.

Classroom Management. Two variables indicated statistical significance for teacher efficacy in relation to classroom management. These variables were gender and the possession of an East Asian passport. Gender exhibited a significance of .035, which indicated that gender was a significant predictor of classroom management scores on the TSES scale. Women tended to have higher scores in classroom management than men (see Figure 6). Since only 12 respondents in the study held East Asian passports (5.1%), the small N among participants makes it difficult to attach any substantial meaning to this variable when no other nationality held any statistical significance. Table 4 provides more details regarding the independent variables' relationship with classroom management and Table 5 gives a key for variable abbreviations in the data analysis.

Figure 6. Frequency of Teacher Efficacy Scores in Classroom Management by Gender

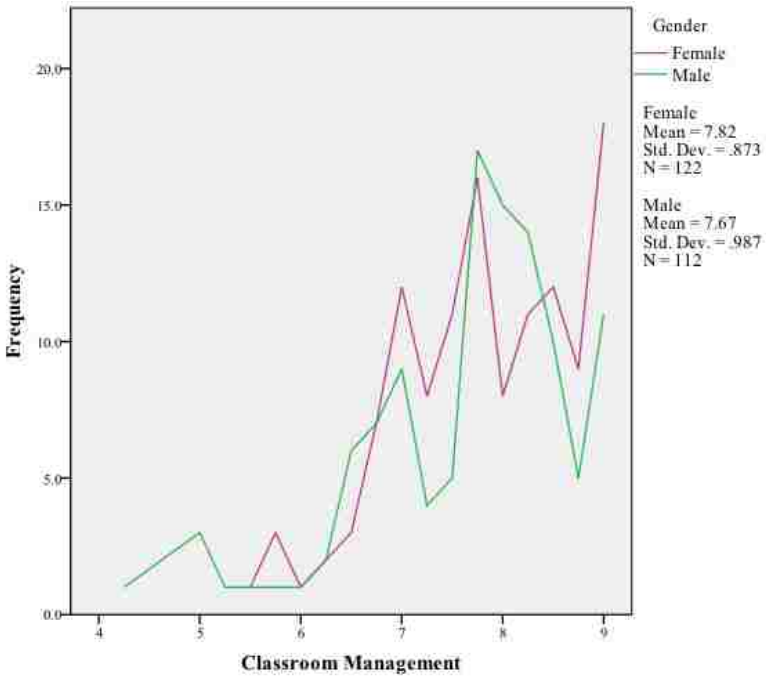


Table 4

Teachers' Sense of Efficacy Scale Coefficients Table with Classroom Management as the Dependent Variable and Collinearity Statistics

Variable	Unstandardized Coefficients		t	Sig.	Collinearity Statistics
	B	Std. Error			VIF
(Constant)	7.772	.202	38.543	.000	
TotalTeach	.011	.007	1.544	.124	1.190
TechTeach	.035	.025	1.398	.163	1.178
Age	.000	.000	.293	.770	1.026
Gender	-.266	.126	-2.116	.035*	1.081
Nationality: US/E. Asian	-.633	.293	-2.162	.032*[1]	1.073
Nationality: US/Other	.029	.147	.199	.842	1.058
Grade Levels: HS/MS	-.092	.139	-.666	.506	1.163
Grade Levels: HS/Both	-.302	.184	-1.644	.102	1.196
Subject-Lang	-.083	.145	-.571	.569	1.380
Subject-Math	-.252	.157	-1.600	.111	1.441
Laptops/Tablets	-.180	.302	-.597	.551	1.043
Laptops/Both	-.232	.421	-.550	.583	1.035

*Significance at the .05 level

[1] Notes small sample size

Table 5

Table of Variable Abbreviations for Data Analysis

Variable Names	**Variable Abbreviations**
General Classroom Teaching Experience	TotalTeach
1:1 Technology Classroom Teaching Experience	TechTeach
Age	Age
Gender	Gender
Passport Nationality (US/East Asian)	Nationality: US/E. Asian
Passport Nationality (US/Other)	Nationality: US/Other
Grade Levels Taught (High School/Middle School)	Grade Levels: HS/MS
Grade Levels Taught (High School/Both Middle and High School)	Grade Levels: HS/Both
Subjects Taught (Other/Language Arts)	Subject-Lang
Subjects Taught (Other/Math & Science)	Subject-Math
Type of Device (Laptops/Tablets)	Laptops/Tablets
Type of Device (Laptops/Other)	Laptops/Both

The data was analyzed with and without a Bonferroni adjustment of alpha at the .05 level (Mundfrom, Perrett, & Schaffer, 2006). The Bonferroni adjustment was added to assure that the null hypothesis was not rejected if it was true. With a Bonferroni adjustment for the three dependent variables represented by the three areas of teacher efficacy, it redefined the .05 level of error to .017 for each dependent variable. This adjustment was not required to reject the null hypothesis, but it added to the statistical rigor of the data analysis. No independent variable achieved a .017 level of significance for classroom management. In other words, gender showed a statistically significant relationship to classroom management, but it did not pass the more rigorous statistical test at the .05 level with a Bonferroni adjustment for three dependent variables. This result means that the relationship should be interpreted with caution even though it meets the criteria required to reject the null hypothesis.

The R-square value for classroom management indicated that 9.3% of the variance was explained by these independent variables. Since many of the variables were not significant predictors , $p > .05$, the adjusted R-squared value removes the inflation of this value due to the number of variables. The adjusted R-squared value was 3.9%, a relatively low explanation of the variance in classroom management.

Instructional Strategies. The same statistical process evaluated teachers' sense of efficacy in instructional strategies. General classroom teaching experience was a strong predictor of teacher efficacy in instructional strategies, achieving a significance value of .002. This level of significance denoted a strong relationship between general classroom teaching experience and teachers' sense of efficacy in instructional strategies. It exceeded the more rigorous requirement of a Bonferroni adjustment at the .01 level of significance. Table 6 summarizes the relationships of the identified independent variables with teachers' sense of efficacy in instructional strategies.

While a strong relationship between instructional strategies and general classroom teaching experience appears to exist, the adjusted R-squared value for instructional strategies showed that less than 1% of the variance was explained by these independent variables. Without an adjustment, the R-square value was 6.4%. Although a strong relationship appears to exist, these independent variables exhibit a very low explanation of the variance in teacher efficacy as related to instructional strategies.

Table 6

Teachers' Sense of Efficacy Scale Coefficients Table with Instructional Strategies as the Dependent Variable and Collinearity Statistics

Variable	Unstandardized Coefficients		t	Sig.	Collinearity Statistics
	B	Std. Error			VIF
(Constant)	7.404	.193	38.372	.000	
TotalTeach	.021	.007	3.177	.002*	1.190
TechTeach	-.012	.024	-.481	.631	1.178
Age	.000	.000	.451	.652	1.026
Gender	-.151	.120	-1.255	.211	1.081
Nationality: US/E. Asian	-.173	.280	-.619	.536	1.073
Nationality: US/Other	-.071	.141	-.501	.617	1.058
Grade Levels: HS/MS	.028	.133	.209	.835	1.163
Grade Levels: HS/Both	.147	.176	.835	.404	1.196
Subject-Lang	-.012	.138	-.086	.932	1.380
Subject-Math	-.172	.151	-1.140	.255	1.441
Laptops/Tablets	.060	.289	.207	.836	1.043
Laptops/Both	.194	.403	.482	.631	1.035

*Significance at the .05 level inclusive of a Bonferroni adjustment

Student Engagement. The same predictor variables for student engagement found an overall significance level of .002 for the model (see Table 7). Student engagement was the only aspect of teacher efficacy that achieved a significant F statistic, signifying that the entire model with all independent variables would not predict the dependent variable by chance. This result provided strong evidence to reject the null hypothesis.

The independent variables of general classroom teaching experience and gender acted as predictors of teachers' efficacy in relation to student engagement, inclusive of the Bonferroni

adjustment. General classroom teaching experience exhibited statistical significance of .000, which met the .01 level of significance, inclusive of a Bonferroni adjustment. Teachers that possessed more general classroom teaching experience tended to exhibit higher teacher efficacy in student engagement. Gender had a statistical significance of .014 (see Table 8). Like classroom management, female participants tended to exhibit higher teacher efficacy in student engagement than males (see Figure 7).

Table 7

Teachers' Sense of Efficacy Scale ANOVA with Student Engagement as the Dependent Variable

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	33.332	12	2.778	2.923	.001*
Residual	206.208	217	.950		
Total	239.539	229			

*Significance at the .05 level

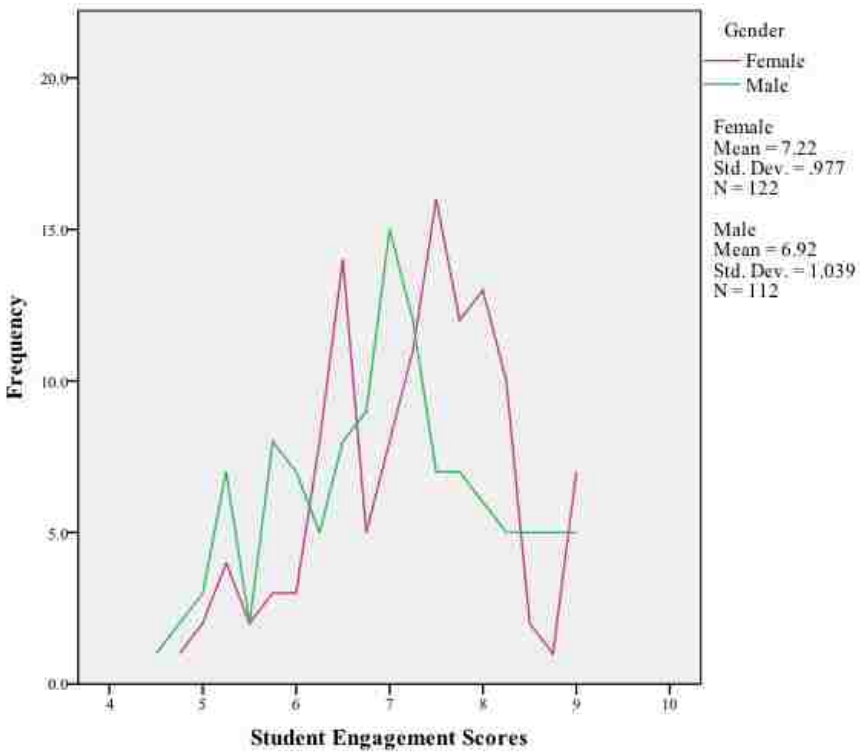
Table 8

Teachers' Sense of Efficacy Scale Coefficients Table with Student Engagement as the Dependent Variable and Collinearity Statistics

	Unstandardized Coefficients				Collinearity Statistics
Variable	B	Std. Error	t	Sig.	VIF
(Constant)	6.677	.215	31.077	.000	
TotalTeach	.028	.008	3.678	.000**	1.190
TechTeach	.035	.027	1.310	.191	1.178
Age	.000	.001	.857	.392	1.026
Gender	-.331	.134	-2.474	.014*	1.081
Nationality: US/E. Asian	.109	.312	.350	.727	1.073
Nationality: US/Other	.020	.157	.128	.898	1.058
Grade Levels: HS/MS	.249	.148	1.686	.093	1.163
Grade Levels: HS/Both	.102	.196	.519	.604	1.196
Subject-Lang	-.185	.154	-1.199	.232	1.380
Subject-Math	-.305	.168	-1.821	.070	1.441
Laptops/Tablets	-.143	.322	-.445	.657	1.043
Laptops/Both	.144	.448	.321	.748	1.035

*Significance at the .05 level inclusive of a Bonferroni adjustment
**Significance at the .01 level

Figure 7. Frequency of Teacher Efficacy Scores in Student Engagement by Gender



Student engagement exhibited the highest R-square value at 14%. When adjusted for the number of variables in the model, these independent variables explained 8.8% of the variance in student engagement scores. The R-square value corresponds to the significance found in general classroom teaching experience and gender. Given the complexity of teacher efficacy, high R-squared values were not expected. This coefficient of determination supports the significance of the identified variables.

Within the multiple regression analysis, variable inflation factors (VIF) were evaluated for multicollinearity. No independent variables were found to have a VIF value greater than 4 so no independent variables were removed from the analysis (O'Brien, 2007).

Null Hypothesis. Based on these findings, the null hypothesis for the first research question was rejected. General classroom teaching experience indicated significant relationships

to teachers' sense of efficacy in both instructional strategies and student engagement. The relationships met the .01 level for significance inclusive of a Bonferroni adjustment.

Teachers' 1:1 technology classroom teaching experience did not indicate a relationship with teacher efficacy. When asked if they perceived classroom experience with 1:1 technology to increase their effectiveness in 1:1 technology classrooms, participants overwhelmingly agreed that teaching experience increased their effectiveness. Of the 234 respondents, 205 (87.6%) agreed or strongly agreed that experience increased their effectiveness. On a scale of 1 (strongly disagree) to 5 (strongly agree), the average response was 4.18. While this perception existed among teachers, no statistical evidence supported this perception in the results of this study.

Professional Development and Teacher Efficacy

The second research question examined the relationship between teacher efficacy and teachers' perception of the effectiveness of the identified professional development formats. The null hypothesis stated the following:

H_0^2 = Teachers' sense of efficacy is not significantly related to teachers' perception of the effectiveness of certain professional development formats.

The independent variables were the effectiveness ratings that teachers assigned to the eight professional development formats identified in the survey instrument. Like the first research question, the dependent variables consisted of teachers' sense of efficacy scores in classroom management, instructional strategies, and student engagement.

Professional development formats that received responses of "not experienced this format" or "do not understand this format" were coded with zeroes. Blank responses were also coded with a zero. With higher numbers reflecting a perception of greater effectiveness, these

professional development formats were rated on a scale of 1 to 9. Figures 8 through 15 show the distribution of effectiveness ratings for each professional development format. Within these figures, the number of participants that did not understand or experience a specified professional development format is evident by the number of zeroes.

Figure 8. Distribution of Effectiveness Ratings of a Lecture Style Workshop

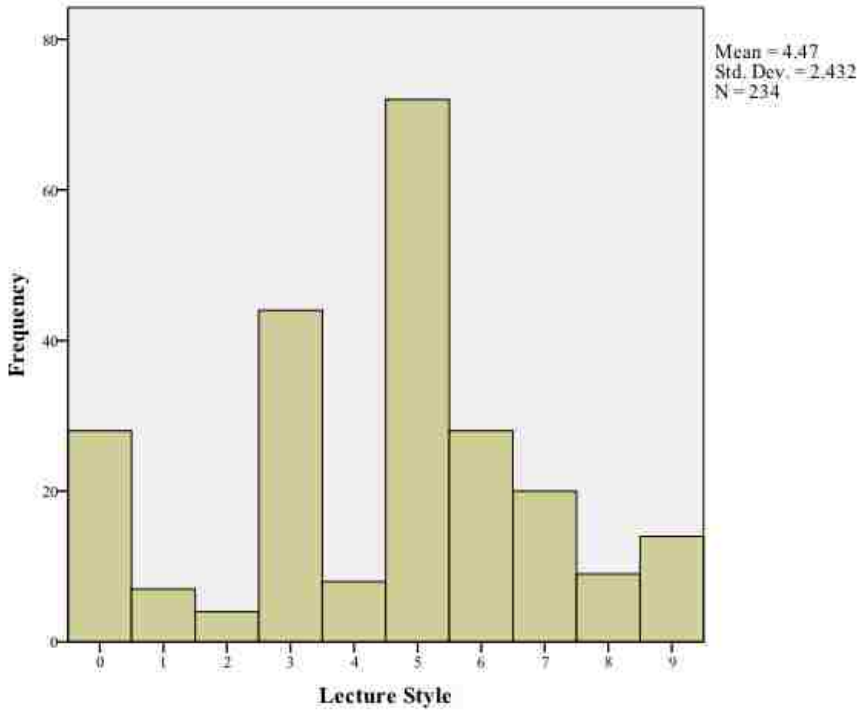


Figure 9. Distribution of Effectiveness Ratings of a Hands On Workshop

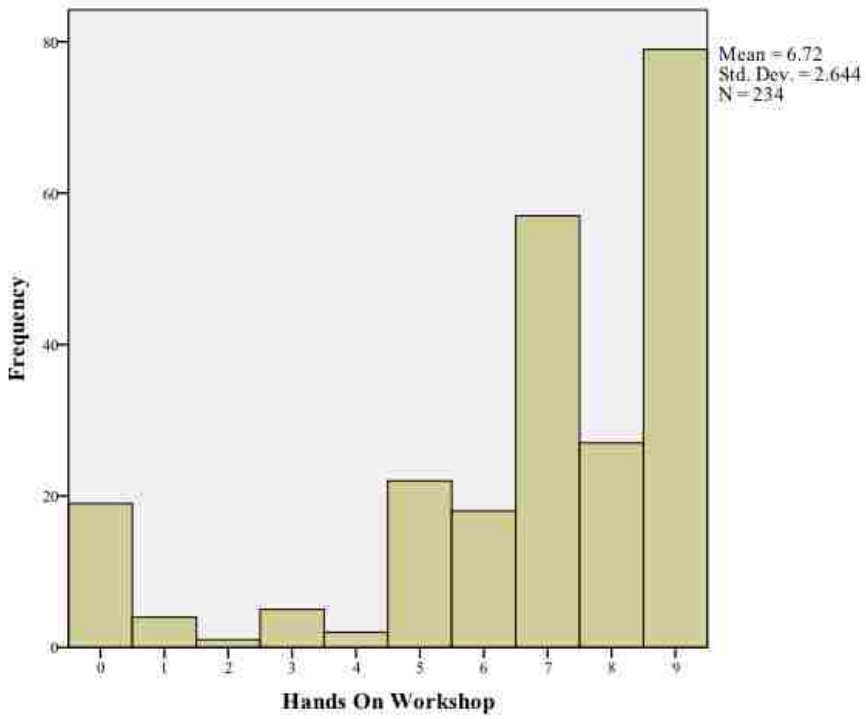


Figure 10. Distribution of Effectiveness Ratings of Observed Demonstration of Skills with Adults and Students in a Workshop

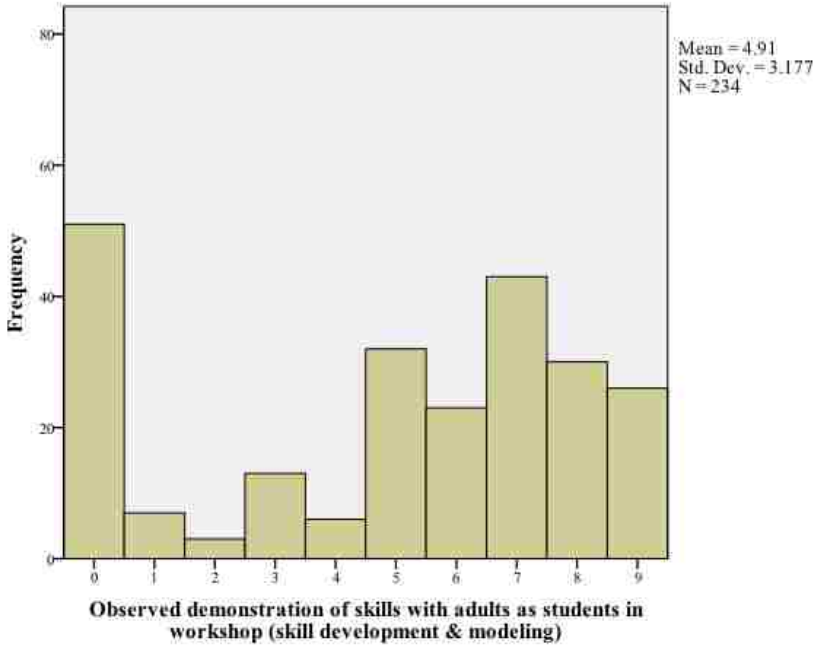


Figure 11. Distribution of Effectiveness Ratings of Observed Demonstration of Skills with Students via Video or Students Actually Attending a Workshop

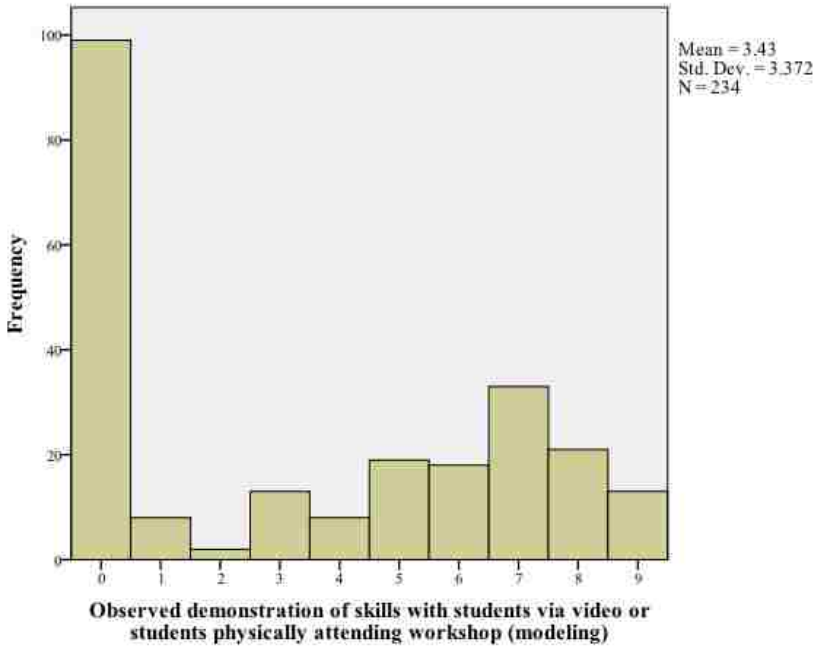


Figure 12. Distribution of Effectiveness Ratings of Small Group Reflection on Classroom Experiences

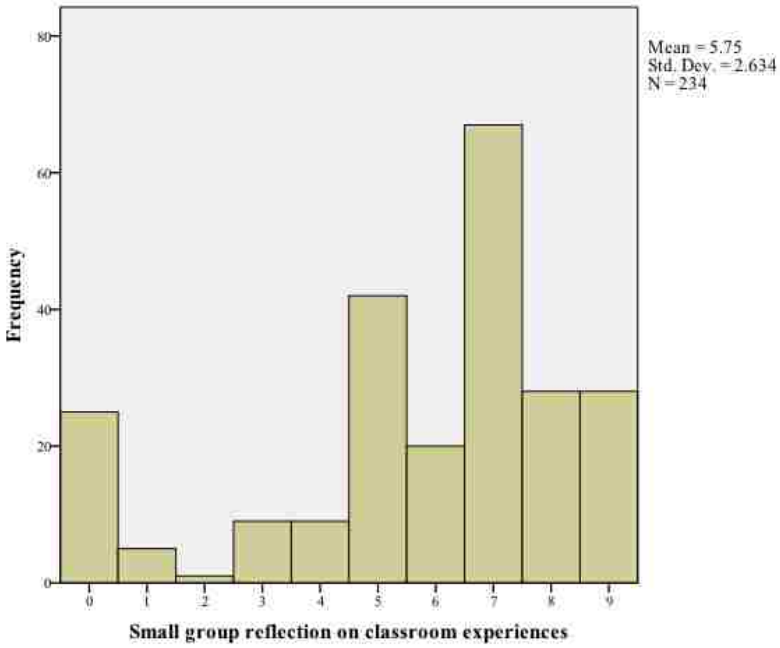


Figure 13. Distribution of Effectiveness Ratings of Small Group Collaboration to Practically Insert New Strategies Into Lessons and Curriculum

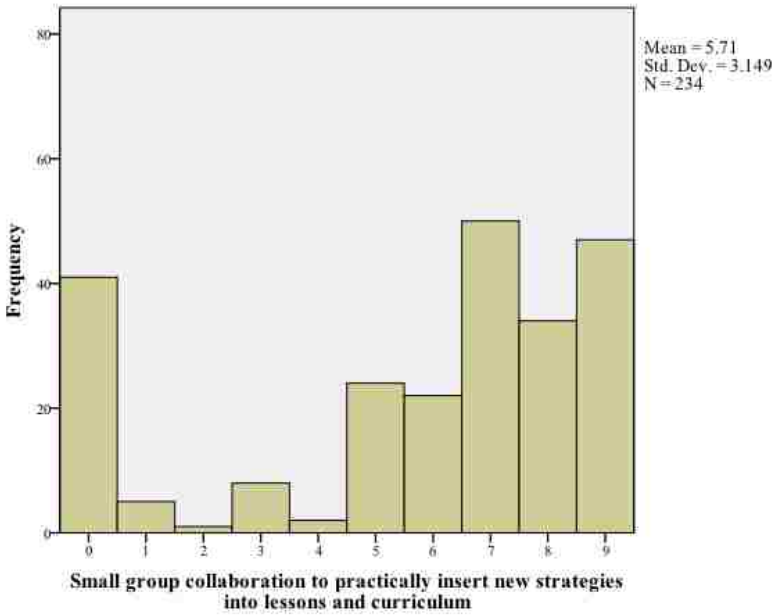


Figure 14. Distribution of Effectiveness Ratings of Individual Modeling of Strategies in Your Classroom by a Trainer/Coach with Your Students

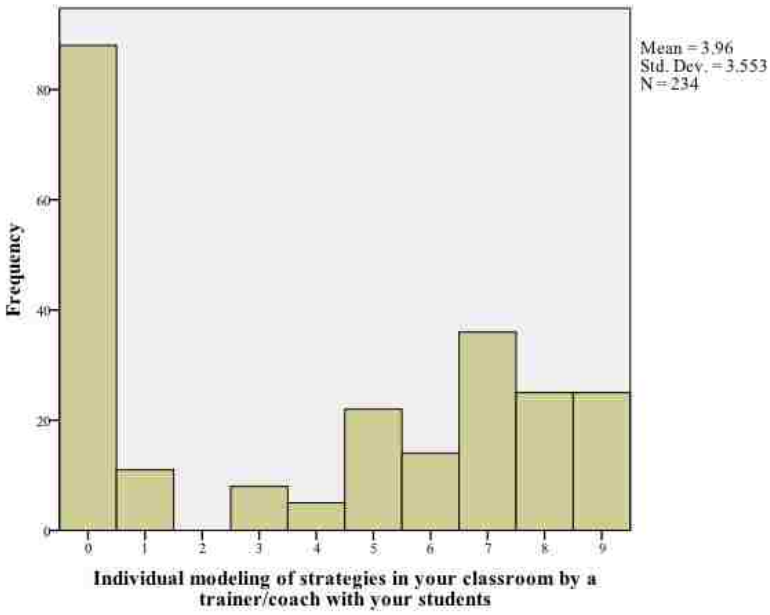
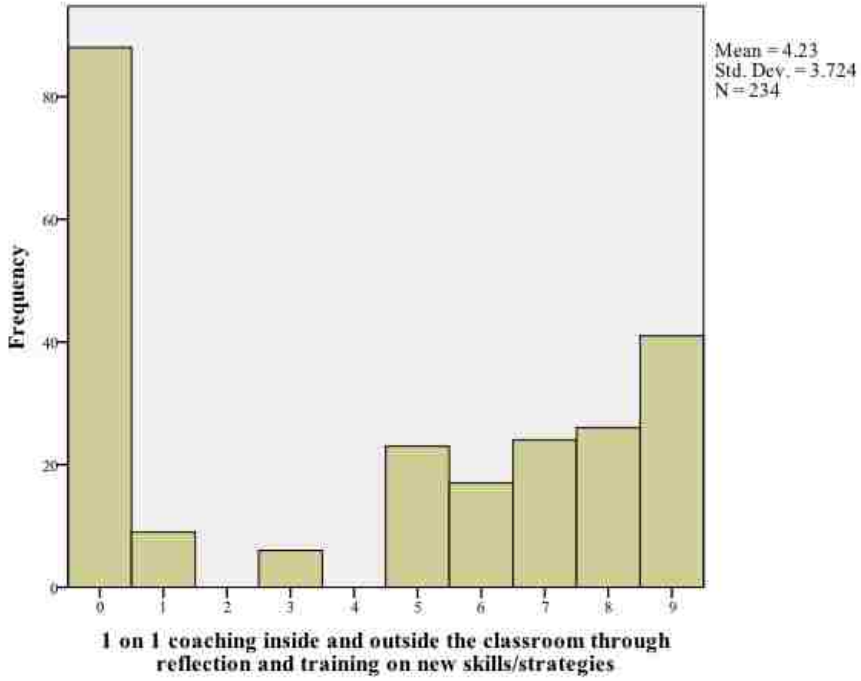


Figure 15. Distribution of Effectiveness Ratings of 1 on 1 Coaching Inside and Outside the Classroom Through Reflection and Training on New Skills/Strategies



Results. Multiple regression analysis was used to determine if any perceived effectiveness ratings of the identified professional development formats provided statistical significance to predict teachers' sense of efficacy. An analysis of the identified professional development formats did not exhibit any statistical significance in predicting teachers' sense of efficacy for classroom management. However, these independent variables acted as predictors of teachers' sense of efficacy in instructional strategies and student engagement.

Instructional strategies exhibited relationships with the perceived effectiveness of lecture style workshops and hands on workshops (see Table 9). Lecture style professional development indicated a negative relationship with teachers' sense of efficacy in instructional strategies. Participants with stronger teacher efficacy tended to rate lecture style as less effective, resulting in a significance value of .027. Participants that rated hands on workshops as more effective

exhibited stronger teacher efficacy in instructional strategies. The relationship between hands on workshop ratings and instructional strategies resulted in a significance of .038. Although two statistically significant relationships were found with instructional strategies, no significance achieved the more rigorous test of a Bonferroni adjustment. No other effectiveness ratings for professional development had individual significance.

Table 9

Effectiveness of Professional Development Coefficients Table with Instructional Strategies as the Dependent Variable and Collinearity Statistics

Variable	Unstandardized Coefficients		t	Sig.	Collinearity Statistics
	B	Std. Error			VIF
(Constant)	7.392	.183	40.446	.000	
Lecture Style	-.062	.028	-2.230	.027*	1.339
Hands On Workshop	.058	.028	2.083	.038*	1.594
Observed demonstration of skills with adults as students in workshop (skill development & modeling)	.009	.024	.369	.712	1.793
Observed demonstration of skills with students via video or students physically attending workshop (modeling)	.011	.022	.479	.632	1.638
Small group reflection on classroom experiences	.006	.028	.203	.839	1.600
Small group collaboration to practically insert new strategies into lessons and curriculum	-.008	.027	-.316	.752	2.044
Individual modeling of strategies in your classroom by a trainer/coach with your students	.008	.023	.362	.718	1.944
1 on 1 coaching inside and outside the classroom through reflection and training on new skills/strategies	-.003	.020	-.131	.896	1.547

*Significance at the .05 level

Student engagement exhibited the strongest relationship with the perceived effectiveness of the identified professional development formats. The F statistic of this model exceeded the .01 level of significance with a value of .000 (see Table 10). The relationship between the perceived effectiveness of hands on workshops and student engagement achieved a significance

of .001, again demonstrating statistical significance at the .01 level inclusive of a Bonferroni adjustment (see Table 11). No other professional development formats exhibited a relationship with student engagement.

Table 10

Effectiveness of Professional Development ANOVA with Student Engagement as the Dependent Variable

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	27.606	8	3.451	3.716	.000*
Residual	203.367	219	.929		
Total	230.973	227			

*Significance at the .01 level

Table 11

Effectiveness of Professional Development Coefficients Table with Student Engagement as the Dependent Variable and Collinearity Statistics

Variable	Unstandardized Coefficients		t	Sig.	Collinearity Statistics
	B	Std. Error			VIF
(Constant)	6.339	.201	31.554	.000	
Lecture Style	-.052	.030	-1.727	.086	1.339
Hands On Workshop	.099	.031	3.222	.001*	1.594
Observed demonstration of skills with adults as students in workshop (skill development & modeling)	.018	.027	.668	.505	1.793
Observed demonstration of skills with students via video or students physically attending workshop (modeling)	.036	.024	1.471	.143	1.638
Small group reflection on classroom experiences	.020	.031	.660	.510	1.600
Small group collaboration to practically insert new strategies into lessons and curriculum	-.011	.029	-.386	.700	2.044
Individual modeling of strategies in your classroom by a trainer/coach with your students	.012	.025	.469	.640	1.944
1 on 1 coaching inside and outside the classroom through reflection and training on new skills/strategies	.004	.021	.170	.865	1.547

*Significance at the .01 level

Of the eight professional development formats, five formats received a high frequency of zeroes. These professional development formats included observed demonstration of skills with adults and students in a workshop, observed demonstration of skills with students via video or students actually in the workshop, small group collaboration to practically insert new strategies

into lessons and curriculum, individual modeling of strategies in your classroom by a coach or a trainer, and 1 on 1 coaching inside or outside the classroom through reflection and training in new skills. The results of this data indicate that teachers have less experience with these professional development formats than the others. While significant conclusions for the larger number of zeroes cannot be formed from this data alone, these responses raised a concern that the multiple regression analysis could be skewed due to the large presence of zeroes.

Therefore, the zeroes were removed from the data analysis and a second data analysis was performed. A one-way ANOVA was conducted to explore the relationships between each professional development format and the three dependent variables of teacher efficacy. The perceived effectiveness of the professional development formats was rated on a scale of 1 to 9. Due to the small sample size for an ANOVA, responses with ratings of 1 to 4 were recoded to fives. Each professional development format was analyzed separately to identify its relationship to teacher efficacy in classroom management, instructional strategies, and student engagement. Only professional development formats with significance are reported in Table 12 and only significant dependent variables were reported with their significance values. The N value and power analysis are also present for each significant relationship. The small sample size negatively impacted the power of this analysis and some results maintained a power below the desired .80 level.

Table 12

ANOVA for Professional Development Formats After Removal of Zeroes

Professional Development Format	Sig.	Variance Explained	N	Power Analysis
Hands On Workshop			215	.84
Classroom Management	.025	6%		
Instructional Strategies	.001**	10%		
Student Engagement	.000**	12.8%		
Observed Demonstration of Skills with Adults and Students in a Workshop			183	.77
Student Engagement	.000**	11%		
Observed Demonstration of Skills with Students via Video or Students Actually Attending a Workshop			135	.61
Instructional Strategies	.014*	9.1%		
Student Engagement	.004*	11.2%		
Small Group Reflection on Classroom Experiences			209	.83
Student Engagement	.001**	8.8%		
Small Group Collaboration to Practically Insert New Strategies Into Lessons and Curriculum			193	.79
Student Engagement	.021	6%		
1 on 1 Coaching Inside and Outside the Classroom Through Reflection and Training on New Skills/Strategies			146	.65
Classroom Management	.018	8%		

*Significance at the .05 level inclusive of a Bonferroni adjustment

**Significance at the .01 level

The ANOVA indicated significant relationships for six of the eight professional development formats in relation to at least one area of teacher efficacy. Hands on workshops and small group reflection on classroom experiences passed the desired .80 level of power for the study. Hands on workshops, previously identified as significant in instructional strategies and student engagement through the multiple regression analysis, were identified as significant in all three areas of teacher efficacy. Instructional strategies and student engagement demonstrated a relationship with the perceived effectiveness of hands on workshops at the .01 level inclusive of a Bonferroni adjustment. Classroom management was significant at the .05 level without a Bonferroni adjustment. The perceived effectiveness ratings of small group reflections on classroom experiences had statistical significance in relation to student engagement at the .01 level inclusive of a Bonferroni adjustment.

Additionally, the ANOVA indicated strong relationships among the variables, particularly with student engagement as previously discussed. Observed demonstration of skills with adults and students in a workshop indicated a relationship with student engagement at the .01 level inclusive of a Bonferroni adjustment. Observed demonstration of skills with students via video or students actually attending a workshop indicated significance with instructional strategies and student engagement at the .05 level inclusive of a Bonferroni adjustment. Small group collaboration to practically insert new strategies into lessons and curriculum showed a relationship with student engagement at the .05 level. One on one coaching inside and outside the classroom through reflection and training on new skills/strategies found a significant relationship with classroom management at the .05 level.

Variable inflation factors (VIF) were evaluated for multicollinearity as consistent with the research design. No independent variables were found to have significant VIF values so no variables were removed from the model (O'Brien, 2007).

Explained Variance. As noted in the results of the multiple regression analysis, the perceived effectiveness ratings of hands on workshops indicated a significant relationship with teacher efficacy in student engagement exists, $p > .01$. The R-square value indicated that 12% of the variance in student engagement scores was explained by the perceived effectiveness ratings of professional development formats. When R-square was adjusted for the number of independent variables, the independent variables explained 8.7% of the variance. The adjusted R-squared was calculated for the other dependent variables of classroom management and instructional strategies, and 1% or less of the variance was explained. Student engagement was found to be significantly related to the perceived effectiveness of hands on workshops.

The ANOVA supported this initial regression analysis with more specific explanations of variance as identified previously in Table 12. The perceived effectiveness of three professional development formats explained between 11% and 12.8% of the variance in student engagement. Two additional formats explained 6% and 8.8% respectively for student engagement. Perceived effectiveness for two professional development formats explained 9.1% and 10% of the variance in instructional strategies. From the two professional development formats linked to classroom management, the perceived effectiveness ratings explained 6% and 8% of the variance.

Null Hypothesis. Based on these results, the second null hypothesis was rejected. The results of the data analysis indicated that a relationship between teacher efficacy and teachers' perceptions of professional development effectiveness exists. Participants indicated statistically significant relationships for instructional strategies and student engagement. The results for instructional strategies were statistically significant at the .05 level, not including a Bonferroni adjustment. The relationship between the perceived effectiveness of hands on

workshops and student engagement was significant at the .01 level, inclusive of a Bonferroni adjustment. No relationship appeared to exist with classroom management.

Summary

The results of this study demonstrated that a significant relationship between teacher efficacy and general classroom teaching experience exists. Increased general classroom teaching experience was a predictor of a stronger teacher efficacy in instructional strategies and student engagement. 1:1 technology classroom teaching experience was not identified as a significant predictor of teacher efficacy in any area. In addition, the results of the study indicated that gender was a statistically significant predictor variable for teachers' sense of efficacy in both classroom management and student engagement. Women teaching in 1:1 technology classrooms exhibited a stronger sense of efficacy in relation to classroom management and student engagement than men. Therefore, the null hypothesis that no relationship exists between general classroom teaching experience and teacher efficacy was rejected. The coefficient of determination indicated that 8.8% of the variance in student engagement was explained by these independent variables. In conjunction with this finding, teachers overwhelming perceive 1:1 technology classroom experience to increase their effectiveness in 1:1 technology classrooms. However, no statistical evidence corroborated this perception that 1:1 technology classroom teaching experience increased teacher efficacy in any area.

Aligning in similar ways to the analysis of the first research question, the results of the study demonstrated that teachers' effectiveness ratings of the identified professional development formats were related to teachers' sense of efficacy in instructional strategies and student engagement. A negative relationship appeared to exist between lecture style professional development and instructional strategies. Higher perceived effectiveness ratings of hands on workshops exhibited increased teacher efficacy in both instructional strategies

and student engagement. Hands on workshops indicated the strongest evidence with student engagement. These independent variables appeared to explain 8.7% of the variance in student engagement scores. No relationships were found with classroom management. As a result of these findings, the null hypothesis for the second research question was rejected, acknowledging that a relationship between some professional development formats and teacher efficacy exists.

Chapter Five

Discussion, Implications, and Conclusions

The research around teacher efficacy possesses many gaps, often posing more questions than answers. This research study sought to fill one of these gaps in the current research literature by exploring teacher efficacy during a major shift in classroom practice for teachers. The school change initiative was the implementation of 1:1 technology classrooms, requiring changes in classroom organization and lesson delivery that could be expected to challenge teachers and affect teacher efficacy. The results of this study inform school leaders and educational researchers about the relationship between teacher efficacy and previous classroom teaching experience as well as teachers' ability to successfully adopt new initiatives. This study also explored the role of professional development as it related to teacher efficacy and the support teachers need to both control and accomplish change successfully. In addition to new findings and recommendations for practice, the findings provide guidance for future research.

Limitations of the Study

As the findings of this study are discussed, it is important to understand its limitations. This study did not evaluate causality around teacher efficacy. It focused on what exists rather than why it existed. Intervening variables may affect teacher efficacy or cause the outcomes related to it. The research over the last 35 years has made the complexity of teacher efficacy abundantly clear. Teacher efficacy develops alongside other positive attributes of effective teachers. Therefore, the results of this study should be considered within its context of international schools in East Asia with 1:1 technology initiatives and interpreted in conjunction with previous studies regarding teacher efficacy.

Technology only provides one example of potential change initiatives, and other changes may have different effects on teacher efficacy. The pervasiveness of technology can drastically impact relationships and interactions within a classroom (Newhouse, 2008). In addition, teacher efficacy is hard to generalize because it is context specific (Goddard, Hoy, & Woolfolk Hoy, 2000; Tschannen-Moran, Woolfolk Hoy & Hoy, 1998), meaning it can be high in one area and low in another. It is not a holistic view of the self, rather a perception of one's ability to perform certain tasks and control the outcomes. Given this contextual nature, 1:1 technology environments provide only one example of how change may influence teacher efficacy and another change may exhibit different relationships with all aspects of teacher efficacy. This study did not evaluate other contextual variables such as actual instructional competency, cultural influences, or school environments. Within the context of technology, it is also important for researchers to remember the generalizability of this study to EARCOS international schools in East Asia that are implementing 1:1 technology initiatives.

The collection of self-reported data also creates a limitation within the results of the study. Teacher efficacy results from self-perceptions so the study was designed to collect self-reported data. However, other data may be subject to errors due to self-reporting. Variables as simple as general classroom teaching experience could be reported with errors as it relied on participants' memories. Other data such as passport nationality may not reflect participants' true cultural background. Self-reporting on participation in professional development and its effectiveness ratings may result more from an availability heuristic than actual participation and a particular format's actual impact on classroom instruction. The self-reporting of data was necessary for the design of this study, but its limitations should be recognized as well.

Another limitation of this study was the digital nature of the data collection. Although research of teachers in a 1:1 technology setting and the geographical dispersion of

the participants suited itself to digital data collection, some participants may have been less comfortable participating in the study because all materials were distributed digitally. A response bias may be present towards respondents that have a greater comfort with technology and demonstrate a bias towards stronger teacher efficacy within a 1:1 technology environment. The researcher considered the benefits this design greater than the limitations, thus the selection of this method to obtain the research data. With this understanding of its limitations, we can explore the findings of this study and its implications.

Noteworthy Findings

The study yielded five noteworthy findings as contributions to the current body of research. First, general classroom teaching experience, referring to the total number of years in the classroom as a teacher, demonstrated a significant relationship with teacher efficacy in instructional strategies and student engagement during a change initiative. Second, although previous studies have found more links to classroom management than any other component of teacher efficacy, this study found the strongest relationship with teacher efficacy to be student engagement. Third, women in the study tended to have higher teacher efficacy in both classroom management and student engagement than men in the change situation in this study. In addition, teachers that rated hands on professional development workshops with a higher degree of effectiveness were found to have stronger teacher efficacy in student engagement. Fifth, the participants' responses to professional development formats that were designed to address sources of teacher efficacy indicated that some professional development formats were noticeably absent from teachers' experience. The implications of each of these findings are discussed in detail in the following sections.

Teaching Experience. General classroom teaching experience exhibited a significant relationship with teacher efficacy. From a statistical perspective, general classroom teaching

experience showed a very strong statistical significance to teachers' sense of efficacy in instructional strategies (p = .002) and student engagement (p = .000). Although this relationship was strong, less than 1% of the variance in instructional strategies was explained by general classroom teaching experience and 8.8% of the variance was explained in student engagement. This study focused on teacher efficacy during a major change initiative, indicating that more experienced teachers will maintain a stronger sense of efficacy when confronted with a new implementation. The positive teacher behaviors that lead to increased student achievement are inherent within strong teacher efficacy and therefore, are more likely to be present in experienced teachers during change. General classroom teaching experience was not related to teacher efficacy in classroom management.

No relationship was found between 1:1 technology classroom teaching experience and teachers' sense of efficacy in any area, yet teachers maintained a strong belief that 1:1 technology classroom teaching experience increases their effectiveness in a 1:1 technology classroom. Although teacher efficacy is context specific and can be high in one area and low in another, this study implies that general classroom teaching experience is more important than experience with a specific change.

Teachers' perceptions of the benefits of experience may relate to the physiological arousal component of teacher efficacy. Bandura (1977) identified physiological arousal, or stress, as one of the four sources of efficacy, but due to the difficulty of measuring it, it is often an unmeasured factor within teacher efficacy research. Actual experience in the 1:1 technology classroom may raise teachers' comfort level and confidence to reduce the stress associated with the new environment produced by the change initiative. Classroom teaching experience with a particular change such as 1:1 technology in the classroom reduces uncertainty and accompanying fears that may relate to resistance to change. Further study is

needed to understand the relationship between classroom teaching experience and change more fully.

Student Engagement. Despite the previous research indicating that professional development had a greater effect on classroom management than any other aspect of teacher efficacy (Griffin, 2009; Ross & Bruce, 2007; Tschannen-Moran & Woolfolk Hoy, 2007; Woolfolk, Rosoff, & Hoy, 1990), this study found that student engagement was shown to be most strongly related to the significant variables in the study, general classroom teaching experience and gender. Although gender was found to have a significant relationship to classroom management ($p = .035$), its statistical significance was substantially stronger with student engagement ($p = .014$), exceeding the .05 level of significance inclusive of a Bonferroni adjustment. The Bonferroni adjustment accounted for three dependent variables and adjusted the p value to .017 to reach the .05 level of significance. Gender only passed this more rigorous threshold of significance in student engagement. Contrary to the findings by Tschannen-Moran and Woolfolk Hoy that noted no difference in student engagement between novice and experienced teachers, this study found a significant relationship between general classroom teaching experience and teachers' sense of efficacy in relation to student engagement.

From the multiple regression analysis, the perceived effectiveness of professional development formats exhibited the strongest relationship with teacher efficacy in student engagement. The relationship between the perceived effectiveness of hands on workshops and student engagement exceeded the .01 level of significance inclusive of a Bonferroni adjustment. From the ANOVA, student engagement indicated strong relationships with 5 of the 8 professional development formats, exceeding the .05 level of significance inclusive of a Bonferroni adjustment for 4 of those 5 relationships. Three of those relationships also exceeded the .01 level of significance inclusive of a Bonferroni adjustment. Student

engagement also exhibited higher explanations of variance than classroom management or instructional strategies.

These results appear to contradict some previous findings, but previous conclusions can also help explain the change in results. Tschannen-Moran and Woolfolk Hoy (2007) concluded that classroom management and instructional strategies were the primary focus of novice teachers and student engagement occurred later in teachers' development. They also suggested that student engagement was beginning to receive an increased professional development focus at the time of their research. From their ideas, one can derive two explanations for the increased significance of student engagement that this study found. First, if student engagement has received more attention in professional development during recent years, then it explains why teachers are focused on this more advanced developmental stage, and in turn, why they exhibit an increased relationship with student engagement. Second, experienced teachers have a greater likelihood of being at the more advanced developmental stages of teaching, enabling them to devote a greater focus on student engagement. More experienced teachers are likely to feel confident about their classroom management and instructional strategies. When a major change such as 1:1 technology devices is introduced, it may mitigate the role of experience, yet, experience still allows teachers to focus on the more advanced stages of their teaching craft. These results may reflect a shift in professional development that has occurred in recent years as well as the career stages of teachers when they implement a major change. The previous literature and these findings suggest school leaders should focus on classroom management and instructional strategies as a first level of professional development before progressing to student engagement for veteran teachers.

Gender. Women tended to have higher teacher efficacy in respect to their perceptions of their ability to maintain student engagement and control their classroom

behavior while in 1:1 technology classrooms. With a *p* value of .014 for student engagement and .035 for classroom management, gender was the most statistically significant variable in predicting teachers' sense of efficacy other than general classroom teaching experience. In relation to student engagement, gender was the only variable to demonstrate a significant relationship when the higher rigor of a Bonferroni adjustment was applied.

The significance of the relationship between gender and teacher efficacy was an unexpected outcome. Previous teacher efficacy research has not explored gender as a significant factor in teacher efficacy. In attempting to explain the relationship with gender, the research on technology adoption provides useful insight. Venkatesh, Morris, and Ackerman's (2000) research found that gender shapes technology adoption in its initial stages which also affected sustained use. They reported that men adopted technology with a much greater focus on its perceived usefulness while women adopted technology with a more balanced approach that went beyond mere usefulness, considering peer opinions and the availability of support during the adoption process as well. Morris, Venkatesh, and Ackerman (2005) found that gender differences in technology adoption varied by age. Younger people tended to have fewer differences based on gender than older people. These findings suggest that women's adoption process may cause them to view a 1:1 technology implementation from a broader perspective that places less emphasis on the specific change, allowing their efficacy to remain at a higher level. From the technology adoption research, women appear to view technology adoption more holistically as opposed to a singular focus on usefulness. These findings also suggest that women may be more focused on exploring and adapting teaching methodology than men, who may be more focused on the skills needed to effectively implement the technology. Ultimately, the gender differences identified in this study may be unique to the technology change initiative and may not occur during other new

implementations. Further research is needed to fully understand gender differences within teacher efficacy and its development.

Professional Development Formats. Participants' feedback on the effectiveness of the identified professional development formats highlighted two noteworthy findings for consideration and further study in the future. First, the results demonstrated a strong relationship between hands on workshops and higher teacher efficacy in student engagement. Hands on workshops, defined as professional development sessions that introduce new skills and allow participants to practice these new skills during the training, provide teachers with multiple sources of efficacy through mastery experiences, verbal persuasion, and vicarious experiences. Although teachers in this setting may practice and master a specific skill, the application to their classroom may be theoretical and only vicariously experienced during the professional development workshop. While variations in the delivery of these workshops occur, teachers that perceived these workshops to be effective, which inherently mean they personally experienced them, exhibited higher teacher efficacy in student engagement. Although this study was based on self-reported perceptions and other factors may be present to impact the results, an inference of this finding is that hands on professional development workshops may result in stronger teacher efficacy in student engagement. This finding is consistent with previous studies that suggested vicarious experiences and social persuasion are most effective when joined with mastery experiences (Tschannen-Moran and McMaster, 2009).

A second noteworthy finding was the lack of experience that teachers reported for professional development formats that involved student modeling, student participation, student simulation videos, or adults role-playing as students. The ratings for these professional development formats appeared either very positive or received a zero as a response. The zeroes were a combination of participants' responses that they had not

experienced the format, they did not understand the format, or they left the answer blank. Of the zeroes on these questions, 91.4% to 96.4% of the responses directly indicated that they had not experienced the professional development format. The ANOVA removed the non-responses to these ratings and identified strong relationships between the perceived effectiveness ratings and all three areas of teacher efficacy, implying that they significantly impacted the development of teacher efficacy. More research is needed regarding the professional development formats in common use by schools during 1:1 technology implementations and other changes to understand how professional development formats relate to successful change.

Significance of the Study

With the constant school improvement efforts underway in nearly every school, the implications of change on teacher efficacy are an important consideration in planning professional development and teacher support for new initiatives. The results of this study have direct applications to EARCOS schools currently implementing 1:1 technology initiatives in East Asia. While the generalizability of the study is limited in scope, other international schools in EARCOS may likely experience similar experiences. Additional studies with other populations should seek to examine if these same findings are applicable to a broader scope of schools. The findings that show how perceived effectiveness of professional development correspond to teacher efficacy should be of particular interest to school leaders. School leaders should adopt comprehensive strategies to intentionally cultivate teacher efficacy during change initiatives rather than making it a random by-product of their professional development efforts. The development of teacher efficacy builds the foundation for teachers to willingly and successfully implement new initiatives in their classrooms.

This study contributes to the research literature by considering teacher efficacy in two unique ways. First, the study explored teacher efficacy in both novice and experienced teachers. The current research literature lacks data regarding teacher efficacy in experienced teachers. Second, the study explored teachers' perceptions during a change initiative that was expected to challenge their existing classroom practices. Given the recent advancement of 1:1 technology and implementations into classrooms, this change was expected to be a new challenge for most practicing classroom teachers. The environment of change introduces a new dynamic to understanding the relationship between teacher efficacy, teacher practice, and professional development. Besides providing new findings with implications for current practices, the study raises additional questions to guide future researchers.

Recommendations for Practice

The results of this study suggest two recommendations for practice. School leaders must be mindful that the teachers that will need the most help with a change initiative are those with the least classroom teacher experience. This finding suggests that more experienced teachers have already adapted to some changes previously and therefore, feel more confident about their ability to be successful. Thus, less experienced teachers may have more uncertainty and fears associated with change initiatives, needing more support to build their confidence and ensure their success. As teachers gain more experience with changes to their practice, this finding suggests that they will exhibit stronger teacher efficacy. As a result, school leaders should plan professional development and their implementations to support less experienced teachers in more substantial ways than more experienced teachers.

The findings of the research provide insight into teacher perceptions on professional development formats, highlighting the positive relationship between hands on workshops and teacher efficacy. This finding suggests that school leaders should seek to employ a variety of

professional development formats during major change initiatives, paying special attention to the incorporation of hands on activities. The influence of professional development on teacher efficacy should motivate school leaders to provide teachers at all experience levels mastery experiences, joined with the other sources of efficacy through vicarious experiences and verbal persuasion. Teachers appreciate the opportunity to practice new strategies and techniques in low risk situations with their colleagues before implementing new strategies in the classroom. Strategically planned professional development that addresses the major sources of teacher efficacy will result in more confident teachers, and ultimately, more effective classroom instruction.

In addition to the incorporation of hands on workshops, school leaders should give time and thought to identifying the best professional development formats for the specific change the school wants to initiate. For example, it may be more difficult to bring groups of students into professional development settings, video exemplary lessons to share with teachers, or develop role-playing scenarios for teachers in order to provide both mastery experiences and vicarious experiences. Financial obstacles may make the hiring of instructional coaches difficult. However, if these professional development formats produce the desired results as suggested by these findings and previous research (Corn et al., 2011; Glazer et al., 2005; Matzen & Edmunds, 2007; Mueller et al., 2008; Shidler, 2009; Tschannen-Moran & McMaster, 2009), inclusive of developing teacher efficacy, then school leaders need to find ways to integrate these formats into their professional development plans and prioritize financial resources to provide these opportunities for teachers.

Recommendations for Future Research

Despite 35 years of research, an understanding of the significant factors that influence teacher efficacy is still limited, as is the research between specific professional development

strategies and the development of teacher efficacy. Teacher efficacy is often measured alongside other indicators of effective practice, intermingling findings with other variables and topics of research. Further research around teacher efficacy, perhaps using a control group methodology, is needed to isolate teacher efficacy and understand its development more fully. In addition to experimental studies, qualitative data should be gathered to gain a more in-depth understanding of the emotional responses at work in change situations and its relationships with teacher efficacy, as suggested by other researchers (Evans, 1996; Hipp & Bredeson, 1995; Labone, 2004; Tschannen-Moran & Woolfolk Hoy, 2007; Wheatley, 2005).

The results of this study pose a new question for future researchers to explore. In Tschannen-Moran and Hoy's (2001) study, they found the strongest relationships tied to classroom management, which also exhibited the weakest sense of efficacy in their study. In the present study, the mean efficacy score of classroom management was 7.75, the strongest of the three areas. Classroom management exhibited the weakest relationships in the study. The weakest sense of efficacy among these participants was student engagement, and it demonstrated the strongest relationships to the significant variables. The results of the study question to what extent weaker or stronger areas of teacher efficacy interact with the significant variables to predict teacher efficacy and changes to it. For example, if teachers demonstrated the weakest scores in instructional strategies, would it exhibit the strongest relationships with significant variables? The results of the study suggest that some variables may have the greatest impact upon the weakest areas of teacher efficacy. Due to the limited research available and limited scope of the study, definitive conclusions cannot be reached from the current data. More data is needed on why a study in public schools in the United States found greater impacts on classroom management versus a study of private international schools in East Asia. Additional research about the role of cultural and environmental factors may also provide additional understanding regarding teacher efficacy

and the variables that influence it. Future studies should explore these relationships through experimental studies.

More research should explore teacher efficacy within different stages of change as well as during other major change initiatives outside of technology. This study did not evaluate the teachers' career stages and the maturity of the change in relation to teacher efficacy. Additional research should explore how teachers at different career levels respond to change, particularly during different stages of a change initiative. For example, future research should consider teacher efficacy during a technology implementation with pre/during/post implementation measures. Additional research during the introduction of new programs and instructional strategies will add to the understanding of teacher efficacy during change outside of the limitations of technology.

The findings of this study demonstrate a need to consider gender differences in conjunction with teacher efficacy. Future research should explore to what extent teacher efficacy is affected by gender in different contexts. Researchers should consider to what extent, if any, the role of gender has on the effectiveness of professional development to increase teacher efficacy.

Conclusion

General classroom teaching experience demonstrated a significant relationship to teacher efficacy in instructional strategies and student engagement. In addition, teachers' perceived effectiveness ratings of hands on professional development workshops demonstrated a significant relationship with their sense of efficacy in student engagement. Significant relationships were identified through the multiple regression analyses, but a deeper understanding of these relationships is needed. The complexity of teacher efficacy

and its overlap with other attributes of effectiveness and success has made it a difficult concept to isolate.

This study affirmed some previous findings as expected, and it raises new questions that highlight the numerous gaps in the research that remain unexplored. The results provide a new perspective on teacher efficacy, particularly as it relates to professional development. The conclusion that teachers with less experience will need more support during a change initiative has important implications for school leaders. The results also challenge school leaders to evaluate the professional development formats that they are putting into practice in their schools. Additionally, the introduction of gender as a significant variable in teacher efficacy deserves more attention in the future. While the results of the study provide some key recommendations for practice such as increased support for less experienced teachers and the implementation of hands on professional development to increase teacher efficacy, perhaps the study's greatest contributions are the growth of the research literature to guide future research and emphasize changes occurring over time. The findings of this study suggest that changes taking place in professional development and the adoption of new pedagogical practices through new school initiatives require ongoing research to see how factors such as teacher efficacy are affected.

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Appendix A: Teacher Efficacy and Institutional Change in 1:1 Technology Initiatives Instrument

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

1:1 Technology Classrooms

1. The following research study is intended for teachers that meet the following criteria:
1) currently teach at least one course where all students have a laptop or tablet (iPad or similar) in grades 6-12
2) currently teach in an EARCOS member school in China, South Korea, or Japan.

Do you currently meet these two qualifications?

◯ Yes
◯ No

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

Consent Form

CONSENT FORM

Teacher Efficacy and Institutional Change within a 1:1 Technology Environment

You are invited to participate in a research study of teacher efficacy in 1:1 technology environments. You were selected as a possible participant because you are a secondary faculty member in an EARCOS school in East Asia and you are a teacher in at least one class where students have 1:1 technology access. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Darren Price, a doctoral candidate in Educational Leadership at Lehigh University, under the direction of Dr. Jill Sperandio, a faculty member within the Educational Leadership department of Lehigh University.

Purpose of the study

The purpose of the study is to examine the relationship of experience and how teachers perceive their own abilities within a 1:1 technology environment. The study will also collect and analyze teacher perceptions regarding the effectiveness of various professional development formats.

Procedures

If you agree to be in this study, you will be asked to complete the survey instrument which follows. This instrument will provide the researcher with a score for teacher efficacy, demographic information about yourself, information about your classroom setting, and your perceptions of professional development you have experienced.

Risks and Benefits of being in the study

The study is entirely voluntary and may be exited at any time. All data collected is anonymous and not linked to individual responses or schools.

Potential benefits include reflecting on your past practice and becoming more self-aware of your own perceptions.

Compensation

You will not receive any compensation for participating in this study. However, at the conclusion of the study, as a "thank you", we will randomly select 15 subjects to receive a $30 gift cards to Amazon.com or an equivalent store. At the end of the survey, participants will have the option to place their email address into a separate database in order to be randomly selected for the gift certificates. The email addresses will not be linked to responses in any way and is completely optional.

Confidentiality

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a participant. Research records will be stored securely and only researchers will have access to the records. Again, no survey data is linked back to individuals.

Contacts and Questions

The researchers conducting this study are Darren Price (dmp305@lehigh.edu) and Dr. Jill Sperandio (jis204@lehigh.edu). You may ask any questions you have before proceeding with the survey. If you have questions later, you are encouraged to contact them via email or phone (+1.610.758.3392).

Questions or Concerns: If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact Susan E. Disidore at (610)758-3020 (email: sus5@lehigh.edu) or Troy Boni at (610)758-2985 (email: tdb308@lehigh.edu) of Lehigh University's Office of Research and Sponsored Programs. All reports or correspondence will be kept confidential.

You may print this page to keep for your records.

***2. By checking the box below, I acknowledge that I have read the above information. I have had the opportunity to ask questions and have my questions answered. I consent to participate in the study.**

◯ Yes, I consent to participate in this research study.

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

Teacher Beliefs

All responses are anonymous and cannot be linked back to an individual.

***3. Directions: Please indicate your opinion about each of the questions below by marking any one of the nine responses in the columns on the right side, ranging from (1) "None at all" to (9) "A Great Deal" as each represents a degree on the continuum.**

Please respond to each of the questions by considering the combination of your current ability, resources, and opportunity to do each of the following in your present position. For respondents currently teaching in a 1:1 technology classroom, please answer the questions within that context.

	1-Not at all	2	3-Very little comfort	4	5-Some degree	6	7-Quite a bit	8	9-A great deal
How much can you do to control disruptive behavior in the classroom?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to motivate students who show low interest in school work?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to calm a student who is disruptive or noisy?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to help your students value learning?	◯	◯	◯	◯	◯	◯	◯	◯	◯
To what extent can you craft good questions for your students?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to get children to follow classroom rules?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to get students to believe they can do well in school work?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How well can you establish a classroom management system with each group of students?	◯	◯	◯	◯	◯	◯	◯	◯	◯
To what extent can you use a variety of assessment strategies?	◯	◯	◯	◯	◯	◯	◯	◯	◯
To what extent can you provide an alternative explanation or example when students are confused?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you assist families in helping their children do well in school?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How well can you implement alternative teaching strategies in your classroom?	◯	◯	◯	◯	◯	◯	◯	◯	◯

Demographic Data

***4. Total Years Classroom Teaching Experience:**
(Please round to the whole year including the current school year)

***5. Total Years Classroom Teaching Experience in a 1:1 technology (laptop or tablet) classroom:**
(Please round to the whole year including the current school year)

***6. What year were you born?**

***7. Gender:**

- ◯ Female
- ◯ Male

***8. Passport Nationality:**

- ◯ Australia or New Zealand
- ◯ Canada
- ◯ China
- ◯ Japan
- ◯ South Korea
- ◯ United Kingdom
- ◯ United States
- ◯ Other

Other (please specify)

***9. Grades currently taught: (mark all that apply)**

- ☐ Grades 6-8
- ☐ Grades 9-12

10. Subjects currently taught: (mark all that apply)

- ☐ Fine Arts (music, visual arts, design)
- ☐ Language Arts (grammar, literature, writing)
- ☐ Mathematics
- ☐ Science
- ☐ Social Studies (economics, history, philosophy, psychology, religious studies, sociology)
- ☐ Technology (programming, basic or advanced computer skills)
- ☐ World Languages (any 2nd language instruction)

Other (please list)

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

***11. The students in my 1:1 device classroom have the following devices...**

- ◯ Laptops
- ◯ Tablets (Apple iPad, Samsung Galaxy, or similar tablet device)
- ◯ Both laptops and/or tablets
- ◯ Computer Lab (with stationary computers)

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

Additional Information

***12. To what extent do you agree with the following statement...**

	Strongly Disagree	Disagree	Neutral	Agree	Stongly Agree
As I have taught in a 1:1 technology classroom, my effectiveness increases with my experience.	◯	◯	◯	◯	◯

13. If you have participated in professional development that supported the implementation of 1:1 laptops into instruction, please rate how effective you found these forms of professional development to be on your classroom practice.

	1-Not at all	2	3-Very little	4	5-Some degree	6	7-Quite a bit	8	9-A great deal	Not experienced this format	Do not understand this format
Lecture style workshop (informational or skill development)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Hands on style workshop where new skills are introduced and practiced (skill development)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Observed demonstration of skills with adults as students in workshop (skill development & modeling)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Observed demonstration of skills with students via video or students physically attending workshop (modeling)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Small group reflection on classroom experiences	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Small group collaboration to practically insert new strategies into lessons and curriculum	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Individual modeling of strategies in your classroom by a trainer/coach with your students	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
1 on 1 coaching inside and outside the classroom through reflection and training on new skills/strategies	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Thank you for taking the time to complete this feedback! Your contributions to my research are greatly appreciated. Your answers are complete once you click on SUBMIT.

Upon submission of your answers, you will be taken to a totally separate form which you can complete for an opportunity to receive a $25 gift from Amazon.com or an equivalent online site. Fifteen participants will receive gift certificates. This gift is simply another way to say thank you for assisting me in my research. Your participation is optional and no contact information is linked in any way to your responses.

Appendix B: Permission to Use TSES Instrument

The College Of
WILLIAM&MARY

School of Education
Post Office Box 8795
Williamsburg, Virginia 23187-8795
Fax: (757) 221-2988

Megan Tschannen-Moran, Ph.D.
Professor
mxtsch@wm.edu
(757) 221-2187

December 2011

Darren Price
Director of Technology & School Improvement
Gyeonggi Suwon International School (Suwon, South Korea)
Taejon Christian International School (Daejeon, South Korea)

Dear Darren Price:

You have permission to use the Teachers Sense of Efficacy Scale that I developed with Dr. Anita Woolfolk Hoy for your dissertation research. Please use the following citation when referencing the scale:

> Tschannen-Moran, M & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17,* 783-805.

Although the name of the measure has been changed since that article was published, the contents of the scale remain the same.

You may download a copy of the instrument and directions for scoring from my website at http://mxtsch.people.wm.edu. I would like to receive a brief summary of your results when you are finished.

Sincerely,

Megan Tschannen-Moran

Appendix C: Letter of Approval from EARCOS

East Asia Regional Council of Schools

Executive Director
Richard T. Krajczar, Ed.D.

April 9, 2013

Dear Mr. Price,

You have been granted permission from the East Asia Regional Council of Overseas Schools (EARCOS) to conduct your dissertation study among EARCOS schools in China, Japan, and South Korea. Your study on teacher efficacy in relationship to 1:1 technology implementations and professional development will be valuable for the international schools.

Please share your findings with EARCOS once you complete your research.

Sincerely,

Dr. Dick Krajczar
EARCOS Executive Director

Appendix D: Letter to EARCOS Heads of Schools in East Asia

October 14, 2013

Dear EARCOS Head of School,

My name is Darren Price and I am currently a doctoral student at Lehigh University. I have recently spent 10 years working at Taejon Christian International School and Gyeonggi Suwon International School in South Korea. I am conducting research for my dissertation on the relationship between change and teacher efficacy. Teacher efficacy is the degree to which teachers feel they control the learning outcomes of students, and it also reflects how competent teachers feel about a professional skill.

I need your help to complete my research. Would you, or your delegate, please forward the letter below via email to your faculty that currently teach in a 1:1 technology classroom in grades 6-12? The survey should take faculty approximately 5-10 minutes to complete. As a thank you to those that complete the survey, I am giving away fifteen $30 Amazon gift certificates. If faculty are not able to access Amazon, I will substitute an equivalent alternative for them.

If you are willing to send this to your faculty, please respond to let me know your school is participating. To make it easy, you can just copy me or forward me a copy of the email sent out to your faculty. For those that agree to participate, I will send a second reminder after 2 weeks to be forwarded on to faculty.

In summary, my research explores changes to teacher efficacy as a result of a 1:1 technology implementation. One-to-one technology refers to having one technology device for each student. One-to-one technology initiatives most frequently refer to laptops or tablets for each student.

My research has several implications for educational leaders in schools, particularly international school leaders. The study will inform heads of schools about the importance of experience during change initiatives. This aspect has implications for recruiting new staff members. It will also examine the perceived effectiveness of various professional development formats, which may help schools plan their professional development more effectively during change efforts.

All responses to this survey are anonymous and cannot be traced back to a school or an individual.

Thank you for your consideration and support for research among EARCOS schools! If you wish to view the survey before sending it out to faculty, you have permission to do so by clicking on the link below and answering the required questions at the beginning. I can also send you a PDF of the survey for easy previewing upon request. I hope that my research will be practical and valuable to school leaders in the future. Please do not hesitate to contact me with any questions.

Sincerely,

Darren Price
dmp305@lehigh.edu
darrenmprice@gmail.com

Dear EARCOS Teacher,

My name is Darren Price and I am currently a doctoral student at Lehigh University. I have recently spent 10 years working at Taejon Christian International School and Gyeonggi Suwon International School in South Korea. I am conducting research for my dissertation on the relationship between change and teacher efficacy. Teacher efficacy is the degree to which teachers feel they control the learning outcomes of students, and it also reflects how competent teachers feel about a professional skill.

My research explores changes to teacher efficacy as a result of a 1:1 technology initiative. One-to-one technology refers to having one technology device for each student. One-to-one technology initiatives most frequently refer to laptops or tablets for each student.

I need your help to complete my research. Would you please take a moment to complete the survey at the link below? The survey will take approximately 5-10 minutes. All responses are completely anonymous and confidential. To say thank you for completing my survey and assisting me with my research, I will be giving away fifteen $30 gift certificates to Amazon.com (or an equivalent store if desired).

http://www.surveymonkey.com/s/pricedissertation

Thank you for your willingness to assist researchers in EARCOS schools! If you have any questions, please do not hesitate to contact me at the contact information below.

Sincerely,

Darren Price
dmp305@lehigh.edu
darrenmprice@gmail.com

Appendix E: Second Reminder Letter to EARCOS Heads of Schools in East Asia

October 27, 2013

Dear EARCOS Head of School (or delegated administrator),

Thank you for your willingness to participate and support my research regarding 1:1 technology initiatives and its relationship with teacher efficacy. *Would you, or your delegate, please forward the reminder email below to your faculty as a second reminder to complete the survey?* It should be sent to all faculty currently teaching in a 1:1 technology classroom in grades 6-12. This is the last reminder and the deadline to complete the survey is Monday, November 11, 2013.

If you did not send out the original email, it is not too late. If this is the case for you, you can just send the first email out in lieu of this reminder.

As many of you did in your original email, please copy me or confirm with me that this reminder gets forwarded to faculty so I can note it in my procedures. To make it easy, you can just copy me or forward me a copy of the email sent out to your faculty.

Thank you for your support for research among EARCOS schools! I am deeply appreciative of the support you have provided me for this research. Please do not hesitate to contact me with any questions.

Sincerely,

Darren Price
dmp305@lehigh.edu
darrenmprice@gmail.com

Dear EARCOS Teachers,

This is a second and last request and reminder to please take a few minutes and complete the survey at the link below. More information is in the original email included at the end of this email. The survey will take you 5-10 minutes and you have the option to be randomly selected for a $30 gift certificate in appreciation for your support. *Your support for research that can benefit students and your school is one of the reasons EARCOS is such a successful organization of international schools*. Your help and support is very appreciated!

Please complete the survey before Monday, November 11 which is the deadline for the survey to close.

http://www.surveymonkey.com/s/pricedissertation

Again, thank you, and please let me know if you have any questions!

Sincerely,

Darren Price
dmp305@lehigh.edu
darrenmprice@gmail.com

Appendix F: Pilot Survey Instrument

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

1:1 Technology Classrooms

1. The following research study is intended for teachers that meet both of the following criteria:
1) currently teach at least one course where all students have a laptop or tablet (iPad or similar) in grades 6-12

Do you currently meet this qualification?

- ◯ Yes
- ◯ No

Teacher Efficacy and Institutional Change with 1:1 Technology Dissertation

Consent Form

You are being asked to participate in a pilot survey for a research study to consider the relationship between classroom teaching experience and teacher efficacy. This research will also consider the relationship between professional development and teacher efficacy. At the end of the survey, you will be asked a couple questions about the survey. As you take the survey, please not approximately how long it takes you to complete it and any questions/responses that may be unclear or confusing.

CONSENT FORM

Teacher Efficacy and Institutional Change within a 1:1 Technology Environment

You are invited to participate in a research study of teacher efficacy in 1:1 technology environments. You were selected as a possible participant because you are a secondary faculty member in an EARCOS school in East Asia and you are a teacher in at least one class where students have 1:1 technology access. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Darren Price, a doctoral candidate in Educational Leadership at Lehigh University, under the direction of Dr. Jill Sperandio, a faculty member within the Educational Leadership department of Lehigh University.

Purpose of the study

The purpose of the study is to examine the relationship of experience and how teachers perceive their own abilities within a 1:1 technology environment. The study will also collect and analyze teacher perceptions regarding the effectiveness of various professional development formats.

Procedures

If you agree to be in this study, you will be asked to complete the survey instrument which follows. This instrument will provide the researcher with a score for teacher efficacy, demographic information about yourself, information about your classroom setting, and your perceptions of professional development you have experienced.

Risks and Benefits of being in the study

The study is entirely voluntary and may be exited at any time. All data collected is anonymous and not linked to individual responses or schools.

Potential benefits include reflecting on your past practice and becoming more self-aware of your own perceptions.

Compensation

Participants will not be compensated for participation in the pilot study.

Confidentiality

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a participant. Research records will be stored securely and only researchers will have access to the records. Again, no survey data is linked back to individuals.

Contacts and Questions

The researchers conducting this study are Darren Price (dmp305@lehigh.edu) and Dr. Jill Sperandio (jis204@lehigh.edu). You may ask any questions you have before proceeding with the survey. If you have questions later, you are encouraged to contact them via email or phone (+1.610.758.3392).

Questions or Concerns: If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact Susan E. Disidore at (610)758-3020 (email: sus5@lehigh.edu) or Troy Boni at (610)758-2985 (email: tdb308@lehigh.edu) of Lehigh University's Office of Research and Sponsored Programs. All reports or correspondence will be kept confidential.

You may print this page to keep for your records.

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***2. By checking the box below, I acknowledge that I have read the above information. I have had the opportunity to ask questions and have my questions answered. I consent to participate in the study.**

◯ Yes, I consent to participate in this research study.

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Teacher Beliefs

All responses are anonymous and cannot be linked back to an individual.

***3. Directions: Please indicate your opinion about each of the questions below by marking any one of the nine responses in the columns on the right side, ranging from (1) "None at all" to (9) "A Great Deal" as each represents a degree on the continuum.**

Please respond to each of the questions by considering the combination of your current ability, resources, and opportunity to do each of the following in your present position. For respondents currently teaching in a 1:1 technology classroom, please answer the questions within that context.

	1-Not at all	2	3-Very little comfort	4	5-Some degree	6	7-Quite a bit	8	9-A great deal
How much can you do to control disruptive behavior in the classroom?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to motivate students who show low interest in school work?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to calm a student who is disruptive or noisy?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to help your students value learning?	◯	◯	◯	◯	◯	◯	◯	◯	◯
To what extent can you craft good questions for your students?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to get children to follow classroom rules?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you do to get students to believe they can do well in school work?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How well can you establish a classroom management system with each group of students?	◯	◯	◯	◯	◯	◯	◯	◯	◯
To what extent can you use a variety of assessment strategies?	◯	◯	◯	◯	◯	◯	◯	◯	◯
To what extent can you provide an alternative explanation or example when students are confused?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How much can you assist families in helping their children do well in school?	◯	◯	◯	◯	◯	◯	◯	◯	◯
How well can you implement alternative teaching strategies in your classroom?	◯	◯	◯	◯	◯	◯	◯	◯	◯

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Demographic Data

***4. Total Years Classroom Teaching Experience:**
(Please round to the whole year including the current school year)

***5. Total Years Classroom Teaching Experience in a 1:1 technology (laptop or tablet) classroom:**
(Please round to the whole year including the current school year)

***6. What year were you born?**

***7. Gender:**

- ◯ Female
- ◯ Male

***8. Passport Nationality:**

- ◯ Australia or New Zealand
- ◯ Canada
- ◯ China
- ◯ Japan
- ◯ South Korea
- ◯ United Kingdom
- ◯ United States

Other (please specify)

***9. Grades currently taught: (mark all that apply)**

- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9
- ☐ 10
- ☐ 11
- ☐ 12

***10. Subjects currently taught: (mark all that apply)**

- ☐ Fine Arts (music, visual arts, design)
- ☐ Language Arts (grammar, literature, writing)
- ☐ Mathematics
- ☐ Science
- ☐ Social Studies (economics, history, philosophy, psychology, religious studies, sociology)
- ☐ Technology (programming, basic or advanced computer skills)
- ☐ World Languages (any 2nd language instruction)

Other (please list)

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***11. The students in my 1:1 device classroom have the following devices...**

- ◯ Laptops
- ◯ Tablets (Apple iPad, Samsung Galaxy, or similar tablet device)
- ◯ Both laptops and/or tablets
- ◯ Computer Lab (with stationary computers)

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Additional Information

***12. To what extent do you agree with the following statement...**

	Strongly Disagree	Disagree	Neutral	Agree	Stongly Agree
As I have taught in a 1:1 technology classroom, my effectiveness increases with my experience.	◯	◯	◯	◯	◯

13. If you have participated in professional development that supported the implementation of 1:1 laptops into instruction, please rate how effective you found these forms of professional development to be on your classroom practice.

	1-Not at all	2	3-Very little	4	5-Some degree	6	7-Quite a bit	8	9-A great deal	Not experienced this format	Do not understand this format
Lecture style workshop (informational or skill development)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Hands on style workshop where new skills are introduced and practiced (skill development)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Observed demonstration of skills with adults as students in workshop (skill development & modeling)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Observed demonstration of skills with students via video or students physically attending workshop (modeling)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Small group reflection on classroom experiences	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Small group collaboration to practically insert new strategies into lessons and curriculum	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Individual modeling of strategies in your classroom by a trainer/coach with your students	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
1 on 1 coaching inside and outside the classroom through reflection and training on new skills/strategies	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

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Thank you for taking the time to assist us in our research! Please complete the following questions about the survey.

14. Approximately how long did it take you to complete the survey?

15. Were any of the questions confusing or unclear? Were the response choices clear? If any questions were unclear, please note which ones and what specifically was confusing.

16. Was their anything in this survey that you might suggest to make it more clear or collect additional data?

Darren Mark Price

Curriculum Vitae

Darren Price was born and grew up in High Point, North Carolina. He completed his undergraduate degree from the University of North Carolina in Chapel Hill. While living and working in international schools in South Korea, he was able to experience international schools in East Asia firsthand. He has completed graduate degrees from Michigan State University and Lehigh University. He is currently the Head of School for a private school in Walnut Creek, California. He has regularly participated in and presented at conferences and workshops related to 21st century learning and the integration of technology into modern learning environments.

Education & Certifications

Master's of Arts in K-12 Educational Administration, Michigan State University, 2003
Teacher Certification, North Carolina Agricultural & Technical University, 2002
Bachelor's of Arts in History & Geography, University of North Carolina-Chapel Hill, 2000

Professional Experience

2012-present: Head of School at Contra Costa Christian Schools (Walnut Creek, CA)
2006-2011: Director of Technology & School Improvement for Gyeonggi Suwon International School (Suwon, Korea) and Taejon Christian International School (Daejon, Korea)
2002-2006: Secondary Assistant Principal at Taejon Christian International School (Daejon, Korea)
2000-2002: High School Social Studies Teacher at Wesleyan Christian Academy (High Point, NC)

Presentations & Articles

21st Century Learning Environments, 2011 Global Education Symposium (Seoul, Korea)
Technology Infusion with Apple Tools, Workshop Facilitator (Singapore)
Podcasting in the Classroom, Korea Council of Overseas Schools (Bundang, Korea)
Learning in the 21st Century, International Children Educators' Conference (Suwon, Korea)
The Effective Implementation of a 1:1 Learning Environment, International Children Educators' Conference (Suwon, Korea)
Where is Global Citizenship in Your School?, EARCOS Administrators' Conference (Manila, Philippines)
Embracing Student Learning in the 21st Century: Moving to a New Paradigm, workshop at the International Children Educators' Conference (Hong Kong, China) & published article in Christian School Education
Fast Schools in a Fast World: How to Avoid Becoming a Dinosaur in Today's Teaching Profession, International Children Educators' Conference (Hong Kong, China)
From Dogma to Understanding, International Baccalaureate Asia-Pacific Regional Conference (Hanoi, Vietnam)