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What Professional Development Practices Support The Successful Integration Of Technology Within A Standards-Based Educational (SBE) System

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WHAT PROFESSIONAL DEVELOPMENT PRACTICES SUPPORT THE SUCCESSFUL INTEGRATION OF TECHNOLOGY WITHIN A STANDARDS-BASED EDUCATIONAL (SBE) SYSTEM

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Abstract

The purpose of this quantitative study was to explore the relationship between K-12 teachers' current technology skill level, their self-efficacy as teachers, and their attitude toward changes required to integrate 21st-century technologies into their classrooms. Twenty-five members of the teaching staff from a rural School Department in Maine participated. This study describes the following: (a) What is the relationship between teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies in the classroom? (b) What is the relationship between teachers' current self-efficacy towards using technology, and their capacity towards integrating 21st-century technologies in the classroom? and (c) What components of professional development, measured through survey data, are required to support change and prepare teachers to successfully integrate 21st-century technologies in the classroom? This study evaluated data from two different needs-based professional development surveys that were designed to gather individual teacher input about their technology learning needs and which were correlated to formulate a hypothesis on teacher attitudes and current practices. Relevant organizational data was collected within the School Department. This study utilized a descriptive, quantitative method employing a non-experimental design that studied the phenomena of attitude toward change. The educational research was conducted for the purpose

of describing and planning improvement related to a teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies in the classroom. Using a Likert scale, variables within the cross-sectional surveys were identified and measured carefully to identify trends in the data.

Keywords: 21st-century technologies, self-efficacy, technology integration, teacher attitude, professional development, classroom integration, best practices

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CHAPTER ONE

INTRODUCTION

> Research has revealed that the attitude you have at the beginning of a task determines the outcome of that task more than any other single factor. For example, if you believe you will be able to succeed at a particular undertaking and you approach the endeavor with a sense of excitement and joyful expectation, your chances of achieving success are much higher than if you face the task with dread and apprehension.
>
> ~Abascal, Brucato, and Brucato (2001, p. 39)

Background of the Study

Policy makers, school and district leaders, and researchers are all increasingly concerned with improving the quality of evidence regarding the effectiveness of teacher professional development (Penuel, Fishman, Yamaguchi, & Gallagher, 2007). Much of the activity underway on multiple levels of the educational system is driven by a very strong perceived need for action, but it is not often guided by any substantial knowledge base derived from research about what works and why with regard to technology (Lawless & Pellegrino, 2007).

This research study examines teacher perceptions of the professional development practices that support the successful integration of technology within a standards-based educational (SBE) system. This school-based study will provide information about how teachers in the School Department currently use technology and how appropriately designed and assessed professional development practices support 21st-century technologies within their classrooms.

One outcome of the study is the identification of professional development practices that are designed to support the successful implementation of a technology-enriched curriculum. These professional practices and the subsequent needs-based professional development plan were identified through surveys of practicing teachers. This study will evaluate the current professional development program so that modifications can be made and procedures can be developed to support teachers' integration of 21st-century technologies into the classroom. Technology integration challenges need to be considered when developing a needs-based professional development system deal with specific contextual situations. As a result, it is critical that classroom teachers and administrators work together to develop the system (Lee, 2005). The funding and formal integration of the 21st-century technologies within the classrooms will be an outlining factor that will be informally addressed in this study as well.

School leaders in the School Department are well positioned to interrupt the "status quo" of traditional instructional practices for the purpose of maximizing learning opportunities for all those involved in the organization (Grogan, Donaldson, & Simmons, 2007). Currently, the School Department utilizes traditional models of professional development, which do not include time for interactions between our teachers. Recent research has explored the connections between designing professional development activities, the skills teachers learn during these activities, and the changes that occur in the classroom (Borko, 2004). The development of a needs-based professional development schedule and focus will provide the time and space where teachers can come together to identify similar challenges, collaboratively discuss possible solutions, enact these solutions, assess their success, and then revisit the challenge (MacDonald, 2009).

Problem Statement

Not all teachers within the School Department integrate 21st-century technologies into the curriculum they use with their students. Based on the literature (Christensen, 2002; Gorder, 2008), technology integration is now deemed to be an essential teaching skill. This study addresses the problem of the gap in knowledge regarding what issues contribute to teachers' difficulty and capacity to integrate 21st-century technologies into their classrooms. Specifically, more information is needed to assess the relationship of teachers' technology skill level, teacher self-efficacy, and teacher attitude to change (Farah, 2011; Gorder, 2008; Penuel et al., 2007). More needs to be known about how teachers' skills, beliefs, and attitudes impact their openness to accepting and integrating technology into their classroom. This research study will identify the relationships, factors, and related variables that influence teachers' capacity to integrate 21st-century technologies into their classrooms.

Purpose of the Study

The purpose of this study was to explore the relationship between K-12 teachers' current technology skill levels, their self-efficacy as teachers, and their attitude toward the changes required to integrate 21st-century technologies into their classrooms. The research questions were:

1. What is the relationship between teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies into the classroom?

2. What is the relationship between teachers' current self-efficacy towards using technology, and their capacity towards integrating 21st-century technologies into the classroom?

3. What components of professional development, measured through survey data, are required to support change and prepare teachers to successfully integrate 21st-century technologies into the classroom?

This study utilized a descriptive, quantitative method employing a non-experimental design to examine the phenomenon of attitude toward change. The educational research was conducted for the purpose of describing and planning improvement related to current teacher skills/abilities using technology and their attitude towards integrating 21st-century technologies into the classroom.

As a former technology director/educator I have always been fascinated with the evolution of technology and its impact on education. The 21st-century technologies that are currently available have been shown to make different demands on students and schools. Schools face the challenges of preparing students to live, learn, and work successfully in today's knowledge-based digital society. Teachers have to work toward encouraging students to become critical thinkers, collaborative colleagues, and technology-literate citizens (Sage, 2000). The thought that we are preparing students for careers that do not currently exist is amazing yet concerning. The availability of computers and other technology in schools continues to increase, causing concerns for educators about their real use and the impact technology has in the classroom. Educators cannot deny the fact that they must support technology integration into their classrooms; however, the adoption and use in the classroom is ultimately determined by the classroom teacher, and their skills, beliefs, and attitudes influence whether or not the technology has a positive impact on the educational process.

Conceptual Framework

Although there is a significant amount of literature about the topic of technology integration in classrooms, there are specific elements that made this research unique and contribute to the growing body of literature. One element in the study was the role of the Maine Learning Technology Initiative (MLTI). The MLTI seeks to provide professional development and 21st-century tools to middle and high schools to support the attainment of the Maine state standards. The MLTI made Maine the first state to seize the potential of technology to transform teaching and learning in classrooms statewide by providing laptops and professional development to all Maine students and teachers in grades 7-8 (Maine Department of Education, 2014).

Another important element of this research was the use of two different needs assessment surveys to guide the future development of the professional development schedule. This professional development approach will provide individualized training and support to practicing teachers within the district. The School Department currently expends over $260,000 per year on technology-related services and equipment purchases. When looking more closely at the amount of money that is specifically designated for providing professional development, this study revealed that the School Department only designates $19,860 a year or less than 8 percent of the total budget. Although funding 21st-century technologies is a challenge for our district, this study is focused on looking closely at our current professional development procedures and addressing teacher needs.

The current literature recognizes that a needs-based professional development schedule has been shown to have a rapid, positive effect on teacher attitudes, such as computer anxiety, perceived importance of computers, computer enjoyment, active engagement, collaboration, and

community building among participants (Christensen, 2002; Desimone, 2009; Lawless & Pellegrino, 2007; Penuel et al., 2007). Current studies suggest that high quality professional development is central to any education improvement effort. Successful implementation of 21st-century technologies depends upon extensive, high-quality professional development and ongoing support (Lemke & Fadel, 2006; O'Dwyer, Russell, & Bebell, 2004; Penuel, 2006)

Providing support to teachers and encouraging them to seek new information and to improve classroom instruction is vital in building their knowledge capacity (Helmer, Bartlett, Wolgemuth, & Lea, 2011). Understanding the role of technology in classrooms requires the understanding of the role and importance of technology in the real world. Technology integration should support curriculum standards that call for problem solving, communication, reasoning, and establishing connections among curriculum areas (Angers, 2004).

Assumptions

Lack of funding for the needs-based professional development schedule may impact the full implementation of the model but will not be a deterrent from identifying the instructional technologies that are necessary. Teachers are the center of the teaching/learning effort, and, based on the conversations I have had with staff over the last several years, I anticipate that the majority of our teachers will embrace the opportunity to engage in this study. Student achievement and the development of a needs-based professional development plan will be the focus of future studies.

Significance

This study examined and identified the relationship that self-efficacy and attitudes have on the development of professional development practices for teachers seeking to integrate technology into a SBE system. This research study documented survey data related to teacher

needs in relation to their current abilities, level of self-efficacy, and attitudes that impact the level preparation required to successfully incorporate 21st-century learning technologies into the classroom. Enhancing such experiences will enable students to better navigate through and among the global world in which they now live and must later work (U.S. Department of Education, 2010).

Even though we have offered professional development opportunities to improve teacher use of technology as an effective instructional tool, we have realized that this alone does not prepare them to successfully integrate technology use into their classrooms. I believe that this approach to professional development created "holes" in our system which have forced teachers to spend too much time on teaching students how to use the technology versus showing students how to learn instructional content through the use of technology. The needs-based professional development program that will be developed upon completion of this study will provide on-going programs for teachers to learn new technology and to integrate 21st-century technologies into the classroom.

This professional development also will need to accommodate the busy schedules of teachers and be offered during regularly scheduled professional development times. Similar to our current curriculum development plan, time is designated during the summer months, which allows teachers to focus and be free from the stress and time limitations that come from their daily classroom responsibilities.

Conclusion

This research examined the four general sources of self-efficacy and teacher attitude as they are related to the level of confidence, familiarity, anxiety, and fear teachers identify that affect the successful integration of technology within a standards-based educational (SBE)

system. The School Department is currently utilizing the traditional one-day workshop model, and through the use of individual surveys, this research study provided needed information that will contribute to the future development of a needs-based professional development program that will help support practicing teachers integrate 21st-century technologies into their classroom.

CHAPTER TWO

LITERATURE REVIEW

Researchers (Bai & Ertmer, 2008; Crittenden, 2009; Holden & Rada, 2011; Steinbronn & Merideth, 2007) have identified primary concepts and practices that support the successful integration of technology within a standards-based educational (SBE) system. Each concept will focus on my observations and data analysis related to technology integration in the classroom. The three primary concepts that direct the focus for this study are: (a) professional development, (b) self-efficacy, and (c) attitude. The literature included here considers the relationships, factors, and related variables that influence what teachers do to inform and support their integration of 21st-century technologies into the classroom.

Professional Development

Professional development for technology has been defined throughout the literature to include the skills and abilities required to integrate 21st-century technologies (Steinbronn & Meredith, 2007; Zhao, 2007). The emerging variables within this concept include the Maine Learning Technology Initiative (MLTI), needs-based professional plans, and 21st-century technologies. The term “best practices” is referred to often when looking at educational practices and often includes a model or proposed strategies that impact student achievement. Steinbronn & Meredith (2007) suggest that both technology skills and pedagogy need to be addressed when one is trying to compare the impact technology integration has on instructional practices. This study also concluded that best practices in learning include a high level of engagement and collaboration between students.

Policy makers, school and district leaders, and researchers are increasingly concerned with improving the quality of evidence about the effectiveness of teacher professional development, especially in terms of its impact on desired reform outcomes (Penuel et al., 2007). Zhao (2007) identified that school systems spend the majority of their funding on acquiring the technology and very little on professional development. Although Maine state standards and the National Council for Accreditation of Teacher Education (NCATE) require teachers to incorporate technology into their classrooms successfully, inadequate training in the use of technology as an instructional tool continues to be a barrier to successful integration of 21st-century technologies (Zhao, 2007).

Barriers to technology use are a common research focus. Studies have found that a plan for technology integration needs to include the correct equipment and training (Lee, 2005; MacDonald, 2009). The use of technology is related to several factors teachers consider important, including the availability of equipment, training, ease of use, level of confidence using technology, and colleagues' use of the technology (Groves & Zemel, 2000). Technology integration in education is ultimately impacted by the lack of resources, planning time, equipment, and training. Teachers also need to understand what technology integration involves and be provided with the incentive, equipment, and training necessary to use technology effectively themselves (Bauer & Kenton, 2005).

Sheingold (1990) found that needs-based training fostered meaningful use by teachers, which, in turn, promoted student enjoyment and perception of the importance of computers. Integrating technology in the classroom is not about teaching students how to operate computers, but providing teachers opportunities for integrating technology and experiencing technology as a tool for learning.

Structured and focused professional development and support is critical to supporting teachers' integration of 21st-century technologies into the classroom and the development of these strategies, and this goal will be the driving force behind the needs-based professional development schedule/plan that will be developed as a result of this study. The structure must support the development of self-efficacy as well as technology skills.

Self-Efficacy

Self-efficacy has been defined through the literature to include one's beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments within the structural characteristics of their existing environment and to enable people to develop desired attributes and improve their living conditions (Bandura, 1997; Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2008). The literature also indicates that self-efficacy and self-esteem are entirely different constructs. According to Bandura (1997), self-efficacy is a judgment of capability while self-esteem is a judgment of self-worth. As a result, the empirical status of self-esteem has no bearing on the functional properties and predictiveness of self-efficacy.

There are four general sources of known self-efficacy measures, which include performance accomplishments, vicarious experiences, verbal persuasion, and psychological states (Crittenden, 2009). According to Bandura (2006, 2012), the sources of self-efficacy, or people's level of self-efficacy and beliefs in their capabilities, are developed in four ways, which include mastery experiences, social modeling, social persuasion, and choice processes. These self-efficacy beliefs influence how well people motivate themselves and persevere in the face of difficulties through the goals they set for themselves, their outcome expectations, and casual attributions for their successes and failures.

Now more than ever before, society has become dependent upon digital technologies to stay connected with the world. Many teachers are aware of the technology that is available to them but they are not capitalizing on the opportunity to integrate these resources into their classroom (Farah, 2011). Self-efficacy influences the behavior people choose to demonstrate and is a common theme in relation to motivation. Within our schools, many teachers are less confident in their abilities and often know less about the technology than their students. Given what is known about self-efficacy and its potential to predict behavior, it is useful to examine teachers' levels of technology self-efficacy and the factors that affect those levels (Farah, 2011).

There are emerging variables within the concept of self-efficacy, which include personal, behavioral, and environmental experiences. Leaders' awareness of those factors plays a role in the design of professional development. There are also general sources of known self-efficacy measures, which include performance accomplishments, vicarious experiences, verbal persuasion, and psychological states (Crittenden, 2009). Holden and Rada (2011) suggested that school districts might increase teachers' acceptance and use of technologies by focusing on increasing influential individual external factors, such as self-efficacy. Bai and Ertmer (2008) concluded that if a person has a high level of computer self-efficacy then they will believe that they will be successful in using technology, and if the person demonstrates a low level of computer self-efficacy, then the person will have difficulty using the technology on their own.

Given what is known about how self-efficacy can determine potential behaviors, it is important to examine how it affects teachers' attitudes to the implementation and use of technology in the classroom. Thus, this research will examine the level of technological self-efficacy practicing teachers in the School Department have.

Attitude

Attitude is defined in this study as the amount of teacher confidence, familiarity, anxiety, and fear as they are correlated to feelings towards technology integration in the classroom and the teachers' competence and ability to shape instructional technology activities to meet students' needs (Gorder, 2008).

The teacher is the most important ingredient for success when using technology and their attitudes toward technology usage are an essential factor in assisting successful technology integration (Mandell, Sorge, & Russell, 2002). This is a result of the fact that students today must learn to search and discover knowledge, actively communicate with others, and solve problems so that they can become productive life-long members of our society (Bitner & Bitner, 2002). As a result of the challenges that 21st-century learning technologies present to teachers, the amount of confidence that a teacher possesses in using computers and related technologies may greatly influence his or her effective implementation of technology methods in the classroom (Christensen, 2002).

District and school policy and professional development workshops are designed to positively influence teachers' adoption of technology; however, the adoption and use in the classroom are determined by teachers' attitudes and beliefs about technology (Angers, 2004). Vannatta and Fordham (2004) concluded that in order for teachers to successfully support instruction through the use of technology, teachers have to dedicate a significant amount of their own time experimenting with the technology, and also that positive teacher attitudes toward 21st-century learning technologies are directly correlated and necessary for the successful integration of technology within a SBE system. They found that beliefs exert a powerful influence on their instructional decisions and classroom practices.

There are also first-order and second-order barriers associated with teacher attitudes (Bai & Ertmer, 2008). First-order barriers are extrinsic to teachers and include lack of access to hardware and software, time, and necessary support. Second-order barriers are more ingrained and center on a teachers' beliefs about teaching and learning, and play an important role in the ways in which technology is used in the classroom (Bai & Ertmer, 2008).

Examination of teacher attitudes also supports the relationship between teacher perceptions of technology integration into the classroom and their ability to integrate activities that improve student learning (Woodrow, 1992). One critical relationship between 21st-century technologies and education is that the majority of teachers only focus on teaching first and not on supporting the integration of secondary level technology skills into their classroom. Many teachers often learn along with their students instead of being the expert in the integration of technology (Gorder, 2008). Individual teacher attitudes and beliefs help shape their instructional goals and perceptions of technology integration.

Basinger (2000) outlined how these attitudes and beliefs impact student learning and eliminate or create barriers on what they do with technology. Teacher self-perceptions of computer proficiency create stages of growth in using technology where the focus moves from self-use to how to use technology for the greatest impact on student learning. Once they move through the process of designing, developing, and delivering an application, teachers are more able to see the effectiveness of the technology in helping students learn (Basinger, 2000).

This research addresses the influence that teacher attitudes have on the impact that 21st-century technologies have within the classroom. The literature suggests that the predictors of technology use among teachers include attitude, beliefs toward computers, computer self-

efficacy, technology proficiency, active-learning, mediation, collaboration, interactivity, and pedagogical beliefs (Christensen, 2002; Gorder, 2008; Vannatta & Fordham, 2004).

Although many pre-service and in-service programs have sought to improve the preparation of teachers so they can use technology as an effective instructional tool, many teacher educators and school administrators have realized that technology training alone does not create an effective technology-using teacher (Vannatta & Fordham, 2004). Several studies (Bai & Ertmer, 2008; Bitner & Bitner, 2002; Gorder Vannatta & Fordham, 2004) have focused on the influence of attitudes of teachers and their intent to utilize technology. Bai & Ertmer (2008) also suggest that the personal attitude and beliefs of teachers may relate to or predict the successful integration/instruction of technology in the classroom.

Teachers conceptualize and approach teaching in a number of different ways. Teachers who perceive learning as the accumulation of information are more likely to view teaching as the transfer of information. These teachers are more likely to use a teacher-centered approach where information is presented to students. Teachers who view learning as conceptual change will likely view teaching more as facilitating conceptual change and they are more likely to use a student-centered approach (Prosser & Trigwell, 1999).

Otte and Benke (2006) addressed the focus on pedagogy in technology use and suggested that change in instruction is a matter of pedagogy, and that a how-to approach cannot adequately ensure change. They also identified the fact that in order to maintain the focus for teaching and learning, whether in an online classroom or face-to-face, requires a commitment to both quality pedagogy and to the goals and mission of the institution.

Conclusion

This study examined current professional development schedules as well as self-efficacy and personal attitudes of teachers within the School Department. Each concept will be studied closely and the data collected through this research will help inform future decisions that will provide the support needed for teachers to incorporate 21st-century technologies into their classrooms.

Teachers currently spend more time focusing on the use of technology than on integrating the technology into their instruction to improve student learning and understanding. We are not in the business of teaching students how to use computers and I believe that our efforts should be focused on how to use technology as a tool to improve our understanding and learning. The most significant conclusion from this initial literature is that teachers use technology for professional productivity and to facilitate and deliver instruction, but they do not integrate technology as well into teaching and learning. I also agree with the literature that there is a difference in how technology is integrated into the classroom within various grade levels.

The effective use of technology is widely recognized as a crucial component of modern education and is increasingly seen as an enabler of learning. The U.S. Department of Education (2010) describes it as being pivotal in improving student learning opportunities. There has historically been a lack of obvious alignment between the integration of technology and student achievement (Martin et al., 2010). On average, the strength of the correlation between computer technologies and student achievement varies from low to moderate (Jones & McLean, 2012). There are also indications that professional development that makes an explicit connection between technology and specific types of instruction may be effective and can establish a viable

chain of reasoning in which technology use can be linked to changes in student learning (Ravitz, 2009).

Over the last several years the School Department has dedicated a significant amount of funding towards PreK-12 teaching/learning. Future expenditures are expected to be just as great and there should be no surprise that calls for accountability regarding the impact of these expenditures upon student achievement are continually being echoed throughout the country (Kmitta & Davis, 2004).

CHAPTER THREE

METHODOLOGY

This study utilized a descriptive, quantitative method employing a non-experimental design to study the phenomena of attitude toward change (Gall, Borg, & Gall, 2007). The educational research was conducted for the purpose of describing and planning improvements related to a teachers' current skills/abilities using technology and their attitude towards integrating 21st-century technologies in the classroom. The research employed a survey design using industry-developed surveys. "A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. From sample results, the researcher generalizes or makes claims about the population" (Creswell, 2009).

Surveying allowed for ease of data collection and identification of the distribution of certain traits or attributes of the population and generalization to a larger group of K-12 teachers (Babbie, 1973). The surveys were cross-sectional in design.

> In a cross-sectional survey, data are collected at one point in time from a sample selected to describe some larger at that time. Such a survey can be used not only for purposes of description but also for the determination of relationships between variables at the time of study. (Babbie, 1973, p. 62)

The purpose of this study was to explore the relationship between K-12 teachers' current technology skill level, their self-efficacy as teachers, and their attitude toward changes required to integrate 21st-century technologies into their classrooms.

The research questions were:

1. What is the relationship between teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies into the classroom?

2. What is the relationship between teachers' current self-efficacy towards using technology, and their capacity towards integrating 21st-century technologies into the classroom?

3. What components of professional development, measured through survey data, are required to support change and prepare teachers to successfully integrate 21st-century technologies into the classroom?

Instrumentation

This study evaluated data from two different needs-based professional development surveys, which were designed to gather individual teacher input about their technology learning needs. This data was correlated in order to formulate a hypothesis on teacher attitudes and current practices. Relevant organizational data was collected within the School Department.

This study utilized a descriptive, quantitative method employing a nonexperimental design that studied the phenomena of attitude toward change. The educational research was conducted for the purpose of describing and planning improvement related to teachers' current skills/ability using technology and their attitudes towards integrating 21st-century technologies into the classroom.

Using a Likert scale, variables within the cross-sectional surveys were identified and measured carefully to identify trends in the data (Creswell, 2012). As a result of my current supervisory role as Superintendent of Schools, this study will not utilize any experimental control on the variables with the intent that future studies would be looking at various independent variables that include student achievement and the development of a needs-based professional development schedule.

This research also included the identification and examination of the impact that teacher dispositions have on the successful integration of technology in the classroom. These dispositions would include: self-efficacy, philosophy, openness to change, and prior teaching experience, data regarding which were collected through two separate surveys and questionnaires. The first survey included the use of a Technology Integration Matrix (TIM) survey (see Appendix A), which illustrated how teachers can use technology to enhance learning for K-12 students. Although there are multiple TIMs available, the general concept is that the matrix compares characteristics of meaningful learning environments with levels of technology integration. The TIM includes specific parts that focus on Confidence and Comfort (Self-Efficacy) and Teacher Use. The data collected from each of these parts will be used to answer the second and third research questions, which are focused on measuring self-efficacy towards using technology and what current levels of technology use are being utilized in the classroom.

The second survey used in this study was the Teachers' Attitude Toward Computers (TAC) survey (see Appendix B), which will be used to study the effects of integrating 21st-century technologies on the attitudes of teachers. The TAC is a validated research questionnaire that was developed by Rhonda W. Christensen and Gerald A. Knezek during a 1995-1997 study of the effects of technology integration on the attitudes of teachers and their students (Christensen & Knezek, 1996). The data collected through the use of the TAC and TIM will be used to answer the first research question, which will help determine if there is a relationship between teachers' current skill levels and their attitudes towards integrating 21st-century technologies into the classroom.

Setting

The participants and data in this research primarily involved teachers from the School Department. The School Department consists of 1300 students and 96 teachers. The interactions with participants took place via electronic mail, and surveys were administered through a paper format at a location within the School Department site. The site itself was agreed upon by the Chair of the School Department (see Appendix C). No aspect of this study was conducted in locations outside of the scope of proposal.

Participants/Sample

All 96 professional classroom teachers within the School Department were invited to participate through the use of a participant outreach letter (see Appendix D). Initial contact to the participants was through a formal letter via electronic mail that explained the detail and scope of the research study.

My professional office was located at the research site and I was readily available for a face-to-face meeting to clarify any questions and/or address concerns. However, contact with participants happened almost exclusively through email or a written request delivered to the individual's school mailbox. In an effort to maintain privacy, there was no discussion with anyone regarding individuals who either opted in or out..

No support staff were included in this research; only teachers. The only other exclusion criteria were individuals who opted out of the study. All teachers received copies of the surveys during their professional time. Numbers were assigned to each set of surveys so there was no personal information reported on the surveys that would allow me to identify the teachers who completed or decided to not participate in the study.

The site was selected so that data from this study could be used to develop a needs-based professional development schedule and help analyze student achievement data in future studies. The age span of the participants who were included in the study ranged from 21 to 65+ years old. There were currently no teachers with health concerns or differing abilities requiring a specialized accommodation or approach.

Data Management

All data obtained as a part of this study was maintained by me. The information regarding data management was included in the Consent for Participation document. All participant names/identifiers and information were removed from the data and were not identifiable or included in the research documentation.

All research data was stored securely on my laptop that was password protected. Any data transferred was via secured options; encrypted files or through a flashdrive supplied by and collected by me. Surveys were distributed and collected by the Assistant Superintendent in order to ensure confidentiality and anonymity. Documents were kept for the duration of the study; hard copies will be maintained in a locked cabinet for 1 year. Following the 1-year time period for saving data, hard copy files will be shredded and electronic files will be deleted. Information regarding data security is included in the Consent for Participation in Research document.

For this study, identifiers were not necessary because surveys were attached together and identified through the use of a random number so that I would not have any access or ability to determine who actually completed the survey. This ensured anonymity and protected each participant from concern that their responses would be reflected in their evaluation and summary of their work and performance.

Confidential personnel information was not included in the data. Beyond naming the state that the study was based in and the economic status of the location, there were no other personally identifiable indicators included in the research.

Data Analysis

The Technology Integration Matrix (TIM) illustrates how teachers can use technology to enhance learning for K-12 students. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, constructive, goal directed (i.e., reflective), authentic, and collaborative (Jonassen, Howland, Moore, & Marra, 2003). The TIM survey was administered during a professional development day in March to document teachers' perceptions about how technology had been integrated into the classrooms throughout the year. There was no personally identifiable information included in the reporting.

The Teachers' Attitude Toward Computers Questionnaire (TAC) was used to study the effects of integrating 21st-century technologies has on the attitudes of teachers. The TAC is a 10-part composite instrument that includes 51 items spanning a 32 Likert and Semantic Differential subscale (Christensen & Knezek, 2009). The TAC questionnaire was also administered during a professional development day in March 2015 in order to document the effects of integrating 21st-century technologies on the attitudes of teachers. There was no personally identifiable information included in the reporting of data.

Participants' Rights

Participation in this research allowed teachers to influence the type of professional development offered and to offer feedback on how technology was being used throughout our Strategic Educational Plan. There were no professional disadvantages or risks associated with participation in this research.

Potential Limitations

This quantitative research study examined the beliefs, factors, and teaching practices that lead to the successful integration of technology within a standards-based educational (SBE) system. My goal was to gather data through this research that provides information on how technology is currently being used and what practices are common in the successful implementation of a technology-enriched curriculum. My primary focus was on the impact that striving to integrate technology was having on the teachers and their students my current School Department and other local and regional school systems in Maine. There was no risk to participants associated with this study.

Assumptions

In the role of Superintendent of Schools, I previously conducted quantitative surveys. Although I am not the direct supervisor of the participants, every effort was made to communicate that participation in this study was voluntary. I was cognizant of my dual role as superintendent of schools and researcher.

CHAPTER FOUR

RESULTS

Overview of Research

The purpose of this study was to explore the relationship between K-12 teachers' current technology skill level, their self-efficacy as teachers, and their attitude toward changes required to integrate 21st-century technologies into their classrooms.

The research questions were:

1. What is the relationship between teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies into the classroom?

2. What is the relationship between teachers' current self-efficacy towards using technology, and their capacity towards integrating 21st-century technologies into the classroom?

3. What components of professional development, measured through survey data, are required to support change and prepare teachers to successfully integrate 21st-century technologies into the classroom?

This study utilized a descriptive, quantitative method employing a nonexperimental design to study the phenomena of attitude toward change (Gall, Borg, & Gall, 2007). The educational research was conducted for the purpose of describing and planning improvements related to teachers' current skills/abilities using technology and their attitude towards integrating 21st-century technologies into the classroom. The research utilized a survey design using industry-developed surveys. "A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. From

sample results, the researcher generalizes or makes claims about the population" (Creswell 2009, p. 145).

Analysis Methods

This study evaluated data from two different needs-based professional development surveys and questionnaires, which were designed to gather individual teacher input about their technology learning needs.

The first survey included the use of a Technology Integration Matrix (TIM) survey (see Appendix A), which examined how teachers were using technology to enhance learning for K-12 students. Although there are multiple TIMs available, the general concept is that the matrix compares characteristics of meaningful learning environments with levels of technology integration. The TIM includes two specific sections that focus on Confidence and Comfort (Self-Efficacy) and Teacher Use. The data collected from each of these sections were used to answer the second and third research questions, which focused on measuring self-efficacy towards using technology and what current levels of technology use were being utilized in the classroom.

The second questionnaire used in this study was the Teachers' Attitude Toward Computers (TAC) questionnaire, which was used to study the effects of integrating 21st-century technologies has on the attitudes of teachers. The TAC is a validated research questionnaire that was developed by Rhonda W. Christensen and Gerald A. Knezek during a 1995-1997 study of the effects of technology integration on the attitudes of teachers and their students.

The data collected through the use of the TAC and TIM were used to answer the first research question, which helped determine if there was a relationship between teachers' current skill levels and their attitudes towards integrating 21st-century technologies in the classroom. This study focused on relevant organizational data from participants within the School

Department. The interactions with participants took place via electronic mail and surveys were administered through a paper format during a March 20, 2015, professional day.

Presentation of Results

The TIM illustrates how teachers can use technology to enhance learning for K-12 students. The TIM incorporates five interdependent characteristics of meaningful learning environments: active, constructive, goal directed (i.e., reflective), authentic, and collaborative.

The TIM survey was administered March 20, 2015, during a professional development day. The survey documented teachers' perceptions about how technology has been integrated into the classrooms throughout the year. There was no personally-identifiable information included in the reporting.

The TAC questionnaire was also administered March 20, 2015, during a professional development day. This survey documented the effects that integrating 21st-century technologies has on the attitudes of teachers. There was also no personally-identifiable information included in the reporting.

On March 20, 2015, surveys were distributed together by the Assistant Superintendent of Schools to the 66 teachers who were in attendance for a regularly scheduled professional day. Of the 66 teachers who were in attendance, 23 completed and returned their surveys at the end of the day. All 96 teachers were sent a follow-up email reminder on April 6, 2015 and two additional surveys were returned for a total of 25.

Technology Integration Matrix (TIM)

The TIM utilized two different types of rating scales for teachers in order to select a response that best described their level of agreement with each statement. Tables 1 to 5 indicate how each rating scale was coded.

Table 1

Data Analysis Recoding, Technology Integration Matrix

Code	Descriptor
1	Strongly Disagree (SD)
2	Disagree (D)
3	Undecided (U)
4	Agree (A)
5	Strongly Agree (SA)

Teachers' Attitudes Toward Computers (TAC)

The TAC was used to study the effects that integrating 21st-century technologies has on the attitudes of teachers. The TAC is a 9-part questionnaire that includes 52 Likert and semantic differential subscales that measure teachers' attitudes toward computers. Table 2 indicates how each rating scale was coded in sections 1-6 and 8-9.

Table 2

Data Analysis Recoding, Teachers' Attitudes Toward Computers (1-6, 8-9): Interest, Comfort, Accommodation, Interaction, Concern, Utility, Absorption, and Significance

Code	Descriptor
1	Strongly Disagree (SD)
2	Disagree (D)
3	Undecided (U)
4	Agree (A)
5	Strongly Agree (SA)

Table 3 indicates how each rating scale was coded in section 7. This Likert scale with seven increments was used to determine the level of agreement from each of the teachers who completed the survey. Using a rating of 1 to 7, teachers were asked to rate their level of perception toward computers. For example, a teacher who felt that computers were very unpleasant to use would use a number 1 while another person who felt that computers were very pleasant to use would use a rating of 7.

Table 3

Data Analysis Recoding, Teachers' Attitudes Toward Computers (7) Perception

Descriptor	Code	Descriptor
Unpleasant	1 2 3 4 5 6 7	Pleasant
Suffocating	1 2 3 4 5 6 7	Fresh
Dull	1 2 3 4 5 6 7	Exciting
Unlikable	1 2 3 4 5 6 7	Likeable
Uncomfortable	1 2 3 4 5 6 7	Comfortable

Using the directions provided by Christensen and Knezek (2009), certain items in the TAC have a negative meaning and needed to be reversed prior to including them with the earlier data. Table 4 provides an overview of the coding methods used for the specific items that contained a negative meaning. For example, if the respondent selected 1 or SD (Strongly Disagree), the answer was coded as a 5 or SA (Strongly Agree). If the respondent selected 4 or A (Agree), the answer was coded as a 2 or D (Disagree).

Table 4

Coding Methods Used for Specific Items That Contained a Negative Meaning

Descriptor	Part	Item Numbers
Comfort	2	1,2,3,4,5
Accommodation	3	1,2,3,4,5
Concern	5	1,2,3,4,5,6,7,8
Absorption	8	5

Note: Item numbers that had a negative meaning that needed to be were reversed in each subscale.

Scores from the TAC were averaged in an effort to provide a scale score for each part of the TAC. Each part of the TAC focused on a particular descriptor. These included: Interest, Comfort, Accommodation, Interaction, Concern, Utilization, Perception, Absorption, and Significance. Table 5 provides the descriptor for each part of the TAC along with the averaged scale score of all of the respondents. It is important to note that the average score for descriptor 7, Perception, was based on a 1-7 Likert scale while the other eight descriptors only used a 1-5 Likert scale.

Table 5

Averaged Scale Score

TAC Descriptors		
Part Descriptor	Part Number	Average Scale Score
Interest	1	4.22
Comfort	2	4.49
Accommodation	3	4.86
Interaction	4	3.29
Concern	5	3.42
Utilization	6	4.29
Perception	7	4.99
Absorption	8	3.27
Significance	9	4.39

Three of the parts of the TAC averaged a scale score of less than a 3.5. Using the Likert scale (see Table 2) respondents reported that they were closer to being "undecided" in the specific areas related to the level of Interaction, Concern, and Absorption with the use of technology. When looking closer at the individual responses, between 42-63 percent of the respondents in part 4 selected 1-3 (see Table 2) in their responses to their level of interactions to technology.

Correlation Analysis

The correlation coefficient values listed in Table 6 were used to determine the relationship between various responses on the TIM and TAC questionnaires.

Table 6

Correlation Coefficients

Range	Correlation
0-.29	No Linear Relationship
.30-.49	Weak Positive Linear Relationship
.50-.69	Moderate Positive Linear Relationship
.70-.99	Strong Positive Linear Relationship
1	Perfect Positive Linear Relationship

The first correlation analysis that was conducted looked specifically at individual questions in both Part 1 and Part 6 of the TAC. The questions in Part 1 were focused on the level of interest that the respondents had toward learning about computers while the questions selected in Part 6 were focused on how the respondents felt about the utilization of computers and the impact technology has on their instruction. In Table 7 four different sets of questions were selected, the ones with the highest levels of correlation, in an effort to address research questions 1 and 2.

Table 7

Correlation Analysis: Interest/Utilization

Questions	*Part 6 Q1*	*Part 6 Q2*	*Part 6 Q3*	*Part 6 Q4*	*Part 6 Q5*	*Part 6 Q6*	*Part 6 Q7*	*Part 6 Q8*
Part 1 Q1	0.94	0.91	0.91	0.91	0.60	0.84	0.88	0.88
Part 1 Q2	0.78	0.78	0.77	0.77	0.57	0.72	0.66	0.71
Part 1 Q3	0.85	0.82	0.82	0.82	0.69	0.83	0.76	0.80
Part 1 Q4	0.95	0.86	0.84	0.84	0.53	0.78	0.83	0.83
Part 1 Q5	0.90	0.94	0.91	0.91	0.69	0.84	0.87	0.87

Variables	Range
(Question 1 Part 1) I think that working with computers would be enjoyable and stimulating. (Question 3 Part 6) Computers are necessary tools in both educational and work settings.	0.91
(Question 1 Part 1) I think that working with computers would be enjoyable and stimulating. (Question 1 Part 6) Computers could increase my productivity.	0.94
(Question 4 Part 1) I like learning on a computer. (Question 1 Part 6) Computers could increase my productivity.	0.95
(Question 5 Part 1) I can learn many things when I use a computer. (Question 2 Part 6) Computers can help me learn.	0.94

Strong linear relationships ranging from .91-.95 were indicated when questions related to interest and utilization were correlated. The four highest correlations are reported in Table 7,

which includes the actual questions from each section. When looking at the individual responses, 92 percent of the respondents agreed or strongly agreed that working with computers would be enjoyable and stimulating, 83 percent agreed or strongly agreed that computers were necessary tools in both educational and the work settings, 88 percent agreed or strongly agreed that they liked learning on a computer, and 100 percent agreed or strongly agreed that computers could help them learn.

The second correlation analysis that was conducted looked specifically at individual questions in both Part 2 and Part 7 of the TAC. The questions in Part 2 were focused on the level of comfort that the respondents had toward using technology while the questions selected in Part 7 were focused on the level of perception that the respondents had toward the use of technology. In Table 8 three different sets of questions with the highest levels of correlation were selected in an effort to address research questions 1 and 2.

Table 8

Correlation Analysis: Comfort/Perception

Questions	*Part 2 Q1*	*Part 2 Q2*	*Part 2 Q3*	*Part Q4*	*Part 2 Q5*
Part 7 Q1	0.54	0.51	0.49	0.51	0.65
Part 7 Q2	0.37	0.37	0.41	0.37	0.56
Part 7 Q3	0.32	0.32	0.36	0.32	0.51
Part 7 Q4	0.33	0.31	0.35	0.31	0.50
Part 7 Q5	0.41	0.41	0.45	0.41	0.57

Variables	Range
(Question 1 Part 2) I get a sinking feeling when I think of trying to use a computer. (Question 1 Part 7) Computers are unpleasant-pleasant.	0.54
(Question 5 Part 2) Using a computer is very frustrating. (Question 1 Part 7) Computers are unpleasant-pleasant.	0.65
(Question 5 Part 2) Using a computer is very frustrating. (Question 5 Part 7) Computers are uncomfortable-pleasant.	0.57

Moderate positive linear relationships ranging from .54-.65 resulted from the correlation analysis focused on questions related to the comfort and perception levels of respondents. Three of the questions from each part produced a weak linear relationship ranging from .31-.42. The three questions in Part 2 that produced a weak linear relationship were questions related to how computers intimidated the respondents and made them feel tense, uncomfortable and nervous.

The third correlation analysis that was conducted looked specifically at the individual questions in both Part 5 and Part 9 of the TAC. The questions in Part 5 were in part focused on the level of concern that the respondents had toward using technology, while the questions selected in Part 9 were focused on the level of significance that the respondents had in regard to the level of impact technology had on their level of instruction. In Table 9 the correlation values for all of the questions in Part 5 and Part 9 are presented in an effort to address research question 2.

Table 9

Correlation Analysis: Concern/Significance

Questions	*Part 5 Q1*	*Part 5 Q2*	*Part 5 Q3*	*Part 5 Q4*	*Part 5 Q5*	*Part 5 Q6*	*Part 5 Q7*	*Part 5 Q8*
Part 9 Q1	0.52	0.58	0.51	0.50	0.29	0.57	0.56	0.73
Part 9 Q2	0.30	0.42	0.56	0.43	0.42	0.46	0.40	0.66
Part 9 Q3	0.55	0.65	0.62	0.56	0.43	0.63	0.54	0.79
Part 9 Q4	0.50	0.57	0.61	0.53	0.47	0.59	0.55	0.77
Part 9 Q5	0.50	0.53	0.54	0.53	0.46	0.51	0.41	0.67

Variables	Range
(Part 9 Question 1) It is important for students to learn about computers in order to be informed citizens. (Part 5 Question 8) Working with computers makes me feel isolated from other people.	0.73
(Part 9 Question 3) Students should understand the role computers play in society. (Part 5 Question 8) Working with computers makes me feel isolated from other people.	0.79
(Part 9 Question 3) Students should understand the role computers play in society. (Part 5 Question 8) Working with computers makes me feel isolated from other people.	0.77

Strong linear relationships ranging from .73-.79 were indicated in the correlation of question 8 in Part 5 and questions 1, 3, and 4 in Part 9 of the TAC. A moderate linear

relationship ranging from .66-.67 was also indicated in the correlation of the remaining questions 2 and 5 in Part 9 of the TAC. When looking at individual responses to the questions in part 9, 92-96 percent of the respondents agreed or strongly agreed that is was important for students to learn about computers at school in order to be informed citizens and to understand the role of computers in today's society, 100 percent agreed or strongly agreed that having computer skills helps to get a better job, and 83 percent agreed or strongly agreed that computers could stimulate creativity in students.

The fourth correlation analysis that was conducted looked specifically at questions in both Part 3 and Part 5 of the TIM. The questions in Part 3 of the TIM were focused on the types of professional development that the respondents felt they would benefit from and the questions in Part 5 of the TIM were focused on the level of confidence and comfort each respondent had in regard to their level of training. In Table 10 the correlation values for all of the questions in Part 3 and Part 5 are presented in an effort to address research questions 2 and 3.

Table 10

Correlation Analysis: Professional Development/Confidence

Questions	*Part 5 Q1*	*Part 5 Q2*	*Part 5 Q3*	*Part 5 Q4*	*Part 5 Q5*	*Part 5 Q6*	*Part 5 Q7*	*Part 5 Q8*	*Part 5 Q9*	*Part 5 Q10*	*Part 5 Q11*
Part 3 Q1	-0.10	0.02	0.29	0.39	0.54	-0.10	0.02	0.29	0.39	0.54	-0.10
Part 3 Q2	0.15	0.36	0.28	0.28	0.28	0.15	0.36	0.28	0.28	0.28	0.15
Part 3 Q3	-0.05	0.19	0.55	0.64	0.57	-0.05	0.19	0.55	0.64	0.57	-0.05
Part 3 Q4	-0.09	0.10	0.46	0.52	0.55	-0.09	0.10	0.46	0.52	0.55	-0.09
Part 3 Q5	-0.04	0.04	0.29	0.39	0.56	-0.04	0.04	0.29	0.39	0.56	-0.04

Variables	Range
(Part 3 Question 3) Professional development training in Instructional applications (e.g., presentation, digital content creation). (Part 5 Question 5) I am prepared to guide other teachers in planning and implementing lessons that incorporate technology.	0.57
(Part 3 Question 4) Professional development training on applications used by students. (Part 5 Question 5) I am prepared to guide other teachers in planning and implementing lessons that incorporate technology.	0.55
(Part 3 Question 1) Professional development training on introductory technology skills. (Part 5 Question 10) I am prepared to recognize the unethical uses of technology.	0.54
(Part 3 Question 5) Professional development training on the pedagogy of technology integration. (Part 5 Question 10) I am prepared to recognize the unethical uses of technology.	0.56

Of the questions in Part 3 and Part 5, 75 percent produced no or a weak positive linear relationship when correlated. Moderate relationships ranging from .52-.64 were indicated in the remaining 25 percent of the questions, with six of those correlations being in questions 3, 4, 5, 8, 9, and 10 in Part 3 of the TIM. When looking at individual responses related to what types of professional development that the respondents felt they would benefit from, 71 percent of the respondents indicated that they would benefit to a great extent or entirely from being provided professional development training on applications used by students. Similarly, 67 percent indicated that they would benefit to a great extent or entirely from being provided professional development training related to specialized training on the pedagogy of technology integration. In contrast, 71 percent indicated that professional development training on introductory technology skills would have no or little benefit to them.

When looking at individual responses related to the level of confidence and comfort respondents had using technology, between 75-79 percent of the respondents indicated that they agreed or strongly agreed that they were prepared to recognize the unethical uses of technology and were comfortable teaching their students about copyright and fair use guidelines. On the responses related to effective use of technology in their classrooms, 63 percent of the respondents indicated that they agreed or strongly agreed that they used technology effectively in their classrooms, while only 50 percent of the respondents agreed or strongly agreed that they were developing expertise in the uses of technology in their classroom. In contrast, 71 percent of the respondents indicated that strongly disagreed or disagreed that they currently have adequate opportunities for technology training in their school.

The fifth correlation analysis that was conducted looked specifically at questions in both Part 2 and Part 4 of the TIM. The questions in Part 2 of the TIM were focused on the level of

preparation and sources of acquiring technology skills. The questions in Part 4 of the TIM were focused on the respondents' perceptions of technology use in the classroom/workplace. In Table 11 the correlation values for all of the questions in Part 2 and Part 4 are presented in an effort to address research questions 1 and 3.

Table 11

Correlation Analysis: Preparation/Perceptions

Questions	*Part 4 Q1*	*Part 4 Q2*	*Part 4 Q3*	*Part 4 Q4*	*Part 4 Q5*	*Part 4 Q6*	*Part 4 Q7*	*Part 4 Q8*	*Part 4 Q9*	*Part 4 Q10*	*Part 4 Q11*	*Part 4 Q12*
Part 2 Q1	0.52	0.52	0.41	0.48	0.48	0.60	0.51	0.58	0.64	0.59	0.52	0.46
Part 2 Q2	0.36	0.46	0.27	0.40	0.57	0.51	0.25	0.39	0.46	0.40	0.30	0.35
Part 2 Q3	0.72	0.74	0.57	0.50	0.49	0.60	0.72	0.76	0.74	0.56	0.61	0.66
Part 2 Q4	0.46	0.60	0.38	0.39	0.50	0.35	0.49	0.47	0.50	0.44	0.45	0.40
Part 2 Q5	0.64	0.56	0.46	0.58	0.51	0.22	0.26	0.53	0.65	0.46	0.32	0.49
Part 2 Q6	0.70	0.60	0.56	0.63	0.59	0.34	0.49	0.71	0.67	0.51	0.49	0.67

Variables	Range
(Part 2 Question 3) Technology skills acquired through independent learning (e.g., online tutorials or books). (Part 4 Question 8) Technology enhances my teaching.	0.76
(Part 2 Question 3) Technology skills acquired through independent learning (e.g., online tutorials or books). (Part 4 Question 2) Technology skills are essential to my students' success in their future workplace.	0.74
(Part 2 Question 6) Technology skills acquired through interactions with others (e.g., friends, family, etc.). (Part 4 Question 6) Technology changes my role as a teacher.	0.34

Strong linear relationships ranging from .72-.76 were indicated in the correlation of questions 3 in Part 2 and questions 1, 2, 7, 8, and 9 in Part 4 of the TIM. When looking at

individual responses related to where the respondents acquired their technology skills, 17 percent of the respondents indicated that they had received their training through in-service courses or workshops while 50 percent of the respondents indicated that they had acquired their technology skills through their interactions with colleagues and others (e.g., friends, family, etc.). Only 33 percent of the respondents indicated that they had acquired their technology skills through their undergraduate work and distance learning.

When looking at individual responses related to the respondents perceptions of technology use in the classroom/workplace, 92 percent of the respondents agreed or strongly agreed that technology skills were essential to their students' success in their future workplace and that they would like to see their students be able to use technology more in their classes. On the question of training, 96 percent of the respondents agreed or strongly agreed that more training would increase their use of technology in their instruction while 58 percent of the respondents agreed or strongly agreed that they were able to help others solve technology related problems. Finally, 63 percent of the respondents agreed or strongly agreed that student use of technology enhanced student performance and that the respondents' use of technology enhanced student performance.

CHAPTER FIVE

CONCLUSION

Over the last several years Maine schools have been exposed to the need for incorporating the ever-changing world of 21st-century technologies into the classroom. Providing support to teachers and encouraging them to seek new information and to improve classroom instruction is vital to building their knowledge capacity (Helmer, Bartlett, Wolgemuth, & Lea, 2011). As a former technology director/educator I understand the challenges that the teachers within the School Department have in regard to keeping up with the ever-changing technology as well as justifying the value of integrating technology into their classroom.

This study was an attempt to explore the relationship between K-12 teachers' current technology skill level, their self-efficacy as teachers, and their attitude toward the changes required to integrate 21st-century technologies into their classrooms and instructional practices.

These three research questions guided this study:

1. What is the relationship between teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies into the classroom?

2. What is the relationship between teachers' current self-efficacy towards using technology, and their capacity towards integrating 21st-century technologies into the classroom?

3. What components of professional development, measured through survey data, are required to support change and prepare teachers to successfully integrate 21st-century technologies into the classroom?

Through the use of these research questions, which were focused on the current skills, abilities, attitudes, self-efficacy, capacity and components of professional development, I was

able to identify and examine data collected from 25 percent of the teachers within the School Department. Although the total percentage of teachers who participated in this study was not ideal, I believe that the data generated from this study provided accurate and insightful information related to the overall level of teacher skills, abilities, self-efficacy, capacity, and specific components of professional development opportunities that identify the challenges for teachers, within the School Department, to incorporate 21st-century technologies into their classrooms.

Overview

Five different correlation analyses using questions from both the TAC and TIM were conducted for this study. Each analysis was utilized in an effort to answer the three different research questions. Each of the five different correlation analyses examined existing professional development supports and the four general sources of self-efficacy and teacher attitudes as they related to the levels of confidence, familiarity, anxiety, and fear that teachers within the School Department identified as factors affecting the successful integration of technology into their classroom.

Research Questions Answered

Research question 1. What is the relationship between teachers' current skills/ability using technology and their attitude towards integrating 21st-century technologies in the classroom? The data indicated that there was a strong positive linear relationship between a teacher's current skills/ability and their attitude towards integrating 21st-century technologies in the classroom. This positive relationship between teachers' current skills/ability and their attitude was determined by correlating responses collected from the TAC and TIM that determined

similarities between the levels of teacher comfort, perception, interest, preparation, and utilization of technology in their classroom.

In this study, attitude was defined as the amount of teacher confidence, familiarity, anxiety, and fear as they correlated to feelings towards technology integration in the classroom and the teachers' competence and ability to shape instructional technology activities to meet students' needs. Relationships between the level of comfort, perception, interest, preparation, and utilization were compared through individual correlation analyses of questions that were included in the TAC and TIM. When comparing the responses related to the level of comfort respondents had using technology and their perception toward the use of technology, 4 percent of the respondents agreed that using technology made them feel tense, uncomfortable, and nervous while 13 percent of the respondents agreed that using computers was very frustrating.

When participants were asked to identify how they have acquired their technology skills only 33 percent of the respondents agreed that they had developed their skills through their undergraduate coursework, and even fewer, 17 percent, agreed that they had developed their technology skills through in-service courses or workshops. Between 46-50 percent of the respondents agreed or strongly agreed that they had acquired their technology skills through independent learning and their interactions with colleagues and others (e.g., friends, family, etc.).

This data related to where the majority of the School Department teachers have acquired their technology skills is concerning. Although it is nearly impossible to keep up with the ever-changing 21st-century technological skills, this data confirms that there is an immediate demand within the School Department to develop a needs-based professional development schedule that is primarily focused on integrating technology into the classroom.

Although the TIM was administered as a paper survey, there is software available so teachers can input information electronically. As a result of this study, the TIM will be utilized as an additional professional development resource that allows teachers to reflect and identify individual training needs, which will be incorporated into a needs-based professional development schedule. Considerations identified as a result of this data will help drive professional conversations and prioritize professional day agendas for the School Department for future years.

Research question 2. What is the relationship between teachers' current self-efficacy towards using technology, and their capacity towards integrating 21st-century technologies in the classroom? The results of this study indicated that there was a moderate to strong positive linear relationship between a teacher's self-efficacy and their capacity towards integrating 21st technologies in the classroom. With the understanding that self-efficacy is a judgment of capability while self-esteem is a judgment of self-worth, this moderate to strong positive linear relationship was determined through the comparison of data collected from the TAC and TIM that indicated the level of teacher comfort, perception, concern, significance and confidence using technology in their classroom (Tables 7, 8, and 9).

In this study, self-efficacy was defined as one's beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments within the structural characteristics of their existing environment and to enable people to develop desired attributes and improve their living conditions.

Scores from the TAC were averaged in an effort to provide a scale score for each part of the TAC. Each part of the TAC focused on a particular descriptor. These included: Interest, Comfort, Accommodation, Interaction, Concern, Utilization, Perception, Absorption, and

Significance. The three lowest averaged scale scores in the TAC included questions related to the participant's interactions, concerns, and absorption of technology. Although 100 percent of the respondents agreed or strongly agreed that technology was important to student success in the workforce, only 50 percent of the respondents felt that they were prepared to integrate technology into their classroom. When looking even closer at teacher capabilities, 79 percent of the respondents felt comfortable using technology, while only 13 percent of the participants felt that they currently had adequate opportunities for technology training in their schools.

Respondent perceptions related to the amount of technology use in the classroom again indicated that 79 percent of the respondents agreed or strongly agreed that technology made their jobs easier. However, only 63 percent of the respondents indicated that the use of technology changed their role as a teacher. Regarding student use of technology in their classes, 92 percent of the respondents agreed or strongly agreed that students should be able to use technology more in their classes, while only 63 percent of the respondents agreed or strongly agreed that the use of technology enhanced student performance. When considering the influence being placed on incorporating student achievement into the teacher evaluation system and the fact that all of the mandated standardized tests for the School Department are currently being administered through the use of computers, I found this data to be contradictory. One of my goals is to investigate how technology integration impacts student achievement in a future study.

The data from this study indicated that there was a relationship between the teacher's level of self-efficacy and the level of application of 21st-century technologies into the classroom. The results of the correlation analyses of data between questions in Part 3 and Part 5 of the TIM, related to professional development and confidence, indicated that although 79 percent of the respondents agreed or strongly agreed that they were comfortable using technology, only

38 percent of the respondents agreed or strongly agreed that they have had adequate training in the use of technology. Teachers who had stronger beliefs in the value of technology also identified a need for more opportunities to expand their level of understanding and thus their ability to successfully integrate 21st-century technologies into their classrooms.

The data from this study indicated that a teachers' level of self-efficacy or confidence-using technology was directly correlated to the level of professional supports in place. Additionally, although teachers are confident in their technological abilities, 67-71 percent of the respondents indicated that they needed additional training on applications used by students as well as specialized training on instructional pedagogy to improve their capacity towards integrating technology.

Research question 3. What components of professional development, measured through survey data, are required to support change and prepare teachers to successfully integrate 21st-century technologies in the classroom? The results of this study indicated that there were specific components of professional development required to support the teachers within the School Department with the integration of 21st-century technologies in their classroom. Correlations conducted between specific questions within Part 3 and Part 5 of the TIM indicated that there was currently a lack of support and professional development opportunities within the School Department. When looking more closely at the data from this study that was focused on integration and use, it was found that 71 percent of the respondents indicated that there was a need for additional training on applications that are used by students while 67 percent required additional professional development training on pedagogy of technology integration.

The 21st-century technologies that are currently available have been shown to make different demands on students and schools. The School Department is faced with the challenge

of preparing students to live, learn, and work successfully in today's knowledge-based digital society. The School Department currently spends less than 10 percent of its technology budget on professional development. As a result, 25 percent of the respondents disagreed or strongly disagreed that they received adequate opportunities for technology training within their school.

Through the survey questions within this study, respondents indicated their current level of confidence using and integrating technology into their classroom while also indicating their current professional development needs. In this study, professional development was defined as the skills and abilities required to utilize 21st-century technologies. Of the respondents, 83 percent indicated that technology made their job easier and enhanced their teaching; however, 96 percent of the respondents agreed or strongly agreed that more training would increase their use of technology in their classroom. Another important finding of this study was that only 38 percent of the respondents agreed or strongly agreed that they have had adequate training in integrating technology into the classroom, and only a very low 13 percent of the respondents agreed that they had access to adequate training in technology integration in their school. When later asked how often and in which manner that they integrated technology into the classroom, the majority of respondents indicated that the primary use of technology in their classrooms was for research, productivity (e.g., to create charts, reports or other products), communications (e.g., email, electronic discussion), and instructional delivery.

Teachers within the School Department indicated through their responses in this study that there was an important need for additional technology training and support to help them integrate technology into their classrooms. Although questions related to the amount of technology support were not used in any of the five different correlation analyses, over 75 percent of the respondents in this study indicated that there was no or limited support

available from a technology specialist to provide support and implement technology into their classrooms while 58 percent of the respondents agreed or strongly agreed that they had the ability to help and support others with technology related issues or questions. Placing an emphasis on hiring a technology integrator with a strong technical background and providing time in their schedule to provide support to teachers should be a top priority for the upcoming and future school year(s).

Limitations

This quantitative study was designed for the purpose of describing and planning improvements related to a teachers' current skills/abilities using technology and their attitude towards integrating 21st-century technologies in the classroom has many limitations. This study utilized data from 25 percent of the teachers within the School Department.

In my current role as the Superintendent of Schools, I am not the direct supervisor for any of the teachers who volunteered to participate in this study. However, because there was concern related to my influence on teacher responses, there was no demographic or specific grade/content level information related to the respondents collected. I believe that if I would have had access to the demographic information I could have looked closely at additional correlations related to teacher assignments, grade levels, and years of experience.

Considering that the teachers in grades 7-8 currently participate in the MLTI initiative, it would have been interesting to see if the supports and additional technology had any impact on the data or cultural differences between the schools in this study.

Another factor that limited this study was the current legislation related to teacher evaluations and student achievement. As a result of the pressure from the Maine Department of

Education, the state legislature, and Maine Education Association representatives, there was no effort made to connect the data collected in this study with student achievement.

Future Research

This initial study will serve as the foundation for future research related to examining how technology impacts student achievement and the development of a needs-based professional development schedule which will allow administration to work collaboratively with the teachers in an effort to meet their needs and the needs of the students. With the new understanding that the majority of the respondents who volunteered for this study felt confident in their abilities but lacked the support and professional development opportunities in their buildings, efforts will be made to collect additional data in an effort to integrate and develop a needs-based professional development schedule that will provide the internal support for all teachers to integrate technology into their classroom. This effort will include requiring staff to complete the TIM electronically, which will provide the data necessary to move the School Department away from the traditional "one size fits all" style of professional development to an individualized needs-based professional development model.

Summary

The overall conclusion of this study is that there is an immediate need within the School Department to provide specific professional development training related to the integration of 21st technologies into the classroom. Of the respondents, 50 percent agreed or strongly agreed that they attributed their current level of technology skills to independent learning (e.g., online tutorials or books) and interactions with others (e.g., friends, family, etc.). However, 33 percent disagreed or strongly disagreed that they felt comfortable helping others solve technology-related problems. The findings from this study indicated that the majority of the respondents were

confident in their abilities using technology; however, it also indicated the need for additional professional development to support teachers within the School Department with integrating technology into their classroom.

One of the initial goals of this study was to develop a needs-based professional development schedule that provides more in-house technology integrated support and training. Both short and long-term goals will be established within the School Department Strategic Educational Plan in an effort to address this professional development need. The findings from this study will prepare and support teachers with the integration of 21st-century technologies into their classrooms.

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APPENDIX A

TECHNOLOGY INTEGRATION MATRIX QUESTIONNAIRE (TIM)

Technology Integration Matrix Questionnaire (TIM)

Definitions

Technology: Digital devices, software, and connectivity that allow the use of digital content in the classroom.

Digital Devices: Any hardware device that students or teachers can use to search for, create, manipulate, or consume digital content.

Technology Specialist Support

For the following statements, please select the one response that best describes the technology specialist support at your school.

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I have adequate access to a technology specialist.	□	□	□	□	□
2. The technology specialist adequately assists me in solving technical problems with hardware or software.	□	□	□	□	□
3. The technology specialist is committed to helping teachers find solutions.	□	□	□	□	□
4. The technology specialist responds promptly to my requests for assistance.	□	□	□	□	□
5. The technology specialist models techniques to integrate technology into my teaching.	□	□	□	□	□
6. The technology specialist provides professional development.	□	□	□	□	□
7. The technology specialist adequately assists me in planning and implementing the use of technology in my teaching.	□	□	□	□	□

Preparation for Technology Use

For the following items, please select the one response that best reflects the extent to which you've acquired technology skills from the following sources.

	Not at All	To a Small Extent	To a Moderate Extent	To a Great Extent	Entirely
1. As a part of my undergraduate coursework	□	□	□	□	□
2. In-service courses or workshops	□	□	□	□	□
3. Independent learning (e.g. online tutorials or books)	□	□	□	□	□
4. Distance learning courses	□	□	□	□	□
5. Interaction with colleagues	□	□	□	□	□
6. Interaction with others (e.g., friends, family, etc.)	□	□	□	□	□

Preparation for Technology Use (Cont.)

To what extent do you think the following types of technology-related professional development would be beneficial to you?

	Not at All	To a Small Extent	To a Moderate Extent	To a Great Extent	Entirely
1. Introductory technology skills	□	□	□	□	□
2. Professional productivity (e.g., gradebooks, calendar, address book)	□	□	□	□	□
3. Instructional applications (e.g., presentation, digital content creation)	□	□	□	□	□
4. Training on applications used by students	□	□	□	□	□
5. Specialized training on pedagogy of technology integration	□	□	□	□	□

Perceptions of Technology Use

Please read the following statements and select the one response that best reflects your level of agreement.

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I would like every student in my class(es) to have access to a digital device.	□	□	□	□	□
2. Technology skills are essential to my students' success in school.	□	□	□	□	□
3. Technology skills are essential to my students' success in their future workplace.	□	□	□	□	□
4. More training would increase my use of technology in my teaching.	□	□	□	□	□
5. Technology makes my job easier.	□	□	□	□	□
6. Technology changes my role as a teacher.	□	□	□	□	□
7. I can help others solve technology problems.	□	□	□	□	□
8. Technology enhances my teaching.	□	□	□	□	□
9. Student use of technology enhances student performance.	□	□	□	□	□
10. My use of technology enhances student performance.	□	□	□	□	□
11. Technology should be used in all courses.	□	□	□	□	□
12. I would like my students to be able to use technology more in their classes.	□	□	□	□	□

Confidence and Comfort Using Technology

Please read the following statements and select the one response that best reflects your level of agreement.

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I have had adequate training in technology use.	□	□	□	□	□
2. I currently have adequate opportunities for technology training in my school.	□	□	□	□	□
3. I am prepared to effectively integrate technology into my teaching.	□	□	□	□	□
4. I am prepared to assess multimedia projects.	□	□	□	□	□
5. I am prepared to guide other teachers in planning and implementing lessons that incorporate technology.	□	□	□	□	□
6. I am comfortable using technology in my teaching.	□	□	□	□	□
7. I am comfortable assigning multimedia projects to my students.	□	□	□	□	□
8. I use technology effectively in my teaching.	□	□	□	□	□
9. I am developing expertise in the uses of technology in teaching.	□	□	□	□	□
10. I am prepared to recognize the unethical uses of technology.	□	□	□	□	□
11 I am comfortable teaching my students about copyright and fair use guidelines.	□	□	□	□	□

Technology Integration

Listed below are teaching modes in which technology may be used. Please select the response that best indicates how often you use technology in each teaching mode.

	Not at All	**Once per month or less**	**Once per week**	**Several times per week**	**Every day**	**Multiple times per day**
1. Small group instruction	□	□	□	□	□	□
2. Individual instruction	□	□	□	□	□	□
3. Cooperative groups	□	□	□	□	□	□
4. Independent learning	□	□	□	□	□	□
5. As an extension activity	□	□	□	□	□	□
6. As a reward	□	□	□	□	□	□
7. To tutor/ for remediation	□	□	□	□	□	□
8. As a research tool for my students	□	□	□	□	□	□
9. As a tool for students to use in planning and managing projects (individual and group)	□	□	□	□	□	□
10. As a productivity tool for my instruction (e.g., to create charts, reports or other products)	□	□	□	□	□	□
11. As a student presentation tool (including multimedia)	□	□	□	□	□	□
12. Student discussion/communication	□	□	□	□	□	□
13. Instructional delivery	□	□	□	□	□	□
14. As a communication tool (e.g., email, electronic discussion)	□	□	□	□	□	□
15. To create online content for my students (web pages, blogs, etc.)	□	□	□	□	□	□
16. To assess student learning	□	□	□	□	□	□

Teacher Use of Technology

For each type of software and hardware, please select the response that indicates how often YOU

[scale: 1-not at all, 2-once per month or less, 3-once per week, 4-several times per week, 5-every day, 6-multiple times per day]

	1	**2**	**3**	**4**	**5**	**6**
1. Small group instruction	□	□	□	□	□	□
2. Individual instruction	□	□	□	□	□	□
3. Cooperative groups	□	□	□	□	□	□
4. Independent learning	□	□	□	□	□	□
5. As an extension activity	□	□	□	□	□	□
6. As a reward	□	□	□	□	□	□
7. To tutor/ for remediation	□	□	□	□	□	□
8. As a research tool for my students	□	□	□	□	□	□
9. As a tool for students to use in planning and managing projects (individual and group)	□	□	□	□	□	□
10. As a productivity tool for my instruction (e.g., to create charts, reports or other products)	□	□	□	□	□	□
11. As a student presentation tool (including multimedia)	□	□	□	□	□	□
12. Student discussion/communication	□	□	□	□	□	□
13. Instructional delivery	□	□	□	□	□	□
14. As a communication tool (e.g., email, electronic discussion)	□	□	□	□	□	□
15. To create online content for my students (web pages, blogs, etc.)	□	□	□	□	□	□
16. To assess student learning	□	□	□	□	□	□
17. Tutorials (e.g., programs that teach specific subject matter)	□	□	□	□	□	□
18. Learning Management Systems (e.g., Edline, Blackboard, Moodle)	□	□	□	□	□	□
19. Email	□	□	□	□	□	□
20. Web browser (e.g., Chrome, Firefox, Internet Explorer, Safari)	□	□	□	□	□	□
21. Web 2.0 tools (e.g., blogs, wikis, GoogleDocs)	□	□	□	□	□	□
22. Social networking (e.g.; Facebook, Twitter, Edmodo)	□	□	□	□	□	□
23. Video conferencing (e.g., Skype, Facetime)	□	□	□	□	□	□
24. Desktop computer	□	□	□	□	□	□
25. Laptop computer	□	□	□	□	□	□
26. Tablet computer (e.g., iPad)	□	□	□	□	□	□
27. eReader (e.g., Kindle, Nook)	□	□	□	□	□	□
28. Digital camera	□	□	□	□	□	□
29. Digital video camera	□	□	□	□	□	□
30. Projector	□	□	□	□	□	□
31. DVD player	□	□	□	□	□	□
32. Interactive Whiteboard (e.g., SMART, ENO Board)	□	□	□	□	□	□

APPENDIX B

TEACHERS' ATTITUDES TOWARD COMPUTERS QUESTIONNAIRE (TAC)

The Teachers' Attitudes Toward Computers Questionnaire (TAC)

Teachers' Attitudes Toward Computers

This questionnaire is derived from well-validated portions of several attitudinal surveys that have been used with teachers in the past. We will use your responses to help develop a profile of how teachers view technology. Please complete all items even if you feel that some are redundant. This should require about 10 minutes of your time. Usually it is best to respond with your first impression, without giving a question much thought. Your answers will remain confidential.

ID: _____

Part 1

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	I think that working with computers would be enjoyable and stimulating. (186)	1	2	3	4	5
2.	I want to learn a lot about computers. (103)	1	2	3	4	5
3.	The challenge of learning about computers is exciting. (211)	1	2	3	4	5
4.	I like learning on a computer. (181)	1	2	3	4	5
5.	I can learn many things when I use a computer. (9)	1	2	3	4	5

Part 2

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	I get a sinking feeling when I think of trying to use a computer. (263)	1	2	3	4	5
2.	Working with a computer makes me feel tense and uncomfortable. (230)	1	2	3	4	5
3.	Working with a computer makes me nervous. (17)	1	2	3	4	5
4.	Computers intimidate me. (227)	1	2	3	4	5
5.	Using a computer is very frustrating. (18)	1	2	3	4	5

Part 3

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	If I had a computer at my disposal, I would try to get rid of it. (150)	1	2	3	4	5
2.	Studying about computers is a waste of time. (192)	1	2	3	4	5
3.	I can't think of any way that I will use computers in my career. (74)	1	2	3	4	5
4.	I will probably never learn to use a computer. (154)	1	2	3	4	5
5.	I see the computer as something I will rarely use in my daily life. (123)	1	2	3	4	5

Part 4

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	The use of electronic mail (E-mail) makes the student feel more involved. (282)	1	2	3	4	5
2.	The use of E-mail helps provide a better learning experience. (284)	1	2	3	4	5
3.	The use of E-mail makes a class more interesting. (281)	1	2	3	4	5
4.	The use of E-mail helps the student learn more. (283)	1	2	3	4	5
5.	The use of E-mail increases motivation for class. (280)	1	2	3	4	5

Part 5

Instructions: Select one level of agreement for each statement to indicate how you feel.
SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	Computers are changing the world too rapidly. (142)	1	2	3	4	5
2.	I am afraid that if I begin to use computers I will become dependent upon them. (215)	1	2	3	4	5
3.	Computers dehumanize society by treating everyone as a number. (138)	1	2	3	4	5
4.	Our country relies too much on computers. (135)	1	2	3	4	5
5.	Computers isolate people by inhibiting normal social interactions among users. (144)	1	2	3	4	5
6.	Use of computers in education almost always reduces the personal treatment of students. (176)	1	2	3	4	5
7.	Computers have the potential to control our lives. (134)	1	2	3	4	5
8.	Working with computers makes me feel isolated from other people. (241)	1	2	3	4	5

Part 6

Instructions: Select one level of agreement for each statement to indicate how you feel.
SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	Computers could increase my productivity. (202)	1	2	3	4	5
2.	Computers can help me learn. (204)	1	2	3	4	5
3.	Computers are necessary tools in both educational and work settings. (226)	1	2	3	4	5
4.	Computers can be useful instructional aids in almost all subject areas. (175)	1	2	3	4	5
5.	Computers improve the overall quality of life. (207)	1	2	3	4	5
6.	If there was a computer in my classroom it would help me to be a better teacher. (163)	1	2	3	4	5
7.	Computers could enhance remedial instruction. (168)	1	2	3	4	5
8.	Computers will improve education. (162)	1	2	3	4	5

Part 7

Instructions: Choose one location between each adjective pair to indicate how you feel about computers.

	Computers are:								
1.	unpleasant	1	2	3	4	5	6	7	pleasant (44)
2.	suffocating	1	2	3	4	5	6	7	fresh (50)
3.	dull	1	2	3	4	5	6	7	exciting (49)
4.	unlikable	1	2	3	4	5	6	7	likeable (41)
5.	uncomfortable	1	2	3	4	5	6	7	comfortable (46)

Part 8

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	I like to talk to others about computers. (98)	1	2	3	4	5
2.	It is fun to figure out how computers work. (193)	1	2	3	4	5
3.	If a problem is left unsolved in a computer class, I continue to think about it afterward. (85)	1	2	3	4	5
4.	I like reading about computers. (100)	1	2	3	4	5
5.	The challenge of solving problems with computers does not appeal to me. (57)	1	2	3	4	5
6.	When there is a problem with a computer that I can't immediately solve, I stick with it until I have the answer. (69)	1	2	3	4	5

Part 9

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1.	It is important for students to learn about computers in order to be informed citizens. (96)	1	2	3	4	5
2.	All students should have an opportunity to learn about computers at school. (95)	1	2	3	4	5
3.	Students should understand the role computers play in society. (172)	1	2	3	4	5
4.	Having computer skills helps one get better jobs. (97)	1	2	3	4	5
5.	Computers could stimulate creativity in students. (199)	1	2	3	4	5

Thank you for your time.

APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL

December 1, 2014
Institutional Review Board
University of New England
11 Hills Beach Road
Biddeford, ME 04005-9599

Dear Review Board Members,

This letter is to confirm the School Department's intent to support the doctoral study of Richard Green, within our school department.

Mr. Green reviewed the details of her research project, *What Professional Development Practices Support the Successful Integration of Technology within a Standards-Based Educational (SBE) system*. Additionally, we have had personal conversations regarding his research study and the selection of the School Department as a site and he has my full support of this project.

While conducting his research, Mr. Green will have access to the necessary personnel, documents and data that address the guiding and related questions connected to his project. The School Department acknowledges its understanding that data will be reported anonymously, and that all indicators identifying personnel will be stricken from any reportable information. Furthermore, the School Department acknowledges that there are neither risks nor benefits associated with participation in this study.

If further information is needed on behalf of the site, please contact me at your earliest convenience.

Sincerely,

Traci Austin
School Committee Chair

APPENDIX D

LETTER TO POTENTIAL PARTICIPANTS

March 20, 2015

Dear Staff,

The need for students to acquire 21st-century skills has never been greater. In a world where the use of data and technology changes on a daily basis, we as educators are faced with the task of preparing students for careers that currently don't exist. The need for students to learn how to collaborate, think critically, problem-solve and communicate has never been greater. Although the primary focus is generally on student growth, the research supports that the real challenge is preparing classroom teachers to not only integrate new technology into your classroom, but to also prepare you to pass these skills along to your students.

As many of you know, I am completing my doctoral work and my research is focused on technology integration in the classroom. I have also shared with many of you my intent to develop a needs-based professional development schedule for the 2015-2016 school year. In an effort to assist with this process, I have purchased a Technology Integration Matrix (TIM). This matrix was developed by the Florida Center for Instructional Technology. The TIM consists of three different tools, survey, observation and action research, which will provide data that will help us through this process. This study will also be utilizing the Teachers' Attitude Toward Computers Questionnaire (TAC) which is a validated research questionnaire that was developed by Rhonda W. Christensen and Gerald A. Knezek. The TAC will be used to study the effects of integrating 21st-century technologies has on the attitudes of teachers. Your participation in these

two surveys would be helpful because findings from my research will prepare me to make decisions about the professional needs of our district.

The research data collected will be confidential and participation in this research is voluntary. None of the research and data collected will be included as part of your evaluation. The confidential TIM and TAC will be piloted with the administrative staff this spring and I'm hoping you will take the surveys at the upcoming Professional Development Day on March 20, 2015. I'm hoping to complete my research by the end of the summer of 2015. I thank you in advance for your participation.

Sincerely,

Richard A. Green
Superintendent of Schools