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What Superintendents Should Do to Position Their Districts to be Prepared for the Changing Nature of Technology in the Next Ten Years: A Delphi Study

A Dissertation by

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Brandman University

Irvine, California

School of Education

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Education in Organizational Leadership

March 2015

Committee in charge:

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What Superintendents Should Do to Position Their Districts to be Prepared for the Changing Nature of Technology in the Next Ten Years: A Delphi Study

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ABSTRACT

What Superintendents Should Do to Position Their Districts to be Prepared for the Changing Nature of Technology in the Next Ten Years: A Delphi Study

by Ean Ainsworth

Over the past twenty years, schools and districts have been faced with the challenge of integrating technology into their classroom instruction. The rapid rate of evolution that technology changes has placed new burdens on school and district leaders to plan meaningful professional development, create and develop effective policy, and focus on school and district culture. In the coming years, the changing nature of technology is not expected to slow down and most certainly will accelerate. The purpose of this Delphi study was to identify what K-12 superintendents should do to position their districts to be prepared for the changing nature of technology in the next 10 years. The expert panel for this study was comprised of K-12 superintendents from eight Northern California counties. This Delphi study consisted of three rounds. In Round 1, the expert panel identified 74 strategies that superintendents should do to position their districts to be prepared for the changing nature of technology in the next 10 years. Those items were thematically categorized and where then narrowed down into a list of 30 strategies in preparation for Round 2. During Round 2, the expert panel rated the 30 strategies on the level of influence it would have on preparing districts for the changing nature of technology in the next 10 years using a 6-point Likert scale. In Round 3, each panel member was given the mean rating for each item as well as their own ratings for each item. Each panel member was then given the opportunity to change their ratings to the Round 2 survey. The expert panel identified four strategies which had the highest

combined mean and median scores as well as an interquartile range of less than two. Each of the strategies from Round 2 and 3 had a mean score of four or higher. However, consensus was reached on four strategies which were rated with the highest combined mean and median scores. The four highest rated strategies were represented by three categories: culture, professional development, and investment in infrastructure.

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CHAPTER I: INTRODUCTION

The idea that all children in the United States (US) have the right to a publically supported education regardless of race, social class, or religious beliefs is an American value (Aske, Connolly, Corman, & Rhonda, 2013). For the past 60 years, the American educational system has set policy to ensure that these values are achieved. These efforts have led to an age of increased accountability for schools as educators are continually faced with the pressures of improving student achievement (Figlio & Loeb, 2011). No Child Left Behind (NCLB) has changed the way schools approach student learning and has forced them to consider groups of students that have largely gone ignored during the past 50 years. With the implementation of NCLB, there have been many impacts to education, including but not limited to increasing instructional support, closing the achievement gap for subgroups, and professional development focusing on delivery of standards based instruction. Despite the increased focus on these areas, schools across America largely look and operate the same as they did 100 years ago (Christensen, Horn, & Johnson, 2011). The high-tech, globalized economy demands that students are prepared for jobs that don't currently exist (Jerald, 2009). DuFour and Eaker (1998), in their groundbreaking work *Professional Learning Communities at Work*, state "If schools are to be significantly more effective, they must break from the industrial model upon which they were created and embrace a new model that enables them to function as learning organizations" (p. 15). Christensen, Horn, and Johnson (2011) in *Disrupting Class* confirms this notion that schools and their leaders must evolve, "Standardization clashes with the need for customization in learning" (p. 11).

In an effort to keep pace globally, a new set of standards has been created and

adopted in 45 out of 50 states (Common Core Standards Initiative, 2012). These new Common Core State Standards (CCSS) integrate 21st century learning skills throughout all grade levels and content areas. Teachers are being expected to teach with new tools that require new methodologies. School and district leaders are being tasked with leading this change. This leadership is a key to the successful integration of technology in the classroom. Schrum, Galizio, and Ledesma (2011) claims that "no matter how much training teachers receive, unless those teachers have the leadership of their administrator, they may be unable to successfully use that technology" (p. 242). The direction of school leadership, however, is determined by decisions of district leadership.

Today, more than ever, school districts must respond to the call of the technological revolution. Technology leadership is vital for school districts in their ability to successfully integrate technology into instruction and ensure that the present generation is prepared with requisite skills for college and career (Anthony, 2012). Superintendents and district leaders are being required to develop knowledge and skills that move beyond vision setting, strategic plans, purchasing infrastructure, and providing professional development to gain a better understanding of how these systems interact as well as how they impact teachers' confidence and ability to integrate technology (Anthony, 2012). The inherent struggle is that there is little research to date on the impact of digital tools in the K-12 classroom, how teachers and administrators are prepared for technology implementation, and most importantly, how superintendents see their role in the implementation of technology across their districts (Closen et al., 2013; Means, Toyama, Murphy, Bakia & Jones, 2010; Schrum et al., 2011). District leaders

only recently have begun to understand their emerging role for creating cultures and conditions that support the integration of technology.

What is known is that technology leadership matters if teachers are to effectively make use of technology that will meet the demands of 21st century learning (Anderson & Dexter, 2005). Dawson and Rakes (2003) concluded that technology leadership was more important than technology expenditures or infrastructure. Superintendents must have a clear understanding of how their role as a leader influences the success teachers will have in their technology integration. In this, no leader's role is more important than that of the superintendent. Geoffrey Fletcher (2009a) writes "Today's superintendent, now more than ever, must have the knowledge and skills needed to utilize technology to enhance the learning environment"(p. 7). Understanding the perceptions that superintendents currently have about their role in the development and creation of technology policy and how they build knowledge and skills that influence technology implementation will enable districts to more effectively impact technology integration with teachers and students.

Background

As the standards based accountability movement crescendoed with the enactment of NCLB, high-stakes testing emerged as the primary measurement of student learning and achievement (Embse & Hasson, 2012). Embse and Hasson (2012) found in their study of 28 states that there existed little evidence or research supporting the notion that high-stakes testing, including high school graduation exams, increased student achievement. Embse and Hasson further identified that high-stakes testing extended the learning gap between students on each end of the learning spectrum (which was the

purpose of NCLB in the first place). The focus of most schooling systems has been to target students at or near the proficiency line and to narrow all resources (intervention, technology, teacher training, etc.) on them in an attempt to raise school and district test scores (D. Harris, 2007).

The standards based accountability movement has created a direct conflict with the necessary knowledge and skills needed for the 21st century workplace. Businesses and organizations are demanding that high school and college graduates enter the workplace with 21st century skills of collaboration and communication, critical thinking and problem solving, and creativity and innovation (The Partnership for 21st Century Skills, 2009). Increasingly, students are leaving the educational system lacking these skills (Jerald, 2009). School districts find themselves trying to find a balance between the two conflicting ends of standards based accountability and producing students with the perquisite knowledge and skills needed to be successful in the 21st century workplace.

The challenge that districts are facing is to create systems for teacher and administrator pre-service training and professional development to better improve their effectiveness in teaching 21st century skills and the implementation of technology. There is currently an existing gap between these areas (Ritzhaupt, Hohlfeld, Barron, & Kemker, 2008). One of the struggles has been the alignment of these trainings with the value beliefs of teachers and administrators (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010). Additionally, pre-service training and ongoing professional development have not been provided within the context of teacher and administrator technology, pedagogy, and content knowledge and skills (Harris, Mishra, & Koehler, 2009). Harris, Mishra, and Koehler (2009) determined technology skills are taught in isolation of

content and there is often a separate pedagogy for teaching such skills. Finding the point that technology, pedagogy, and content overlap, can lead to the increased confidence of teachers and administrators to implement the strategies that associated with teaching 21st century skills.

Central to the integration of technology and the teaching of 21st century skills is the leadership of superintendents, district administrators, and principals (Fletcher, 2009b; Schrum et al., 2011). Beyond the ongoing professional development for current teachers and administrators, pre-service programs have been found to be lacking in their preparation of educators to facilitate the integration of technology and 21st century skills in their districts, schools, and classrooms (Ottenbreit-Leftwich et al., 2010). Additionally, Richardson, Flora, and Lewis (2012) concluded that little research had been completed to understand the extent that technology leadership of administrators is being studied. This lack of preparation for superintendents, district administrators, and principals creates a vital need for school districts to better understand how to build effective learning systems for adults and students alike (Resta & Carroll, 2010).

When school districts and school sites begin the process of integrating technology and 21st century learning knowledge and skills into the classroom, they will face barriers to their implementation (Ertmer & Ottenbreit-Leftwich, 2010; Kopcha, 2012). The literature states that at the heart of these barriers that superintendents, district administrators, and principals face and need to understand is the role that teacher beliefs and self-efficacy have on their integration of technology (Ertmer & Ottenbreit-Leftwich, 2010). Ertmer and Ottebreit-Leftwich (2010) further provide evidence that the self-efficacy of teachers as it relates to technology is more important than their knowledge

and skills in technology integration in the classroom. This is an important consideration for superintendents and their staff. Schrum, Galizio, and Ledesma (2011), Inan and Lowther (2009), and Aldunate and Nussbaum (2013) all found that the leadership of district administrators in creating a positive climate and culture encouraged risk taking and innovation within their staffs. Anthony (2012) found that technology integration is successful when it is in alignment and integrated within the larger district vision rather than treated as an isolated process. When the culture and climate of schools and districts positively addresses the needs and fears of teachers, effective systems of professional development can be created which can lead to an increased willingness to adopt new instructional strategies and practices and better integrate technology into the classroom (Koc, 2013).

If superintendents are to create positive cultures and climates within their districts, there must be a corresponding understanding of the impact of how technology integration policy is created and implemented (Hess & Kelly, 2007). Wicks (2010) found that technology integration is limited by policy that is set to prevent integration rather than embrace its potential. When superintendents and districts create policy based on the feedback of stakeholders (students, parents, community members, and employees), then further alignment between technology integration and the district's vision can be found and sustained (Shear, Gallagher, & Patel, 2011). Additionally, with the setting of effective policy that encourages and supports technology integration, districts face the potential of cost savings (Brooks, 2011). Literature supports the notion that when technology integration is included in the district vision and supported by policy, districts waste less money on ineffective technology and the realization of savings in all aspects of

the school and district (Huett, Moller, Foshay, & Coleman, 2008a).

The role of superintendents, district administrators, and principals is essential to the development of policy and the establishment of a strong and positive school culture (Muhammad, 2009). However, the literature shows that most superintendents do not have the knowledge and skill to make effective decisions on technology integration (Closen et al., 2013; Johnson, Adams Becker, Estrada, & Freeman, 2014). The end result is a negative impact on the classroom (Closen et al., 2013). The research shows that with the increasing demand for students to exit the K-12 educational system better prepared for the demands of the 21st century work place, and within that, the push to further integrate technology into the classroom, the superintendent's knowledge and leadership in these areas is essential to the creation of a sustainable system for classroom technology integration (Closen et al., 2013; Farley-Ripple, 2012; Tondeur et al., 2012). The challenge found in the research is the lack of existing literature seeking to understand the superintendent's perception of the factors that influence the integration of technology in the classroom (Johnson et al., 2014). The implementation of the CCSS creates additional pressure for superintendents to have the knowledge and skills of 21st century learning skills and technology integration. More importantly, research must address the gap in literature to enable superintendents and school boards to better understand the factors that influence these skills.

Statement of the Research Problem

Over the course of the past several decades, legislative policy has brought about increased focus on accountability for schools and districts. The end result, as identified by Spillane and Kenney (2012), was that classroom instruction was driven by "teaching

to the test" rather than preparing students for the 21st century with relevant skills. This is in direct conflict with the communication, collaboration, critical thinking, problem solving, and innovation skills that researchers have identified that students' need in the 21st century (Shear et al. 2011; Jerald 2009; Robinson 2009). In addition to identifying the 21st century skills of students desired by business leaders for the workplace is the task of effectively embedding technology tools and instructional strategies in the classroom to teach students skills of collaboration, communication, problem solving, and innovation.

The challenge facing school districts, as they try and keep pace with the demands of their communities to more effectively prepare students to enter the workplace, is the exponential and rapid evolution of technology. Simply put, despite large amounts of spending on technology, schools and districts have not been able to keep up with the rapid expansion of technology (Duffey & Fox, 2012; Ertmer & Ottenbreit-Leftwich, 2013). Districts have struggled to adapt their professional development, policy development, purchasing, coaching models, personnel resources, facilities, as well as many other elements which impact student learning to the pace that technology is evolving (Schrum et al., 2011). The end result of this has been tremendous waste of spending on ineffective professional development, lost time, and technology devices, tools and resources. From 2001-2010, through the Enhancing Education Through Technology (EETT) grant, the federal government provided $4.2 billion dollars for schools and districts to scale up and develop robust, effective educational technology grant programs (U.S. Department of Education, n.d.). Yet, even with the focus on technology in education over the past 15 years, students are still limited by their access to computers, technology and high-speed networks. According to the California K-12 High

Speed Network, in 2014, only 39% of schools have a high-speed internet connection (California K-12 High Speed Network, 2014). Additionally, in California's most recent data collection of technology resources in classrooms (2011-12), there were 6,220,993 total students in the state with access to only 1,276,069 computers (Ed-Data, 2014). When compared to the 2009-2010 school year, there were 6,190,425 students with access to 1,110,386 computers. From 2009-2010 to 2011-2012, the student to computer ratio has only dropped from 5.6:1 to 4.9:1 (Ed-Data, 2014). This ratio is even more concerning for California schools when they consider that in 2002, their student to computer ratio was 5.3:1 (Ed-Data, 2014). In nearly 15 years and despite billions of dollars spent, there has been little movement towards increasing the access students have to computers and technology. Schools and districts face an uphill battle to meet the needs of students and properly prepare them for their future in the workplace. In the coming decade, these challenges will only increase. Districts are attempting to develop strategies for addressing the evolution of technology, but they are often found to be obsolete by the time they are implemented.

Researchers have clearly identified the need for administrators to be able to possess the necessary capacities for understanding how technology influences collaboration, policy development, culture building, as well as how content, pedagogy, and technology all intersect (Harris et al., 2009; Schrum et al., 2011). Superintendents, as the leader of their organizations, are being expected to lead this change and guide their districts through the complex world of technology integration. However, research has primarily focused on how isolated technology impacts at the teacher and classroom level or on the decision making process of the superintendent themselves and not to actually

understand the role of the superintendent in how they prepare themselves and their districts for the future of classroom technology integration (Bennett & Thompson, 2011; Bredeson & Klar, 2011; Bredeson & Kose, 2007; Grissom & Andersen, 2012; Schachter, 2010). Closen et al. (2013), Natale (2011) and Ottenbreit-Leftwich et al. (2010) determined that not enough is being done to understand and prepare superintendents for building their (and that of their administrators and teachers) ability to interact with technology to facilitate collaboration, communication, critical thinking, innovation, strategic planning, and develop and implement effective policy. Understanding how superintendents can prepare their districts for the rapidly evolving nature of technology in the coming decade can ensure that schools and districts are able to prepare their students for the demands of the 21st century workplace.

Purpose Statement

The purpose of this Delphi study was to identify what K-12 superintendents should do to position their districts to be prepared for the changing nature of technology in the next ten years.

Research Questions

This study sought to answer the following research questions:

1. What strategies do experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years?
2. Of the strategies identified in Research Question 1, how do experts rank them as having the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years?

3. What can superintendents do to prepare themselves to lead their districts in the strategies identified in Research Question 1 and 2 in order to position their districts to be prepared for the changing nature of technology in the next 10 years?

Significance of the Problem

The goal of this study was to understand how the trends and events of the coming decade will dictate the skills superintendents will need to lead classroom technology integration in their districts. This study also began to fill the gaps in literature as they relate to the factors that influence technology integration and the instruction of 21st century skills in the classroom. School boards, superintendents, district administrators, and site administration may benefit from information that provides better understanding of how their leadership influences policy and knowledge of technology integration. This research will provide school districts valuable insight into how to develop strategies to more effectively influence technology integration with teachers and students. Influencing technology integration and implementation may allow for increased understanding of how to build sustainable systems of technology support and technology professional development for schools and teachers. This growth in understanding can lead to the increased engagement and learning of students, which is the goal of all school systems.

Definitions

Accountability. Holding schools and districts accountable for improving student achievement. This is based on high-stakes state-wide assessments of student learning.

Blended Learning. Defined by the Clayton Christensen Institute for Disruptive Innovation website (2012) as a formal education program in one of three learning environments in which the student learns:

1. At least in part through online learning with some student control over time, place, path or pace.
2. At least in part in a supervised brick-and-mortar location away from home.
3. And the modalities and each student's learning path within a course or subject are connected to provide an integrated learning experience. ("Blended Learning," para. 1)

Delphi Technique. Developed by Dalkey and Helmer in the 1950s for the RAND Corporation. Used to find group consensus of expert panels on trends or events that will take place in a given area of study usually in the areas of goal setting, development of policy, and predicting future events. Studies are conducted with rounds of feedback from the expert participants given until consensus is found by the researcher. (Hsu & Sandford, 2007).

Event. Something (especially something important or notable) that happens (Merriam-Webster Dictionary, 2014).

Expert. An individual who has the knowledge, skill or relevant experience to participate in a Delphi (Clayton, 1997).

High-stakes Testing. A method for measuring student learning and school effectiveness towards meeting standards. The main indicator of progress for NCLB and most state-wide accountability measures.

No Child Left Behind (NCLB). Federal legislation signed into law in 2002. NCLB placed new mandates on all public schools to meet annual yearly progress on each of their underperforming subgroups to reach proficiency. The focus of NCLB is to have accountability for results, implement instruction that is scientifically researched, and close the achievement gap with all subgroups. Schools not meeting these growth measures are placed in program improvement (PI) and given a series penalties until they met their growth targets.

Online Learning. A learning environment that is based entirely online and does not require a traditional brick-and-mortar setting of a school building or facility.

Pre-Service Training. The training programs of teachers and administrators prior to the start of their professional careers. This usually takes place at the university level.

Professional Development. The ongoing on-the-job training of professional educators to increase their learning as they work.

Student Achievement. What is assessed to determine student proficiency levels and success of content knowledge and skills.

Superintendent. The chief administrator of school districts and counties.

21st Century Learning Skills. A framework created by the Partnership for 21st Century Skills (2009). The goal is for students to obtain these skills through deliberately embedded instructional practice. These skills are identified by the categories of creativity and innovation, critical thinking and problem solving, and communication and collaboration.

Technology Integration. The regular embedding, use, and interaction of and with technologies within the teaching and learning in K-12 classrooms (Staker et al., 2011; Ertmer & Ottenbreit-Leftwich, 2013).

Policy. A definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions (Merriam-Webster Dictionary, 2014).

Technology Pedagogy and Content Knowledge (TPACK). A 21st century learning model that proposes that educators teach and learn from the point where the three domains of technology, pedagogy, and content overlap. Each of the domains are dependent upon the others to be fully effective in their implementation (Graham, Borup, & Smith, 2012; Harris & Hofer, 2009).

Trend. To follow a general direction, tendency or course (Merriam-Webster Dictionary, 2014).

Delimitations

This study examined the knowledge and skills that superintendents need in order to lead their districts in building 21st century learning environments. Delimitations of this study were chosen to clarify and narrow the focus of the study. The chosen delimitations of this study include:

1. This study was designed to provide insight into alternative futures of the development of necessary skills for superintendents to lead their districts in the creation of sustainable systems of classroom technology integration.
2. This study was not intended to support any predetermined hypothesis.

3. This study was not intended to explore alternative resolutions to problems, past, present, or future.
4. Ideas generated about the future of superintendent training and classroom technology integration in this study were delimited to those from a select group of informed and interested persons with expertise and experience; specifically, a select number of current superintendents.
5. Experts were selected from Northern California counties.

Organization of the Study

This study is presented in five chapters. Chapter I clarifies the background of the problem, the statement of the problem, the purpose of the study, the research questions, the delimitations of the study, and the definitions of terms. Chapter II reviews the literature related to the superintendent's leadership of technology and includes a review of school accountability, 21st century learning, professional development for teachers and administrators, the impact of climate and culture in school districts, the development of policy, and the role of the leadership which clarifies the evolving role of the superintendent. Chapter III reviews the research design of the study and identifies the methodologies to be used to conduct the study and collect data. Chapter IV includes the findings of the study. Chapter V consists of a summary of the findings of the study and will present conclusions and recommendations for how superintendents can prepare themselves for leading their districts to more effectively integrate technology in classrooms.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

The purpose of this study was to identify, using the Delphi study process, the knowledge and skills that experts believe superintendents will need in order to build effective systems of classroom technology integration. This chapter contains a review of the literature related to this purpose. Chapter II is divided into three sections. The first area of literature examined is the demographic make-up of California's students, teachers, administrators, and schools. It also explores the impact of the accountability movement in education and the conflict it has with 21st century teaching and learning. The next area of literature explored is the factors that influence technology integration. These factors include professional development, pre-service programs for teachers and administrators, the development and maintenance of school culture and climate, and the development and implementation of technology policy. The final section of literature explains the role of the modern day superintendent and the knowledge and skills they will need to lead the integration of classroom technology in their districts.

Demographics of California Schools, Students, Teachers, and Administrators

California is made up of 58 County Offices of Education, 1,028 public school districts, 6,236,672 students (California Department of Education, 2014a). Three different types of school districts exist within the state of California: elementary (grades K-8), high school (grades 9-12), and unified (grades K-12). According to the California Department of Education (2014a), California's students are broken into several race and ethnic categories. The most prevalent percentages of students fall within one of four

groupings: 53% are Hispanic or Latino, 25% are White, 8.5% are Asian, and 6.2% are Black or African American.

Of the 6.2 million students, 59.4% (3,707,508 students) receive free or reduced lunch, 22.7% of students (1,413,549) are classified as English Language Learners, and 685,000 students receive special education services ranging from newborns to age 22 (California Department of Education, 2014b).

California schools employ several types of staff. There are 23,140 administrators (279.3 per student), 26,367 pupil services employees (255.3 per student), and 283,836 teachers (22.7 per student) (California Department of Education, 2014b). There is a gap in the ethnic distribution of teachers as it relates to student demographics. In California, 17.7% of teachers are Hispanic or Latino, 66.8% are White, 5% are Asian, and 4% are Black or African American (California Department of Education, 2014b). In addition, each type of school district has a separate average of student to teacher ratio. In elementary districts, there is an average of 23 students for every teacher, in high school districts, there is an average of 24.1 students per teacher, and in unified school districts there are 22.7 students per teacher.

In addition to the contrasting demographics between students, teachers, and administrators, a more pressing challenge that California school districts face is the teacher and administrator turnover rates. This particularly impacts a school district's ability to develop and implement strategic plans and impacts staff morale and efficacy(Grissom & Andersen, 2012). Fullan (2000) concluded that successful school reform can take five or more years to accomplish and negative impacts to these reforms can have long-lasting damaging effects. In California, the five-year teacher attrition rate

is 30% (Kan, 2014). The data regarding school administrators is even more drastic. Several studies have shown that the average national turnover rate for administrators is 15-30% annually (Burkhauser, Gates, Hamilton, & Ikemoto, 2012; Goodwin, 2014). These attrition rates are even more alarming in districts with high percentages of poor, low-performing, and minority students (Burkhauser et al., 2012). Furthermore, there exists a gap in the literature which seeks to understand why superintendents and principals have such a low retention rate (Grissom & Andersen, 2012). The age of accountability has widened this divide even further. Miller (2009) concluded that schools and districts that have seen a decline in student performance have higher rates of administrator turnover. Yet, few studies have been conducted to understand why these rates take place and what skills superintendents and administrators need to be able to improve retention rates (Burkhauser et al., 2012; Goodwin, 2014; Grissom & Andersen, 2012).

The Age of Accountability

In 2001, NCLB was implemented in districts across the US. With it, a new age of accountability was ushered into thousands of public schools across the country expanding the authority of the state and federal governments over areas of curriculum, assessment, teacher certification, and school improvement (Anagnostopoulos, Rutledge & Bali, 2013; Koyama, 2013). Schools were expected to make Annual Yearly Progress in academic performance with each of their identified demographic subgroups. Schools not meeting this growth target were placed in PI. Students in these schools were given the option to access additional tutoring or to transfer to a non-Program Improvement school (Aske et al., 2013; *No Child Left Behind Act*, 2002). This new accountability was measured by

student performance on high stakes standardized assessments given at the state level. Additionally, these high-stakes tests became the primary method for measuring school effectiveness (Embse & Hasson, 2012). Instructionally, schools and districts focused efforts on power standards and pacing guides driven by rigorous content area standards that would enable schools and districts to perform well on state assessments (Spillane & Kenney, 2012). As a result, the systems designed and the processes implemented to raise the achievement gap through student learning have been driven by words like accountability, alignment, and compliance (Choi, 2011). Additionally, Embse and Hasson (2012) found that policies like NCLB have created an accountability system that primarily places its importance on student test outcomes. Yet Sunderman, Kim, and Orfield (2005) found that the federal and state governments provided insufficient financial and human resources, which limited state education agencies from being able to effectively meet their administrative responsibilities.

Within these efforts it is important to consider that reforms have largely left schools unchanged from the systems of their predecessors. A report by The Foundation for Excellence in Education (2010) found that school systems remain nearly identical to what they were 50 years ago and the overwhelming majority of students still attend a brick and mortar school for set numbers of days and hours based primarily on an agrarian calendar. "Students sit at desks and consume content in textbooks that may already be outdated" (Foundation for Excellence in Education, 2010, p. 4). It is also important to note that analysis of data from states across the country, there is little evidence to suggest that high-stakes testing increases student achievement (Embse & Hasson, 2012). Additionally, there is a gap between the understanding of teachers' and administrators'

definitions of instructional alignment and the standards based assessments that have driven policy for the past several decades. (Polikoff, 2012).

In contrast to the high stakes standardized accountability systems, stands the presence of the high tech global economy that demands students enter the workplace with 21st century learning skills (Jerald, 2009). Schools are expected to prepare students for jobs and technologies not yet created (Buffum, Mattos, & Weber, 2010; Gunderson, Jones, & Scanland, 2004). An inherent conflict exists between the standardization movement and the demands of the workplace technological revolution, both impacting the preparation of 21st century students (Jerald, 2009). The current workplace is searching for students with the ability to innovate and create. Hodge and Lear (2011) state that as the job market increases the level of competition, education becomes key to developing important skills to compete for improved employment. Shear, Gallagher, and Patel (2011) identify how schools have prepared students for these tasks in describing educational systems as being slow to innovate and that while devices have evolved from blackboards to digital projectors, the vast majority of students still exist as information consumers rather than creators, problem-solvers, and innovators. This also holds true in the higher education setting as well. According to a survey by The Partnership for 21st Century Skills (2006) and the American Management Association (2010), many employers believe that higher education is failing in its role to appropriately develop necessary skills in students. Sir Kenneth Robinson (2009), in his book *The Element*, claims there is a need to transform education by moving away from standardized education to the personalization of learning and creating environments in which all students are motivated to discover their true passions.

The end product has been the creation of two competing reform movements of NCLB and 21st century skills (Schoen & Fusarelli, 2008). Schools and districts are being faced with the charge of creating and teaching innovation while meeting the demands and mandates of NCLB (Schoen & Fusarelli, 2008). As a result of this tension, the CCSS were created and adopted by 45 out of 50 states (Common Core Standards Initiative, 2012). An important component of these standards is the integration of technology in all areas ranging from instruction to assessment (Saine, 2013). As a result, states and districts are turning to increasing amounts of blended learning and online learning. Huett, Moller, Foshey, and Coleman (2008) determined that the evolution of distance education and technologies used for it is the single most important reorganization of how learners will be engaged since school systems were established. Likewise, Christensen et al. (2011) predicted that half of all high school classes will be online by 2019. Kong et al. (2014) also concluded that there will be a growing trend to individualized and collaborative learning at all levels of education through the use of online and hybrid models. Yet little is known about the long-term effect of blended and online learning environments. In a study for the U.S. Department of Education, Means, Toyama, Murphy, Bakia, and Jones (2010) found very few published rigorous research studies of the effectiveness of online learning for K–12 students. Means et al. states "A systematic search of the research literature from 1994 through 2006 found no experimental or controlled quasi-experimental studies comparing the learning effects of online versus face-to-face instruction for K–12 students that provide sufficient data to compute an effect size" (p. 16). In a separate report, Bakia, Shear, Toyama, and Lasseter (2012) found that in reviewing available research on the impact of online learning on

educational, productivity for secondary (grades 7-12) students was found to be lacking. Bakia et al. further stated "No analyses were found that rigorously measured the productivity of an online learning system relative to place-based instruction in secondary schools" (p. 9).

21st Century Learning

In 2009, The Partnership for 21st Century Skills created a framework to define 21st century skills. This framework (see Figure 1) created an interconnected support system of standards, assessment, curriculum, professional development, and learning environments (see Figure 1). This framework further defined 21st century skills with the following categories: creativity and innovation, critical thinking and problem solving, and communication and collaboration (Partnership, 2009).

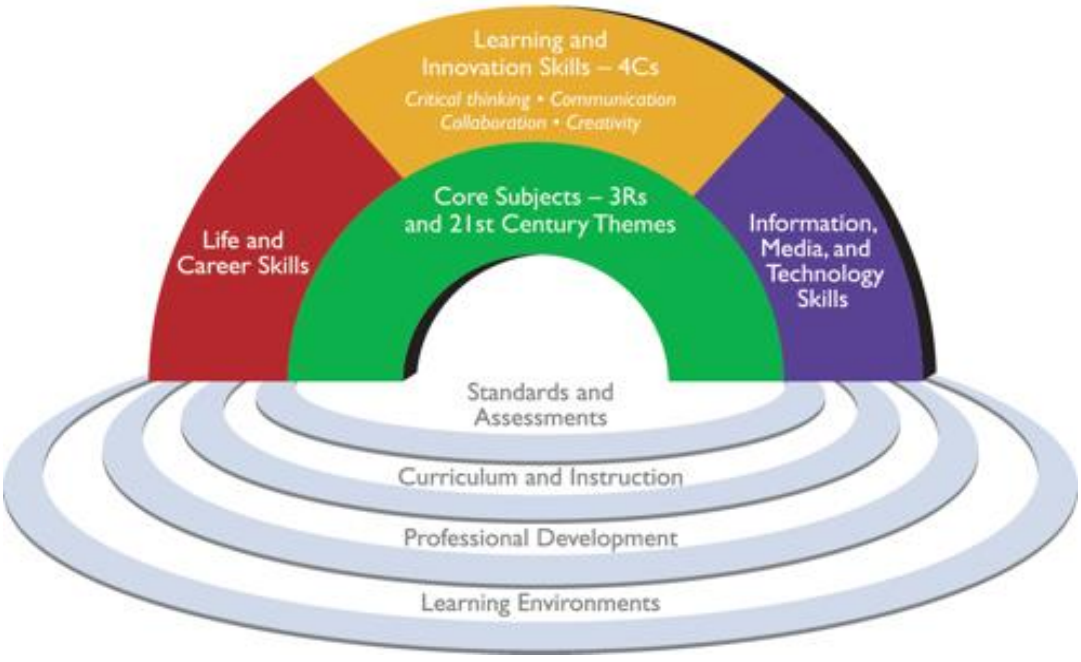


Figure 1: This figure represents the student outcomes and support systems necessary for 21st Century learning. Reprinted from "21st Century Student Outcomes and Support Systems," by The Partnership for 21st Century Skills, 2009. Retrieved from www.p21.org/our-ork/ framework.

Likewise, Gore (2013) defined 21st century skills as being learning skills, innovative skills, creativity, critical thinking, project-based learning, internship, student-driven research projects, problem solving, communication skills, and teamwork. The American Management Association (2010) also defined 21st century skills as being communication, collaboration and teamwork, critical thinking and problem solving, and creativity and innovation. Gore (2013) further reinforced the importance of this idea in citing Toffler (1970) "The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn" (p. 7). In comparison to the definitions determined by researchers, a survey by The Partnership for 21st Century Skills (2009) given to employers identified the top five skills they sought in employees. These were professionalism, teamwork, oral communication, ethics and social responsibility, and reading comprehension. To this end, Hodge and Lear (2011) found that businesses spend billions of dollars to train their employees in these specific skills to increase profits. Yet at such a large expense, they look to hire staff already proficient in such skills. K-12 students, given the exposure and experience to learning these skills, will have an advantage within an increasingly competitive workplace (Gore, 2013). On the other hand, critics of 21st century skills claim that focusing on these skills distracts teachers and students from learning the more important core content (Silva, 2009). Silva (2009) also found that critics do not believe that the types of higher-order thinking skills proposed in 21st century skills can be measured in reliable or valid ways. Schoen and Fusarelli (2008), however, propose that districts and states can find a balance between these two ends and meet accountability goals of NCLB without stifling innovation by

more accurately measuring 21st century skills by measuring critical thinking in a manner that integrates content.

In addition to defining 21st century skills it is necessary to identify whom the end users of these skills will be. Researchers have identified these users as students and classroom teachers (Kong et al., 2014; Gunn & Hollingsworth, 2013; Ottenbreit-Leftwich et al., 2012; Brooks, 2011; Ertmer & Ottenbreit-Leftwich, 2010). Researchers have also found value to teaching 21st century skills to students. Among these are reducing learning barriers, improve academic success, increased high school graduation rates, and flexible access to learning (Gunn & Hollingsworth, 2013). With districts and schools working to transition to the instruction of these skills, they must also balance the demands of the CCSS and how to train administrators and teachers to implement these standards through technology integration (Brooks, 2011). Gunn and Hollingsworth (2013) claim it is essential for site administrators and teachers to receive training and professional development in information and communication technology to engage students with new instructional tools.

In preparation for the CCSS and the assessments that will accompany them, it is recommended that school and district leaders develop systems of support for teachers and principals to be effective in developing their confidence levels and competency skills to innovate with efficacy (Calkins, Ehrenworth, & Lehman, 2012). Muhhamad (2009) claims "effective school leaders developed systems that intensely developed the skill level of their new teachers in ways that limited their struggle in the classroom and in the school in general" (p. 110). Shear et al. (2011) also state that several countries recognize school leadership as a key factor for implementing school-level innovation and comes in

the support that is seen when encouragement, time and material resources, and professional development all align to a common vision. Shear et al. go on to determine that "activities that ask for strong demonstration of 21st century skills are still the exception rather than the rule in the classes we sampled, despite the fact that we deliberately sought out relatively innovative teachers from relatively innovative schools to participate in this research" (p. 18). The challenge then facing educators is how staff might be led through effective professional development that builds interconnectedness between technology, pedagogy, and content and develops the 21st century skills of students (Harris et al., 2009).

Effective technology integration depends on a consideration of the interactions among technology, content, and pedagogy (Ertmer, Ottenbreit-Leftwich, Sadik, E. Sendurur, & Sendurur, 2012). Building systems in which these interactions can take place, is the primary responsibility of the school and district administrators. Currently, the effective integration of technology in schools and classrooms has not been consistently implemented and in many educational settings, is invisible (Gunn & Hollingsworth, 2013). Voogt, Fisser, Pareja Roblin, Tondeur, and van Braak (2013) found that while teachers have knowledge and skills to use technology, they are not able to use it in their classroom instruction. When technology is used in the classroom, it is not typically used to support instruction that has been found to be most effective for student learning (Ertmer & Ottenbreit-Leftwich, 2010). Ertmer and Ottenbreit-Leftwich (2010) further explain that it is no longer appropriate to suggest that low-level use of technology is sufficient enough to meet the needs of the 21st century student. Anthony's study (2012) revealed that contradictory linkages between a district's technology

planning systems and the teachers' systems of technology integration impeded technology use. An and Reigeluth (2012) found that to lead teachers in creating "technology-enhanced, learner-centered classrooms" there needs to be the understanding of three ideas:

1. How they [teachers] perceive learner-centered instruction as well as technology.
2. What kinds of barriers they [teachers] face in creating technology-enhanced, learner-centered classrooms.
3. What kind of support they [teachers] need to create such classrooms (p. 56).

When planning and integration are in sync with each other, successful implementation becomes possible. Likewise, when planning and integration have dissonance, implementation is impeded (Anthony, 2012). There is a need for superintendents, district administrators, and principals to understand that teaching with technology requires teachers to expand their knowledge of pedagogical practices across the elements of the planning, implementation, and evaluation processes (Ertmer et al., 2012). Tondeur et al. (2012) further goes on to describe that teachers need technology modeled for them. It can be argued that to include the use of computers, teachers must have models of how computers work in the classroom and need to be supported to reflect on their own role in the learning process (Dabner, Davis, & Zaka, 2012; Funkhouser & Mouza, 2013; Kopcha, 2012; Ottenbreit-Leftwich et al., 2010). Observing successful Interactive Communication Technology (ICT) integration might increase a teachers perceived need for change as well as assure them that the required changes are not impossible (Ertmer et al., 2012).

Professional Development

Researchers have found that professional development necessitates that district and school administrators allow for multiple views and approaches in pedagogy (An & Reigeluth, 2011; Ertmer & Ottenbreit-Leftwich, 2010; Kopcha, 2012). Barth (1990) states that:

> The criterion for bestowal of the "key" of leadership is evidence that a person knows how to do it. Yet the innovative solutions come more often from teachers who do not know how to do it but want to learn how. This is where leadership and staff development intersect. (p. 136)

Barth (1990) identifies here that there needs to be a balance of focused efforts and choices for professional development for teachers that lead to increased teacher buy-in. Barth's findings are further supported by Kopcha (2012) who found that professional development needs to be designed in a manner that supports the changing needs of teachers over time. Yet there is a challenge that is identified by Rientes, Brouwer, and Lygo-Baker (2013) that teachers are not aware of the options they have to receive professional development. Rientes et al., further go on to explain that this need can be met by focusing professional development as a site based activity and centers around the experiences of the teachers themselves and their peers.

Likewise, technology integration does not require one single pedagogical orientation; it includes a range of approaches to teaching and learning. Tondeur et al. (2012) states that teachers select technology, software, and applications in line with their selections of other curriculum and instructional strategies that fit into their existing educational beliefs. Additionally, An and Reigeluth (2012) found in their study that

participants reported that the 'one size fits all' approach to professional development does not work. An and Reigeluth also suggest that professional development provide teachers more time for hands on practice. In addition, Ritzhaupt et al. (2008) found that with technology professional development, leaders must provide teachers evidence that demonstrates meaningful learning outcomes. When leaders are able to align professional development for teachers with their values, beliefs, and strategies, implementation of the professional development becomes more possible (Ottenbreit-Leftwich et al., 2012). Kopcha (2012), Kim, Kim, Lee, Spector, and DeMeester (2013), and Closen (2013) each identify that there remains a pressing need for research in effective approaches for technology professional development in K-12 education.

The literature indicates that to accomplish the successful integration of technology, administrators need to provide teachers with time and structures to continue learning and collaboration with peers beyond the initial training. Ertmer and Ottenbreit-Leftwich (2010) found that the research on technology self-efficacy suggests that among several recommendations that teachers be given time to play with the technology as well as situating professional development within the context of their peers. Ertmer and Ottenbreit-Leftwich also note that administrators need to provide teachers with access to suitable models of implementation that align with their beliefs and values and frame the professional development within the teacher's ongoing work in the classroom. Shear et al. (2011) report that school and district leadership is a key factor in implementing school-level innovation and can come in the form of time, encouragement, resources, and professional development that are in alignment with a clear vision. When professional development is disconnected from the practices being applied in the classroom, it is less

likely that the professional development will be implemented (Tondeur, Hermans, van Braak, & Valcke, 2008). In addition, Kim et al. (2013), found that teachers have not been provided adequate support for technology professional development. Likewise, Ritzhaupt et al. (2008) determined that the most cited reason for the lack of implementation was the lack of meaningful professional development provided to teachers.

Researchers have found that the effective implementation of professional development comes from the system of support provided by administrators. Funkhouser and Mouza (2013) purport that making a change in teacher beliefs takes time and will only be sustainable if they are provided practical experiences that help them see the value of using technology with their students. Fullan (2001b) suggests that in order for professional development and innovation to become embedded in the regular practice of teachers, it must be closely tied to current goals of the organization. Gunn and Hollingsworth (2013) state that it is essential for teachers and administrators to be trained in technology integration to engage students emotionally, academically, and socially.

Superintendents, district administrators, and site principals equally need to be trained in the integration of technology in the classroom. Fletcher (2009) found that most administrators receive little or no professional development in 21st century skills. Additionally, Fletcher clarifies how this gap is further created in stating "When leaders are clueless about technology and the impact it can have in classrooms, they are powerless to change their school or district into one that provides tech-enabled instruction for students" (p. 22). Ultimately the resources required to continue this effort come from the decisions and priorities of the superintendent and the central office. Schrum et al.

(2011) supports this claim in finding that technology leadership is more important than any technology expenditures or infrastructure, and that administrators must understand what is involved in the process of leading technology integration. The Foundation for Excellence in Education in their 2010 *Digital Learning Now* report found that professional development needs to exist for administrators and teachers alike in how to engage students in personalized digital learning environments.

On the other side of this perspective, superintendents, district administrators, and principals must consider research that show how teacher's beliefs about learning is an important indicator of the effectiveness of professional development and the integration of technology in their classrooms. Kopcha (2012) argues that a teachers beliefs can present barriers to the successful implementation of technology in the classroom. Koc (2013) also found that a teacher's belief system remains the primary barrier to technology integration into the classroom. Kim et al. (2013) claim:

> As fundamental beliefs, teachers' beliefs about the nature of knowledge and learning (epistemology) and beliefs about effective ways of teaching (conceptions) were examined. We found that teachers' beliefs about the nature of knowledge and learning and beliefs about effective ways of teaching were related to their technology integration practices. (p. 82)

Likewise, Ertmer et al. (2012) state that professional development that leads to successful change will most often align with teacher beliefs and needs. Kopcha (2012) found that teacher beliefs and perceptions of technology professional development could be sustained over time when it was combined with a variety of research-based strategies. When teacher attitudes have a strong sense of self-efficacy, there will be a positive

impact on the integration of technology and a corresponding implementation of professional development (Celik & Yesilyurt, 2013).

Researchers have identified that as superintendents, district administrators, and principals consider professional development for themselves and their teachers, there is a need for them to align the relationship between technology, pedagogy, and content (An & Reigeluth, 2011; Graham, 2011, Harris et al., 2009). An and Reigeluth (2012) further state that most technology training overlooks the relationship between technology, pedagogy, and content. While Harris and Hofer (2009) claims professional development must address a teacher's technology, pedagogy, and content and knowledge (TPACK). This model draws on the relationship between these three areas. When administrators ensure that each of these elements overlap, effective and sustainable technology integration can take place (Graham, 2011, Harris et al., 2009).

Pre-Service Training

Notwithstanding the significance of professional development and training of current educators, the preparation of pre-service teachers and administrators is critical. Ottenbreit et al. (2010) found that less than half of teacher education programs covered technology uses that facilitate higher-order thinking skills which is an essential component to 21st century learning. In another study by Natale (2011), 52% of aspiring teachers were found to have experience with online classes but only 4% report they are learning how to teach online classes in their instructional methods courses. Resta and Carroll (2010) found that teacher candidates continue to be trained in "antiquated preparation programs" (p. 1) that prepare teachers to deliver content primarily through lecture based textbook instruction. Schrum et al. (2011) found the training for pre-

service administrators to be even less. In their 2011 study, Schrum et al. found that out of the 50 states in the U.S. only 2 had requirements for administrator demonstration of knowledge and skill of technology, and that even those requirements were vague. Yu and Durrington (2006) found several states have developed or are developing technology plans that dictate the administrator's role in using technology, but they fail to identify the standards and competencies by which administrators need to fulfill those roles. Additionally, Schrum et al. (2011) found that the ongoing collection of data suggests that states continue to not demand that current and future administrators have a working knowledge and expertise in the instructional use of technology. Along with the lack of standards and identified competencies for administrators for technology integration, Richardson, Flora, and Lewis (2012) found in their review of literature that no "systematic analysis" (p. 131) of literature had been completed to gain an understanding of how comprehensively technology leadership is being studied. They further conclude:

> With the many remaining holes in the literature as well as the lack of in-depth research on many vital areas, the scholarly field has not yet provided the necessary resources for educational leaders working to implement technology-facilitated changes in learning and teaching. (p. 145)

When these statistics are compared to the findings of Christensen et al. (2011) who predict that by 2019, 50% of high school courses will be delivered online, it becomes apparent that there is a gap in how teachers and administrators are prepared to manage and facilitate the change process of technology integration. In addition to Ottenbreit-Leftwich et al. (2010) and Natale (2011), Closen et al. (2013) found that "most of our school leaders have received no training whatsoever when it comes to 21st century

schooling" (p. 22). Further evidence of this can be found in both the current California Professional Standards for Educational Leaders (CPSEL) and in the newly revised CPSELs which are still in draft form. Neither the current standards nor the soon to be released standards for administrators provided direction, guidance, or accountability for administrators to gain competencies within instructional technology (California Commission for Teacher Credentialing, 2004, 2013).

The research shows there is an urgent need for educators to be appropriately trained to handle the challenges of technology integration and 21st century learning. Resta and Carroll (2010) found that 21st century educators must get training and experience in online and blended learning environments in their pre-service programs. Likewise, Tondeur et al.'s 2012 review of literature found that research showed that a critical factor influencing the adoption of technology were the quality and quantity of their pre-service programs (Tondeur et al., 2012). Pre-service programs are important times of development for teachers and administrators. These times serve as the biggest influence to the existing belief structures of educators (Koc, 2013). Pre-service programs for both teachers and administrators have shown to have a need to center on adjusting beliefs and practices towards technology and e-learning (Kong et al., 2014).

Culture and Climate of School Districts

Superintendents, district administrators, and principals face the task of increasing their effectiveness in the integration of technology into the culture, climate, and curriculum of the schools. Superintendents need to consider the attitudes and efficacy of teachers towards technology itself (Mama & Hennessy, 2013; Pan & Franklin, 2011; Ritzhaupt et al., 2008; Tondeur et al., 2008). There is a need for administrators to

consider the powerful role that culture and climate play in technology implementation. Schrum et al. (2011) state "school culture is built from leadership: They (administrators) uniformly stressed that the role of the leader is essential in helping teachers establish a culture that values risk taking, promotes exploration, and celebrates innovation" (p. 254). Inan and Lowther (2009) found school culture and climate contribute to teacher attitudes towards technology integration. Shear et al. (2011) determined that "innovative teaching practices are more likely to flourish when particular supportive conditions are in place" (p. 12). Central to the relationship between technology integration and school culture is the presence of early adopters and teacher innovators within a school campus. Aldunate and Nussbaum (2013) found that the absence of these types of teachers negatively impacts the likelihood that a staff of teachers will adopt technology. One role, then, of superintendents, district administrators, and principals is to create and foster the conditions that support technology integration at all of its stages (Anthony, 2012). When a district's technology integration process isolates technology leadership from school sites, technology integration in the classroom becomes inconsistent and in some incidents, is in direct conflict with a district's values (Anthony, 2012).

When culture and climate are not considered or are ignored, it can have damaging effects. Horn and Evans (2013) found that "school principals and teachers complain frequently of top-down control from the district central office, which fosters a culture of compliance rather than one of innovation and pursuing different strategies for different student populations" (p. 16). Bakia et al. (2012) supports Horn's and Evans' findings in stating that gains in technology integration are only realized when technology is paired with organizational change. Anthony (2012) found that there are contradictory links

between a district's technology integration planning system and that of teachers. Additionally, Anthony concluded that effective technology leadership goes further than just influencing individual and district factors and must include work to bring about continuous improvement. The importance of addressing this issue is found in the International Society for Technology Education's (2009), Technology Standards for School Administrators first of six critical areas, *Leadership and Vision* which states: "Educational leaders inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision" (p. 1).

When there is resistance to changes in school culture, effective integration of technology at school sites and in classrooms is prevented from taking place (Koc, 2013). Researchers have found that for technology integration to be successful, teacher belief systems, site administration's expectations, and district technology planning, need to be in alignment (Celik & Yesilyurt, 2013; Koc, 2013; Kopcha, 2012; Inan & Lowther, 2009).

Policy

As the focus of technology integration shifts from teachers and students to the administrators making decisions, attention is given to the factors that influence those choices. The first factor to emerge when considering administrative decision making for technology integration is how districts approach technology policy. There is an impetus for school district administration to think about how technology endorsed in and through policy influences how technology is used in schools (Hess & Kelly, 2007). Technology use, both of what currently takes place as well as what the desired use is, dictates what policies are developed. Ritzhaupt et al. (2008) found effective technology plans include

policy development processes. The focus of that development process, Ritzhaupt et al. found, is to include the strategies that will fund technology integration within a district. Ritzhaupt et al. further clarifies that a district's policy towards funding technology also include capital expenses, infrastructure, hardware, maintenance, and human capital expenses. Anthony (2012) supports this notion by finding that technology policy towards funding must look beyond the purchase of hardware and consider the infrastructure needed to support technology integration in the classroom.

Superintendents are also being faced with the challenge of planning for the growth of online learning environments and the infrastructure needed to support those environments. Huett et al. (2008b), found that there is a lack of understanding for how these environments differ from traditional schools and often the same polices are developed to be applied equally to both physical and online and digital classrooms. Researchers have found that there is potential for substantial cost savings in the development of online learning environments for school districts especially in the areas of transportation, personnel costs, facilities costs, and curriculum costs (Bakia et al., 2012; Means et al., 2010). Policy, then, is needed to facilitate how these environments are created and what their end goals will be to ensure that student learning increases (Huett et al., 2008a).

As superintendents and districts adapt to the impact of how technology integration effects classroom instruction, there needs to be an alignment between district goals for innovation and student products as well as the call for student accountability (Shear et al., 2011). Shear et al. (2011) further states that districts struggle to effectively develop technology policy because of the tensions that exist between these two contrasting

visions. Brooks (2011), in a study conducted on superintendents in Alberta, Canada, found that superintendents and their administrators working for them, were discouraged from developing technology integration policies because of their assumed connection between technology and improved student outcomes. Brooks further describes that Alberta, as a region, had spent millions of dollars on technology integration, but had yet to see a return on that investment. Brooks also found that the important missing consideration was the role that clear policy has on technology integration within the social context of the classroom. Likewise, Kong et al. (2014) found that increasingly districts will need to be mindful of developing policy that anticipates instructional trends that center on individualized and collaborative learning and where the learning experience extends beyond the walls of the classroom. Kong et al. further found that policy planning is needed for successful constructive and interactive digital classrooms.

The second factor influencing technology integration policy development is stakeholder involvement in the development of policy. Tondeur et al. (2012) stated "the development of interactive communication technology school policy gives stakeholders the opportunity to reflect about their educational beliefs in relation to their use of interactive communication technologies" (p. 2551). Ritzhaupt et al. (2008) also found that involving stakeholders in the development of technology integration policy is a necessity and can lead to long-term sustained success of technology integration practices. In Koc's 2013 study, it was found that technology integration requires a change in the roles of the stakeholders themselves and that policy needs to consider and plan for the changes in these roles. Koc further states that "resistance to such changes inhibits from effective integration" (p. 1). This leads to a need for educational leaders to understand

that through their roles as facilitators of policy, they influence stakeholder buy-in for technology integration. As stakeholder roles emerge, it is important that superintendents are able to connect and align their understanding of their responsibilities and the roles of their stakeholders with their expectations of those roles as it relates to the creation of policy as well as instructional leadership (Bredeson & Kose, 2007).

There does exist a struggle when districts attempt to control technology integration in a preventative manner using policy, especially in an environment where development outpaces regulations (Wicks, 2010). Wicks (2010) also determined that administrative rules attempt to put technology integration, especially virtual learning, into a traditional mode of curriculum design and classroom instruction thereby creating unnecessary work and stifling scalability. Cramer and Hayes (2010) describe prohibitive technology policy as "unrealistic" and "undesirable". A 2010 report from Project Tomorrow, identified the lack of current policies related to new and emerging technologies (including network security, digital equity, and cell phone use) in school districts, serves as a primary barrier to technology integration at school sites. Project Tomorrow further concluded that because of this lack of current policy, students are prevented from using their own preferred devices at school. The report found that 62% of parents would purchase their student a mobile device for educational purposes if schools allowed it (ProjectTomorrow, 2010). Likewise, researchers have concluded this gap in consistent technology policy is preventative to successful technology integration (Ertmer et al., 2012; Cramer & Hayes, 2010; Wicks, 2010). The lack of technology integration policies and the preventative nature of the policies that do exist, lead to what Ertmer et al. (2012) describes as first-order barriers to technology integration. Ertmer

(1999) further determines that these first-order barriers serve as significant obstacles to successful technology integration. As superintendents gain a better understanding of how to develop effective technology policy, they will be able to provide more effective leadership for their districts.

The Role of Superintendent

This brings to light how the role of the administrator (superintendents, district administrators, and principals) is vital to the success in which teachers implement technology in their classrooms. Schrum et al. (2011), found that the lack of administrative support is the most important variable and that, without it, other variables will be negatively affected. Tondeur et al. (2012) citing a study from Sugar, 2004, recommended that school administrators work closely with teachers to address their beliefs and concerns about technology integration and provide an influential level of personal support and resources. In this, no role is more important than that of the district superintendent's working knowledge of each of these processes. Yet, there is a gap in the research about the significance of the administrative role of the superintendent in the integration of technology (Closen, et al., 2013).

The superintendent's role has changed over the past several decades. Sydney Marland (1970) examined the changing role of the superintendent as it was impacted by the labor movement of the 1960s. For the first time there was a shift in perception that the superintendent was no longer just the "head teacher." Instead, they were the centerpiece of management. Bredson and Kose (2007) as well as Grissom and Andersen (2012) came to a similar conclusion in how the modern day superintendent's work now focuses on politics and collaboration. In the present day, the superintendent's role

includes management of the central office, staff recruitment, fiscal and budgetary management, meet changing state and federal mandates for accountability, create a positive climate and safe schools, manage standards-based reform, developing and creating policy, and strategic planning. Additionally, they are expected to manage school board relationships, communicate directives, develop written reports, and provide instructional leadership (Kowalski, 2005). Bredson and Kose identified that despite the evolving roles and priorities that school superintendents face, there has been no reconceptualization of a superintendent's training and preparation to manage these responsibilities.

Superintendent Technology Knowledge

When the role of the superintendent is further examined within the context of technology integration, research has found they are lacking in the knowledge and skills required to manage technology integration and often defer decision making to their non-instructional technology directors (Closen et al., 2013). The Horizon Report found that most superintendents do not see technology as their "job" (Johnson, Adams, & Haywood, 2011). Closen et al. (2013) also addresses the lack of leadership as being due to the manner in which superintendents have utilized their technology directors to control purchases, determine program priorities, and, as a result, influence curriculum. Closen et al. then goes on to determine that "technology directors do not always have the pedagogical expertise to assist in effective decision-making when purchasing technology; this is a leadership role for superintendents and other administrators" (p. 6). Closen et al. and Johnson, Adams, and Haywood (2011) each see that the deficit of instructional

technology knowledge and confidence of superintendents negatively impacts the integration of technology in the classroom.

Closen et al. (2013) findings lead to the conclusion that important curricular decisions are being made by non-educators with little understanding of how their choices impact the classroom. Additionally, Schrum et al. (2011) state "in the 21st century, administrators need to know how technology can promote learning, be appropriately situated as both a topic of and a support of the curriculum, and support whole-school improvement" (p. 244). Farley-Ripple (2012) is also critical of the lack of competency that exists when these decisions are made. She found "that there is not much understanding of whether, how, and why central office decision makers use research evidence to support educational decisions" (p. 786).

Many of the limitations of superintendents extend from their inadequate knowledge of instructional pedagogy related to technology integration. The superintendent's primary use of technology is limited to productivity tasks (Closen et al., 2013). Schrum et al. (2011) found that central office administrators, technology directors and coordinators reported using technology primarily for productivity and administrative applications, such as e-mail, word processing, data analysis, budgeting, presentations, and publications. Ertmer and Ottenbreit-Leftwich (2010) determined that there is a need for superintendents, district administrators, and site administrators to understand how technology interacts with content and pedagogy. There is a need, then, for superintendents to have competency in the instructional pedagogies used for technology integration.

Superintendent Technology Skills

Literature supports the notion that superintendents need to become more skillful in their management of technology integration for classroom instruction (Harris & Hofer, 2009; Ottenbreit-Leftwich et al., 2010). Closen et al. (2013) identifies that in addition to their day to day management of the budget, personnel, special education, and school board politics, there is a need for research to understand superintendent's perspectives in how their role as the head instructional leader influences technology integration and as a result, impacts student learning. Stuart, Mills, and Remus (2009) further support this finding in their conclusion that leaders need to be more practically involved in ICT projects in schools and in ICT management. (Stuart, Mills, & Remus, 2009). Ottenbreit-Leftwich et al. (2010) emphasize the need for the 21st century superintendent to build their own 21st century skills and to model those for teachers to best encourage teacher efficacy and the adoption and integration of technology in the classroom.

In their 2008 report, *Empowering the 21st Century Superintendent* the Consortium for School Networking (CoSN) (2008) identified five skills that superintendents need to build within themselves and their organizations in order to positively influence the integration of classroom technology. They are identified as:

1. Strengthen district leadership and communications
2. Raise the bar with 21st century skills
3. Transform pedagogy with compelling learning environments
4. Support professional development and communities of practice
5. Create balanced assessments (p. 3).

The 2008 CoSN report further states "the superintendent must have the vision, then it is superintendent's job to put the support and resources, both financial and personnel, in place to reach that vision" (Consortium for School Networking, 2008, p. 2). As superintendents begin to re-calibrate their skills to match the needs of the 21st century leader, Douglas Reeves of the Leadership and Learning Center, warns of over-extending the superintendent who is often involved in dozens of other activities or initiatives and proposes superintendents execute a "not to do list" (Consortium for School Networking, 2008).

As school districts move into the implementation phase of the CCSS and through the reform of their systems, superintendents will lead their schools through a time of great uncertainty and ambiguity. Fullan (2014) claims that "with CCSS we are instead dealing with leadership for innovations in a domain where no one knows in advance what is likely to work" (p. 156). Bredeson and Kose (2007) determined that no study could be found that examined how the work and priorities of the superintendent had changed over the past decade. Later, Bredeson and Klar (2011) note that little research had been completed that both focused on the interactions between superintendent's leadership practices and the contexts in which they operate as well as the way in which superintendents work to understand and impact the contextual influences within their districts. Fullan (2014) further describes that the main challenge that superintendents and school administrators will face is a top down, strong line authority approach to the solution of technology leadership creating resistance to change from teachers. Berrett (2012) also supports this finding that top down initiatives lead schools to be vulnerable to

the required integration of technology that have not been adequately researched to determine their value and viability.

Research has found that superintendents and school administrators can overcome these vulnerabilities by building a shared vision that is created by all stakeholders and then aligning their knowledge and behavior to that vision (Fullan, 2014; Dufour & Fullan, 2013; Berrett, 2012). Inan and Lowther (2009), Schrum et al. (2011), Shear et al. (2011), and Anthony (2012) each conclude that the main priority of school district leadership is to build a positive organizational culture to foster collaboration, risk-taking, and innovation. Likewise, Campbell in his 2012 study of the "Pathways to Prosperity" project in an Aurora, Illinois school district found that to effectively lead technology integration and the building of 21st century skills required visionary thinking, willingness to listen to credible ideas, and the ability to unify teams from various teams to create and achieve solutions to complex and ongoing systematic problems. In contrast to these findings, Aldunate and Nussbaum (2013) found technology anxiety to increase with teachers are equipped with technology when a positive school culture and climate are not established, the appropriate training not provided, and the purchases are disconnected from the vision and values of the organization.

Summary

The superintendent, as shown in the research, plays a vital role in the successful integration of technology integration in classrooms. Yet, there continues to be a gap in the literature in understanding the perceptions that superintendents have of the factors that influence technology integration in the classroom. A majority of superintendents either do not feel it is their job to understand technology integration (Johnson et al., 2011)

or they lack the knowledge and skill to make decisions about the development and creation of technology policy and how to best prepare their districts to be positioned for the changing nature of technology in the next decade (Closen et al., 2013; Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013; Farley-Ripple, 2012; Tondeur et al., 2012; Schrum et al., 2011). Understanding what superintendents should do to position their districts to be prepared for the evolution of technology and which strategies will most influence technology implementation will provide school districts a plan of action to more effectively influence technology integration with teachers and students.

CHAPTER III: METHODOLOGY

Overview

This chapter describes the research design and the methods used to conduct this Delphi study. Chapter III includes the purpose of the study, the research questions, the research design, a description of the population and sample and the criteria used for selection, a description of the panel size, an explanation of the data collection and data analysis process, and finally, the limitations of the study itself.

Purpose Statement

The purpose of this Delphi study was to identify what K-12 superintendents should do to position their districts to be prepared for the changing nature of technology in the next ten years.

Research Questions

This study sought answer the following research questions:

1. What strategies do experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years?
2. Of the strategies identified in Research Question 1, how do experts rank them as having the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years?
3. What can superintendents do to prepare themselves to lead their districts in the strategies identified in Research Question 1 and 2 in order to position their districts to be prepared for the changing nature of technology in the next 10 years?

Research Design

This study was conducted using descriptive research. It used a Delphi technique to find consensus of opinions by an expert panel. Hsu and Sandford (2007) describe the Delphi technique as being used for "achieving convergence of opinion concerning real-world knowledge solicited from experts within certain topics" (p. 1). Yousuf (2007) states "the Delphi technique applies to situations where policies, plans, or ideas have to be based on informed judgment" (p. 1). Yousuf further argues that the Delphi technique allows educators to communicate effectively and identify trends and factors that relate to a specific area of education. Helmer (1967), who is credited for developing the Delphi technique for the RAND Corporation during the 1940s and 50s, believed that in working to identify future trends could lead to better planning and influence of probability. For this study, the Delphi technique was used to inform policy makers, universities, and school districts with research to provide better training and professional development for their superintendents and administrators.

Delbecq, Van de Ven, and Gustafson (1975) identified five objectives that the Delphi technique is appropriate to be used in:

1. To determine or develop a range of possible program alternatives;
2. To expand or expose underlying assumptions or information leading to different judgments;
3. To seek out information which may generate a consensus on the part of the respondent group;
4. To correlate informed judgments on a topic spanning a wide range of disciplines, and;

5. To educate the respondent group as to the diverse and interrelated aspects of the topic. (p. 11)

The Delphi technique, as described by Helmer (1967) consists of a panel of experts that respond to the researchers questions independent and anonymous of the other panel experts. Helmer describes this as "the Delphi technique in its simplest form, eliminates committee activity among the experts altogether and replaces it with a carefully designed program of sequential individual interrogations (usually best conducted with questionnaires) interspersed with information and opinion feedback" (p. 7). This anonymity prevents dominant participants, common in many group processes, from having a negative impact on the study, such as intimidation, coercion, or manipulation (Dalkey, Rourke, Lewis, & Snyder, 1972). In addition to anonymity, controlled feedback is an essential component to the Delphi method. Hsu and Sandford (2007) discuss the importance of feedback provided to each respondent following each round of questioning and claim the feedback allows the respondents to reassess their initial decisions about the information provided in previous rounds. Hsu and Sandford also argue that feedback in the form of "a well organized summary of the prior iteration … allows each participant an opportunity to generate additional insights and more thoroughly clarify the information developed by previous iterations" (p. 2).

The Delphi technique was determined to be an appropriate research approach for this study and meets the three criteria described by Dalkey et al. (1972) which are: (a) the Delphi method is a forecasting methodology that will generate expert opinion on a given subject, (b) the study benefits from using informed subjective judgments, and (c) the method will allow the expert panel to play an active role in the development of the

survey. In addition to the Delphi technique, a phenomenological study consisting of in depth interviews of multiple superintendents was considered as a potential methodology. However, time constraints (both in the length of the study and time commitment of the superintendents) were found to not be as effective in meeting the purpose of the study, nor would it have been as effective in providing the type of data to reach consensus on answering the research questions.

This study used a Delphi panel of 14 experts, participating in three rounds of feedback to first identify the strategies experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years and then rank those strategies as to which has the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years. The study was designed for three rounds with a fourth to be used if it was required to reach consensus with the expert panel.

Population

"A population is a group of elements (people, objects, or events) that share common characteristics and meet specific criteria for which the researcher intends to generalize the results of the research" (McMillan & Schumacher, 2010, p. 129). This study used the Delphi methodology to forecast what California K-12 superintendents should do to position their school districts for the changing nature of technology in the next 10 years and "required the involvement of panelists who were exceptionally knowledgeable about the substantive area being examined" (Lauffer, 1982, p. 94). The population for this study was comprised of sitting superintendents in the state of California with knowledge of technology integration. Additionally, the population

identified had experience in developing policy, professional development, and resource management. In the state of California there are currently 1,028 school district superintendents and 58 county office of education superintendents.

Sample

The sample in this study was a panel of experts that were selected from current sitting K-12 superintendents from Northern California counties (Contra Costa, Alameda, Santa Clara, Merced, Marin, Sonoma, Solano, and Sacramento counties) with three or more years of experience and who have led technology integration projects within their districts. These counties were selected because of access to the participants and the diversity of school districts within the counties themselves. A homogeneous sampling technique was used to generate a list of experts to serve as panelists for the study. According to Patton (2002) homogeneous samples are used with focus groups to "bring together experts with similar backgrounds are experiences to participate in interviews on issues that affect them" (p. 236). Additionally, Skulmoski and Hartman (2007) found it to be important in a Delphi study to select a sample that is not based on a representation of the population but rather on an expert's ability to answer the research questions. Bourgeois, Pugmire, Stevenson, Swanson, and Swanson (2012) argue that a simple random sampling is not an adequate form in building a Delphi panel of experts. Expert panelists were selected for the sample using the following criteria: (1) expert panelists were nominated by one or more recognized professionals who are current or retired superintendents with five or more years of experience as district or county superintendents, (2) they have extensive knowledge of the role of the superintendent, (3) they have lead classroom technology integration with their districts or counties, (4) each

potential panelist expressed interest in participating in all three rounds of the Delphi study. The recognized professionals were asked to nominate expert panelists who met at least two or more of the selection criteria. These criteria were:

- Are currently or have held the position of superintendent three or more years.
- Demonstrated knowledge about classroom technology integration.
- Have delivered two or more professional development presentations, conference, workshops, or seminars on technology integration.
- Have written or helped develop policy for technology integration in their school districts or counties.

Selection and Size of Panel

Weatherman and Swenson (1974) determined that there was no optimal panel size when employing the Delphi technique. However, they found the more important factor than panel size is "having a sufficient number of representative experts" (p. 84). Delbecq et al. (1975) determined that a representative panel size of 10-15 experts are sufficient if the expert panel is homogeneous. Likewise, Ulschak (1983) found that most Delphi studies have a total panel size of between 15-20. A list of experts was compiled during the first phase of this research study. The sample size of the expert panel consisted of 16 (n=16) panel members. A sample size of 16 allowed for a mortality rate of three experts and still reach consensus. Once Brandman Institutional Review Board (IRB) approval was gained, the researcher contacted the recommended panelists by phone or email to invite them to participate in the study, provide them with a letter of informed consent including the participant safeguards, information regarding the purpose of the study,

directions for accessing the Google Forms, the timeline of the study, and a test form asking the panelists to complete demographic information (see Appendix A).

Data Collection

The Delphi technique is utilized to find group consensus from an anonymous panel of experts and avoid the challenges of face-to-face focus groups. To meet the requirements of IRB and to provide safeguards to the expert panelist participants, two steps were taken to ensure the anonymity of the panelists: (1) participants were not aware of the identities of the other panelists; and (2) responses by participants were not credited to a specific expert. While there are variations of the Delphi, this study used the most common technique, which uses a multi-step iterative process.

For this study, three rounds were conducted. Upon approval of the Brandman IRB, data was collected according to a predetermined process (see Table 1).

Table 1

Delphi Study Schedule

Round	Description of Activity	Timeline
Prior to Round 1	Email to provide informed consent, timeline for the study, expectations for participation, and a test form using Google Forms	January 15 - February 1, 2015
Round 1	Email with description of study's purpose, participation expectations, directions for accessing Round 1 input Google form, examples of responses (for purpose of illustration)	February 5 – February 23, 2015
Round 2	Email with directions for completing the Round 2 input Google Form for ranking the strategies as having the most influence identified in Round 1	February 23 - March 2, 2015

(continued)

Table 1

Delphi Study Schedule

Round	Description of Activity	Timeline
Round 3	Email with directions for completing Round 3 Input Google Form, directions for keeping or changing individual rankings provided in Round 2, provide each expert the median response of all participants to each Round 2 item, provide experts opportunity to make additional comments about any item from the rankings, phone interview with each expert panelist regarding their final responses	March 2 – March 6, 2015

Instrumentation

Prior to Round 1, panelists received an email with a cover letter of informed consent including the participant safeguards, information regarding the purpose of the study, directions for accessing the Google Forms, the timeline of the study, and a test form asking the panelists to complete demographic information (see Appendix B). This study utilized Google Forms as a survey instrument for collecting data and allowed the researcher to provide efficient and secure surveys and feedback to the participants and researcher. The test form was designed to simulate the survey forms to be used during each round of the Delphi. The test form was also used to ensure that participants understood the purpose of the study and the commitment they were making to it. Additional contact information was also gathered on this form to ensure all forms of communication were able to take place.

In addition to the Round 1 test form, a field test of the materials of the open ended Round 1 question and the subsequent Round 2 survey was conducted using Chief Technology Directors from three school districts in Contra Costa County. The intent of

the field test was to ensure that the questions were clear to all participants and would generate the data and response time necessary to conduct the first and second rounds of the study.

The Round 1 materials were delivered using email and Google Forms to each participating expert selected for the panel (see Appendix C). Panelists were asked to identify "what five strategies superintendents should use to position their districts for the changing nature of technology during the next 10 years?" Round 1 responses were reviewed by the researcher and arranged into a list of thematic categories. The list was edited by the researcher to combine substantially similar items into single statements and to eliminate vague or incomprehensible statements (see Appendix D). Clarifying questions were asked to expert panelists to further explain their responses to the Round 1 questionnaire. The Round 1 list was prepared into a survey instrument using a 6-point Likert scale in preparation for Round 2 responses and feedback.

For Round 2, each panelist received an email explaining the process as well as the survey for Round 2 (see Appendix E and F). The panelists' ranked the submissions from Round 1. A Likert scale of one to six (one being a low level of influence and six being a high level of influence) was used to rank the influence each option will have on positioning school districts for the changing nature of technology during the next 10 years. The mean for each Round 2 response was calculated. In addition, each expert's Round 2 rating was provided as feedback to each participant in Round 3.

Round 3 followed the same email protocol and directions as Round 1 and Round 2. Each panelist received the mean ranking for each Round 2 survey item and their own ranking for that same item. Panelists were then tasked with reviewing all the strategies

identified, their rankings of those strategies, and the mean score for all panelists on each item. The experts were then asked if they would like to make any changes to their previous ratings and were invited to make comments about their reasoning for their rankings (see Appendix G). Following Round 3, responses were recalculated and an updated list was provided to each expert participant (see Appendix H).

Data Analysis

The data from the Round 2 and 3 surveys utilized descriptive statistics and are presented for analysis in Chapter IV. The data presented consists of: (1) the trends or events that received the highest mean and median score, (2) the interquartile range of responses of the expert responses for the degree of influence and the percentage of scores that fell within that interquartile range, (3) the distribution of ratings from the top-ranked items and the lowest ranked items. For the purpose of this study, consensus was achieved when the interquartile range (IQR) was two or less. Jacobs (1996) states "the use of the median scores are best suited to reflect the resultant convergence of opinion" (p. 57).

Round 1 responses were collected and categorized with the use of Google Forms into a list of action or strategy items. Ambiguous or vague responses were clarified with the expert panel member that submitted the response. The final list of revised Round 1 items were provided to the expert panel in a Google Form to have them rank the items, using a 6-point Likert scale, to identify the level of influence it will have in positioning school districts to be prepared for the changing nature of technology in the next ten years. The Round 2 responses allowed the researcher to compute the mean and median scores for each element identified from Round 1. Additionally, in Round 3, the mean scores provided the expert panel the opportunity to see where their responses fell within the

distribution of ratings and ultimately provided the panelists feedback to inform them in their decision to change their answer or not. Also in Round 3, each expert panelist had the opportunity to provide the researcher comments on any of the survey items. Furthermore, using the mean and median scores led to the identification of consensus amongst the expert panel responses.

Limitations

The Delphi technique is widely used as a method for planning and forecasting. The Delphi allows a panel of experts to give input in a manner that is focused on a specific set of questions or a specific area. Participants also usually find the process useful and interesting (Weatherman & Swenson, 1974). Yet there are some limitations related to the completion of a Delphi study. Linestone and Turoff (1977), determined five key limitations to the Delphi technique:

1. Imposing monitor views and preconceptions of a problem upon the respondent group by over specifying the structure of the Delphi and not allowing for contribution of other perspectives related to the problem.
2. Assuming that Delphi can be a surrogate for all other human communications in a given situation.
3. Poor techniques of summarizing and presenting the group response and ensuring common interpretations of the evaluation scales utilized in the exercise.
4. Ignoring and not exploring disagreement so that discouraged dissenters drop out and an artificial consensus in generated.

5. Understanding the demanding nature of a Delphi and the fact that the respondents should be recognized as consultants and properly compensated for their time if the Delphi is not an integral part of their job function. (p. 6)

The limitations above generally pertain to any variation in the use of the Delphi technique. Additional limitations that apply to this particular study are noted below.

1. The forecasting of trends in the next 10 years require the expert panelists to make informed guesses about the future. Technology changes at a rapid rate. It may be difficult to accurately predict the impact of future technological innovation on classroom technology integration.
2. There is potential for bias amongst the group of expert panelists. In identifying the knowledge and skills that superintendents will need to create effective systems of classroom technology integration, the experts may have differing levels of knowledge in these areas. Events identified by them may reflect that bias. An attempt was made to minimize this affect by using recognized experts to nominate panelists. Additional steps were taken during the delivery of instructions for completing the surveys.
3. Other groupings of identified experts from other fields may result in different findings if a similar study were conducted.

Summary

Projections for what California's superintendents should do to position their districts for the changing nature of technology in the next 10 years was provided by individuals with expert knowledge in their fields. A descriptive design was used because the study was designed to look at which strategies will have the most influence on

positioning districts to effectively manage the evolution of technology over the next decade. The Delphi technique provided several possible outcomes and has been found in the literature to be useful in planning and forecasting. The data was collected from 14 currently sitting California school district superintendents with at least three years' experience and have lead technology integration projects within their districts. The criteria for the selection of panelists were established and each panelist was nominated from a recognized expert in their field.

The Delphi study consisted of a three round process. Round 1 provided the panelists the opportunity to identify what strategies superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years. Round 2, asked the panelists to rate the level of influence each strategy has on positioning districts to be prepared for the changing nature of technology in the next 10 years. During Round 3, panelists were given the chance to reconsider their responses from Round 2 and comment on any of the elements they have rated.

This Delphi study employed email and Google Forms to communicate during each round of the study. It was not necessary for the researcher to make direct contact either by phone or in face-to-face conversation. The trends identified by the experts will be discussed further in Chapter IV.

CHAPTER IV: RESEARCH, DATA COLLECTION, AND FINDINGS

Introduction

This chapter describes the findings from the data collected during the Delphi study process. Chapter IV includes the purpose of the study, the research questions, a description of the data collection process, a summary of the population and sample, and the presentation of data collected. This study used the Delphi technique to identify what K-12 superintendents should do to prepare their districts for the changing nature of technology during the next 10 years. To accomplish this, the Delphi study utilized a series of surveys and expert panel member feedback to reach consensus to answer the study's three research questions.

Purpose Statement

The purpose of this Delphi study is to identify what K-12 superintendents should do to position their districts to be prepared for the changing nature of technology in the next 10 years.

Research Questions

This study seeks to answer the following research questions:

1. What strategies do experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years?
2. Of the strategies identified in Research Question 1, how do experts rank them as having the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years?

3. What can superintendents do to prepare themselves to lead their districts in the strategies identified in Research Question 1 and 2 in order to position their districts to be prepared for the changing nature of technology in the next 10 years?

Research Methods and Data Collection Procedures

This study was designed to use an expert panel of K-12 superintendents with experience in technology integration to identify what strategies superintendents will need to do to prepare their districts for the changing nature of technology in the next 10 years. The expert panel was comprised of 14 K-12 superintendents from Northern California school districts who have served as a superintendent for three or more years and have experience with technology integration. Two recognized experts, who are experienced superintendents, advised the researcher on the selection of each panel member. In total, 30 superintendents were nominated for inclusion in the panel. Each nominated candidate was sent an invitation to participate in the Delphi study. Four superintendents declined to participate in the study. Nine superintendents did not respond to the invitation to participate. Sixteen superintendents accepted the invitation to participate. Throughout the study, participant's names were kept anonymous, except to the Delphi coordinator and the recognized experts. The researcher was known as the Delphi coordinator to the panelists.

Following the selection of the participants, each panelist was sent an introductory email with a cover letter of informed consent including the participant safeguards, information regarding the purpose of the study, directions for accessing the Google Forms, the timeline of the study, and a test form asking the panelists to complete

demographic information. One hundred percent of the panel members responded by completing the initial test form.

During Round 1, experts were asked to provide five strategies they believed superintendents should use to position their districts to be prepared for the changing nature of technology during the next 10 years. Responses were completed using a Google Form. A total of 74 strategies were contributed by the experts in Round 1. Fourteen of the 16 panelists responded to the Round 1 survey. Four of the participants provided more than five strategies.

The Round 1 responses were used to create a rating form for Round 2. Thirty strategies were developed from the responses submitted in Round 1. An email was sent asking each expert to rate the level of influence they believed each strategy would have on preparing districts for the changing nature of technology during the next 10 years. A link to the Round 2 form was provided in the email. The Round 2 form utilized a 6-point Likert scale to rate the level of influence. One hundred percent of the panelists from Round 1 responded to the Round 2 survey.

Round 2 data was organized and analyzed to determine the mean rating and interquartile range for each item. For Round 3, an email was sent instructing participants to review each strategy from Round 2 along with the mean rating of each item and each panelist's own rating for that same item. Panelists were invited to make changes to their Round 2 ratings. Changes were inputted on the Round 3 form. If panelists did not want to make any changes, it was requested that they respond to the email stating their intentions. Each of the 14 panelists responded to the Round 3 email. No panelists chose to make changes to their scores and confirmed with the researcher of their desire to keep

their ratings the same as in Round 2. The ratings from Round 3 are used for the analysis and findings in this chapter.

Population

The population for this study was comprised of sitting superintendents in the state of California with knowledge of technology integration. The population also had experience in developing policy, professional development, and resource management. In total, there are 1,086 county and district superintendents in the state of California.

Sample

The sample in this study was a panel of experts that will be selected from current sitting K-12 superintendents from Northern California counties (Contra Costa, Alameda, Santa Clara, Merced, Marin, Sonoma, Solano, and Sacramento counties) with three or more years of experience and who have led technology integration projects within their districts. A homogeneous sampling technique was used to nominate and select experts for the panel. Thirty superintendents from Northern California were identified by recognized professionals who are current or retired superintendents with five or more years of experience. The recognized experts were asked to nominate expert panelists who met at least two or more of the selection criteria. These criteria were:

- Are currently or have held the position of superintendent three or more years.
- Demonstrated knowledge about classroom technology integration.
- Have delivered two or more professional development presentations, conference, workshops, or seminars on technology integration.
- Have written or helped develop policy for technology integration in their school districts or counties.

Of the thirty identified superintendents, 16 superintendents accepted the invitation to participate in the study. Fourteen superintendents completed all three rounds of the study. Two superintendents that accepted the invitation to participate did not respond to any of the three rounds of the study.

Presentation and Analysis of Data

Research Question One

What strategies do experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years?

Research Question 1 was addressed during Round 1 of the Delphi process. Superintendents were asked to identify five strategies that would position their districts to be prepared for the changing nature of technology during the next 10 years. The expert panel identified 74 strategies in Round 1. The identified strategies were grouped into 12 categories based on the content and key words of the statement (see Table 2).

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Professional Development
1.1	School district need to nurture technological innovators by providing them time, resources and advanced professional development.
1.2	Provide training/PD so teachers have the ability to implement (teach) the CCSS technology standards.
1.3	Lead efforts to assure that technology's main purpose is to support teaching and learning. Provide differentiated professional develop that is ongoing with coaching support. Teachers are at many different levels in their use of technology. We need to support all levels and use teacher leaders to support others.

Note. No. = number

(continued)

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Professional Development
1.4	Change of this magnitude requires ongoing professional development delivered in varied formats and one that reflects best practices.
1.5	Staff development, teachers were trained and trained and trained. The IT staff did much of the professional growth work, but we also partnered with Cisco and took teachers on fieldtrips to see their innovative ideas, as well as other schools, autodesk, etc.
1.6	Employ additional support for teacher, such as tech coaches. Merely having devices will not bring long term sustainable change. This requires mentoring, support and feedback.
1.7	Use websites and videos showing our teachers using technology in the classroom.
1.8	Teacher coaches that work with other teachers to help them with tech in the classroom. Naviance, Aires, all of our systems now require parents and teachers to use the computer to access student information.
1.9	Time - create the time for teachers to learn, try and adapt their teaching pedagogy to include the integration of technology.
1.10	School systems must provide professional development for teachers, staff, and administrators in the use of technology so that its use is seamless at the school site and in the classroom.
1.11	Teachers need to be provided with quality time to collaboratively identify and share what is working in the classroom and to learn how to better utilize technology to personalize and improve student learning through the use of data analysis to diagnosis student progress.
1.12	Investigate professional partners which can support the Technology Plan's implementation and provide ongoing professional development, training and technical support to staff. We are currently partnering with three technology companies and the Sonoma County Office of Education for this support.
1.13	Sustaining technology and learning staff to support colleagues in upcoming technology applications and address infrastructure needs.
1.14	Professional development programs with a focus on the opportunities for transformational change in communication, student collaboration, curriculum and instructional strategies tied to the common core shifts. PD to understand and use tech tools (iPads, Chromebooks, apps, etc.) are secondary, but support the opportunities.

Note. No. = number

(continued)

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Stakeholder Buy-In
2.1	Began messaging the link between technology and instruction, we identified lead teachers that could model strategies and launched a marketing campaign.
2.2	Develop a clear and concise technology plan which includes the items listed above. Be sure to include teachers in the development of the plan and not just tech-savvy teachers. You need to have quality teachers that have good standing at the school or order to support the early adopters. You need to have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.
2.3	Involve the appropriate stakeholders to establish clear goals and objectives for both instructional technology and management technology.
2.4	Stakeholder involvement - The voices of those impacted by the change (including students) should be an integral part of the planning and feedback process.
2.5	Develop community partnerships to support efforts both for expertise and funding sources. Many businesses are able to support school district efforts.
2.6	Technology changes for student use must include parent education.
2.7	Eliciting youth insights for learning needs.
2.8	Applying Learning and ""Generations"" Research. Personalized learning and brain research examination and application by systems stakeholders. Understanding different needs of generations.
2.9	Set realistic expectations for all stakeholders.
2.10	Listen to all stakeholders to gather input and buy in.
2.11	Include parent education component so they understand that the tools and initiatives (such as 1:1) are an exciting opportunity for their students. Help parents be supportive of their student's learning.
	Purposeful Purchase of Technology
3.1	School district technology departments need to embrace that multiple platforms and devices will be accessing the network and prioritize instructional need as the driver of technology as opposed to ease of technology management.
3.2	Any school district purchase of technology has to be accompanied by a corresponding expenditure plan for technology support and professional development.
3.3	Identify sources of funding. Develop budget priorities that support infrastructure, new devices, replacement devices, and adequate levels of staff support.

Note. No.= number

(continued)

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Purposeful Purchase of Technology
3.4	Increase technology devices so there is access and provide access to a variety of devices (desktop, lap top, iPads, etc.).
3.5	Budgeted money with a long range plan for future expenditures so that the Board and the public knew that every year we would make large investments in technology in the classroom. We have demonstration classrooms for teachers and parents to tour so that we can keep the future in sight.
3.6	Flexibility - with today's operating systems, there is no reason to not offer teachers a choice of devices - who cares if you have a mixture of carts, pcs, chrome books or iPads? Hit early adopters hard by giving them what they need and then show casing their best practices.
3.7	Establish an ongoing budget to support the purchase, maintenance and life cycle replacement for technology.
3.8	The district should identify through the Budget Development Process the fiscal needs and resources required to implement the District Technology Plan and LCAP Goals. This may include specific categorical allocations like the CCSS Funding and Spending Grant (a percentage expenditure is required for technology) or under LCFF general fund allocations.
3.9	The district is required to develop a Five Year Facilities Master Plan which should include the infra-structure, facilities and hardware needs of the district (informed by the program plans) in order for appropriate funding to be designated for technology. Our district recently passed a general obligation bond and the implementation of technology was an identified expenditure for the bond measure and the bond will be used to improve and increase technology use in the district over the next 20 years.
3.10	Multi-year strategic planning for learning that incorporates ubiquitous technology use for personalized learning.
	Investments in Infrastructure
4.1	School districts need to invest in network infrastructure that will flex and grow with increasing usage.
4.2	Assure that adequate infrastructure is in place to support the growing demand. This requires long range planning to support not just current needs but plan for future demands like increased bandwidth. This requires technical expertise beyond the superintendent's level but it is the responsibility to make sure this is addressed.
4.3	We made sure the infrastructure was in place to move forward, Comcast partnered with our District to lay the cable more than five years ago, for free.

Note. No. = number

(continued)

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Purposeful Purchase of Technology
4.4	Develop an ongoing funding source to adjust and meet the ever changing technology demands for your district - this includes the pipeline, wireless, technology devices (i.e., iPads, Chromebooks, Apple TV, etc.) and professional development.
4.5	An intentional plan to address the purpose, infrastructure needs and funding stream is of critical importance.
4.6	Budget for infrastructure maintenance and improvements, devices and PD.
4.7	Strong infrastructure support, with a particular focus on the network and wireless access. The wireless must be robust enough for uninterrupted high data demand.
	Policy
5.1	Because the use of technology is ubiquitous throughout society on a 24/7 basis, school systems must make provisions for students to ""Bring Their Own Device"" to school.
5.2	The district should have a current Strategic Plan which has three to five year goals for the district and technology should be a focal area of the Strategic Plan. In our district the Board of Trustees adopts annual goals in the five strategic goal areas of the district and in areas of governance. Technology goals are stand alone goals in the governance section of the plan and integrated in the other five strategic goal areas.
5.3	Establish Digital Citizenship Policies and Procedures. The digital world changes so rapidly, school system policies must be established to teach the rules and norms for the use of technology by students and staff and they must be reviewed and updated often to reflect those changes.
5.4	There should be a program plan specific to the implementation of technology in the district (District Technology Plan) which specifies goals and actions aligned with industry and educational standards for technology. This would include operational, managerial and instructional technology, equipment and materials, professional development and training and a staffing plan for the plan's implementation. This program plan and its goals and expenditures should be incorporated into the district's LCAP.
5.5	Implementation plans must include the infrastructure to sustain and a professional development/support plan for the "implementers" - teachers and support staff.
5.6	Governance team capacity building … a school board that is proactively informed about technology trends.

Note. No. = number

(continued)

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Policy
5.7	Work with the governing board to develop polices to address student and staff use of technology that promote responsible use and provide an appropriate level of security.
	Leadership
6.1	Create a compelling vision- Help staff and parents understand the changing landscape of the world students inhabit and the world of work for which they need to be prepared.
6.2	Leading from the middle
6.3	Create a System-wide Vision and Specific Goals for the Use of Technology. School systems must establish a clear vision and framework as to how technology will be utilized as an engaging learning tool to accelerate learning both at the school site and outside the school gates after school hours. "
6.4	Clear hurdles--after gathering input and setting expectations the leadership needs to clear all of the hurdles for everyone to achieve success.
6.5	Root work with technology in District mission, vision and LCAP goals. Have the end in mind with "experimenting" with or piloting new strategies and tools.
6.6	Develop leadership capacity of teacher-leaders to innovate, take risk, share findings and lead others. Have structures for communication and involve teachers/practitioners in decision-making.
	Mindset
7.1	Cultivating an inquiry mindset at all levels of the organization.
7.2	The attitude and mindset of the organization is essential for long-term success. Carol Dweck's work on growth mindset has had a profound impact on the way our District has approached the changing nature of technology.
7.3	Cultivating adaptive mindsets.
7.4	View technology as a tool, but the solution.
	Curriculum
8.1	School districts need to make sure that technology is driven by a curricular need as opposed to technology being the driver.
8.2	Focus on 4 Cs for students and adults. Create a learning organization.
8.3	Cyber citizenship to be included from the beginning use of technology. Students need help in understanding use/abuse of technology. Issues of academic integrity, effects of social media, cyber bulling cannot be assumed or regulated by network controls.
8.4	Increase teacher understanding of CCSS technology expectations in math and ELA.

Note. No. = number

(continued)

Table 2

Strategies Identified in Round 1 by the Expert Panel

Item No.	Strategy
	Personnel
9.1	Hire a Chief Technology Officer as a cabinet level position.
9.2	Higher well--put strong people in the decision-making roles.
9.3	Employ staff who are current/forward thinking in the use of technology for the purpose of enhancing teaching and learning. Must have the lens of technology as a tool, not an end.
9.4	It is also essential to continue to have district staff whose job descriptions and responsibilities are meeting the changing demands of technology reporting and instructional implementation. Most districts will need to systematically increase their technology personnel over the next ten years to systems teams, which will be a shift for the school house from a skeletal technology crew and operational "gophers" to situational problem solvers.
	Assessment
10.1	There should be a continuous assessment of the district's "technology readiness", use and needs and aspirations. Assessments should be provided to staff, student and parents/guardians to inform the development of the district's program plans. LCAP and professional development plan. Our district participates in the Bright Bytes "technology readiness" survey and also assesses readiness through the site SPSA/LCAP surveys.
10.2	Environmental Scanning and Sharing. Sharing on-going awareness of education, world and college/career trends with stakeholders.
10.3	Investigate, study, and know what is trending, where things are headed, and where the district has been.
	Culture
11.1	Communicate the expectations that the educators are expected to model technology use expectations.
11.2	Creating a culture that is collaborative.
11.3	Creating a culture that supports risk taking, exploration and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.
	Equity
12.1	Ensure equal student and parent access to the technology

Note. No. = number

Of the data, the top three categories that strategies were grouped in were *professional development*, *stakeholder buy-in*, and the *purposeful purchase of technology*.

Each of these categories received 10 or more responses. In contrast, *assessment*, *culture and equity* received the fewest number of responses during Round 1. Thirty strategies from the list of 74 were included in Round 2. The researcher eliminated strategies for the following reasons:

1. The strategy was repetitive or represented a minor variation or a strategy selected for Round 2.
2. The strategy was vague or unclear in how it would prepare school districts for technology integration.
3. The strategy was excessively complex and would require additional supporting explanation.
4. The statement combined multiple strategies.

Many of the strategies contributed to Round 1 were repetitive and expressed the same concepts that were included in other strategy statements. Of the 14 strategies identified in the category of professional development, eight were found to include the concept of *providing teachers time, resources,* and *professional development*. Additionally, three professional development statements included the strategy of *providing technology coaches*. Table 3 displays the categories and the frequency of the responses.

Table 3

Round 1 Strategies Grouped by Category and Frequency

Category	Frequency
Professional Development	14
Stakeholder Buy-in	11
Purposeful Purchase of Technology	10
Investments in Infrastructure	7

Note. n = 74 (continued)

Table 3

Round 1 Strategies Grouped by Category and Frequency

Category	Frequency
Curriculum	4
Personnel	4
Assessment	3
Culture	3
Equity	1

Note. n = 74

As a result of these repetitive statements, the final Round 2 statements for professional development were narrowed to three items. In contrast, the strategies in the category of purposeful purchase of technology each were found to have distinct characteristics that did not allow them to be combined with other statements. Each of the 12 categories were represented with at least one strategy in the final Round 2 survey. Table 4 shows the breakdown of the number items selected for Round 2 by category and their frequency.

Table 4

Number of Round 2 Items by Category

Strategy	Frequency
Professional Development	3
Stakeholder Buy-in	5
Purposeful Purchase of Technology	7
Investments in Infrastructure	1
Policy	2
Leadership	1
Mindset	1
Curriculum	2
Personnel	3
Assessment	2
Culture	2
Equity	1

n = 30

In developing the wording for the Round 2 strategies, an effort was made to keep the statements as true to the strategies provided by the panel during Round 1. Additionally, there was an attempt to keep all statements to thirty words or less. Four of the Round 2 statements were longer than 30 words, but less than 40 words.

Research Question Two:

Of the strategies identified in Research Question 1, how do experts rank them as having the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years?

Round 2 of the Delphi study asked panelists to rate the level of influence each strategy identified in Round 1 would have on preparing school districts for the changing nature of technology in the next 10 years. Round 2 consisted of 30 strategies identified from the Round 1 statements. Panelists were asked to rate each strategy, using a 6-point Likert scale, on the level of influence it would have on positioning school districts to be prepared for the changing nature of technology during the next 10 years. A rating of one on the Likert scale represented the lowest level of influence. A rating of six on the Likert scale indicated the highest level of influence. On-hundred percent of the 14 panelists that responded to Round 1 also responded to Round 2. Only one panelist did not provide a rating to every item. Thirteen of the panelists rated each of the 30 strategies. These items can be seen in Table 5.

Table 5

Round 2 Strategies

Item No.	Round 2 Strategies
1	Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos).
2	Have coaches and IT staff provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication.
3	Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage.
4	School district technology departments need to embrace that multiple platforms and devices that will be accessing the network and prioritize instructional need as the driver of technology as opposed to ease of technology management
5	Any school district purchase of technology has to be accompanied by a corresponding expenditure plan for technology support and professional development
6	Identify sources of funding. Develop budget priorities that support infrastructure, new devices, replacement devices, and adequate levels of professional development.
7	Transparently budget money with a long range plan for future expenditures so the Board and public know that every year large investments are made for technology in the classroom.
8	Give early adopters what they need and showcase their practices.
9	School systems must establish a clear vision and framework as to how technology will be utilized as an engaging learning tool to accelerate learning both at the school site and outside the school gates after school hours.
10	Create a parent education program so parents can understand that the technology tools and initiatives are an exciting opportunity to support their student's learning.
11	Begin messaging the link between technology and instruction. Identify lead teachers that could model strategies and launch a marketing campaign.
12	Involve all stakeholders in the development of a technology plan with clear and concise goals and objectives.
13	Have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.

Note. No. = number

(continued)

Table 5

Round 2 Strategies

Item No.	Round 2 Strategies
14	Focus on the 4 Cs (Critical Thinking, Collaboration, Communication, and Creativity) for students and adults to create a learning organization.
15	Increase teacher understanding of CCSS technology expectations in math and ELA.
16	School systems must create policy and make provisions for students to "Bring Their Own Device" to school.
17	Work with the governing board to develop polices to address student and staff use of technology that promote responsible use and provide an appropriate level of security.
18	Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.
19	Cultivate a growth mindset at all levels of the organization.
20	Hire a Chief Technology Officer as a cabinet level position.
21	Ensure equal student and parent access to the technology and technology education.
22	The district should identify, through the Budget Development Process, the fiscal needs and resources required to implement the District Technology Plan and LCAP Goals.
23	Develop a Five Year Facilities Master Plan which should include the infrastructure, facilities and hardware needs of the district in order for appropriate funding to be designated for technology.
24	The district should have a current Strategic Plan which has three to five year goals for the district and technology should be a focal area of the Strategic Plan.
25	Hire high quality district staff whose job descriptions and responsibilities are meeting the changing demands of technology reporting and instructional implementation.
26	Districts will need to systematically increase their technology personnel over the next ten years to systems teams, which will be a shift for the school house from a skeletal technology crew and operational "gophers" to situational problem solvers.
27	Implement continuous assessment of the district's "technology readiness", use, needs, and aspirations.
28	Teach students cyber citizenship from the first use of technology.

Note. No. = number

(continued)

Table 5

Round 2 Strategies

Item No.	Round 2 Strategies
29	Conduct ongoing environmental scans to gain awareness of trends with stakeholders, education, technology, and college/career.
30	Identify and remove barriers to technology integration as identified by the collective feedback of all stakeholders.

Note. No. = number

Following Round 2, the mean, median, and interquartile range were calculated for each strategy item. Table 6 displays the mean, median, and interquartile range scores for each item for both Round 2 and Round 3. No mean score was less than 4 (strategy 13) nor higher than 5.64 (strategies 2 and 18). The highest median rating was 6 (strategies 1, 2, 3, and 18) and the lowest rating was 4 (strategies 4, 10, 11, 13, 17, 26, 27, and 29). Eight strategies had a mean score of five or greater (strategies 1, 2, 3, 6, 8, 18, 19, and 28). The lowest interquartile range was .25 for strategy 18. Most scores had an interquartile range of two or less. Four strategies had interquartile range scores of greater than two (strategies 5, 17, 20, and 21).

Table 6

Round 2 and 3 Ratings with Mean, Median, and Interquartile Range

Strategy	Round 2 Mean	Round 3 Mean	Round 2 Median	Round 3 Median	Interquartile Range
Strategy 1	5.36	5.57	6	6	1
Strategy 2	5.64	5.64	6	6	1
Strategy 3	5.62	5.62	6	6	1
Strategy 4	4.79	4.70	4	4	2
Strategy 5	4.71	4.71	5	5	2.25
Strategy 6	5.38	5.38	5	5	1
Strategy 7	4.86	5.00	5	5	1.25
Strategy 8	5.07	5.07	5	5	1.25

(continued)

Table 6

Round 2 and 3 Ratings with Mean, Median, and Interquartile Range

Strategy	Round 2 Mean	Round 3 Mean	Round 2 Median	Round 3 Median	Interquartile Range
Strategy 9	4.79	4.79	5	5	1
Strategy 10	4.36	4.29	4	4	1
Strategy 11	4.43	4.43	4	4	1
Strategy 12	4.93	4.93	5	5	2
Strategy 13	4.00	4.00	4	4	1.5
Strategy 14	4.64	4.64	5	5	1
Strategy 15	4.77	4.77	5	5	1
Strategy 16	4.07	4.22	4.5	4.5	2
Strategy 17	4.08	4.15	4	4	2.5
Strategy 18	5.64	5.64	6	6	0.25
Strategy 19	5.07	5.07	5	5	1.25
Strategy 20	4.50	4.50	5	5	2.25
Strategy 21	4.64	4.79	5	5	2.25
Strategy 22	4.86	4.86	5	5	2
Strategy 23	4.62	4.69	5	5	1.5
Strategy 24	4.57	4.64	5	5	1.25
Strategy 25	4.93	4.93	5	5	2
Strategy 26	4.36	4.36	4	4	1
Strategy 27	4.36	4.36	4	4	1
Strategy 28	5.14	5.14	5	5	1.25
Strategy 29	4.21	4.09	4	4	2
Strategy 30	4.50	4.50	4.5	4.5	1

Four strategies were found to have both the highest mean rating and the highest median rating. Strategy 2: Have coaches and IT staffs provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication, and Strategy 18: Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and

learning, both had the highest mean (5.64) and median (6) ratings. Strategy 3: Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage, was the next closest mean ratings (5.38) and also had a median rating of 6. Strategy 1: Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos), was the only other strategy rated with a median higher than 5 (5.38) and a median of 6. In contrast, the strategy with the lowest mean rating (4) and median (4) was Strategy 13: Have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability. Two strategies are from the Professional Development grouping, also the largest grouping of strategies identified in Round 1. Additionally, one strategy each was identified from the category of Culture and Investment in Infrastructure. The four strategies with both the highest mean and median ratings as well as having an interquartile range of less than two are displayed in Table 7.

Table 7

Round 3 Highest Mean and Median Ratings

Item No.	Strategy	Mean	Median	Interquartile Range
18	Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.	5.64	6	0.25
2	Have coaches and IT staffs provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication.	5.64	6	1

Note. No. = number

(continued)

Table 7

Round 3 Highest Mean and Median Ratings

Item No.	Strategy	Mean	Median	Interquartile Range
3	Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage.	5.62	6	1
1	Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos).	5.57	6	1

Note. No. = number

During Round 3 of the Delphi process, four experts changed their ratings to items from Round 2. Ten experts chose to keep their ratings as they were without making any changes in Round 3. There were no changes to any of the median ratings or the interquartile range as a result of changes to the ratings of strategies during Round 3. The mean rating for strategy one increased to 5.57 during Round 3. One superintendent raised their rating of Strategy 7, which raised the mean to 5.00. Also, during Round 3, on expert lowered their rating to reflect the mean scores of the other panelists. This lowered the mean rating for Strategy 4 to 4.70. The mean rating for strategy 10 was also lowered to 4.29 because the expert stated that other identified priorities were of higher value. Three experts changed their ratings to Strategy 16. One expert lowered their rating to match the mean score. Of the other two other experts, one raised their rating from a two to a four and the other raised their rating from a three to a five. This raised the mean for the strategy to 4.22. For Strategy 17, one expert changed their rating from a one to a two resulting in an increase in the mean score to 4.22. Strategy 21 increased during Round 3 (4.79) due to one expert raising their rating from a three to a five. One expert raised their ratings on both Strategies 23 and 24 from a three to a four resulting in the mean rating

increasing to 4.69 and 4.64 respectively. The final change in the mean ratings in Round 3 was to Strategy 29. One expert changed their rating to reflect other higher priorities. This resulted in the mean rating lowering to 4.09.

Research Question Three

What can superintendents do to prepare themselves to lead their districts in the strategies identified in Research Question 1 and 2 in order to position their districts to be prepared for the changing nature of technology in the next 10 years?

The purpose of each round of the Delphi process was to reach consensus on what superintendents can do to prepare themselves and their districts for the changing nature of technology in the next 10 years. In each round, strategies were identified and grouped together by theme.

Strategy 18 specifically had the highest overall ratings of mean and median as well as the lowest interquartile range (.25). Strategy 18 states: Superintendents should "create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning" (see Table 8).

Table 8

Highest Mean and Median Ratings by Category

Item No.	Strategy	Round 1 and 2 Category
18	Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.	Culture

Note. No. = number

(continued)

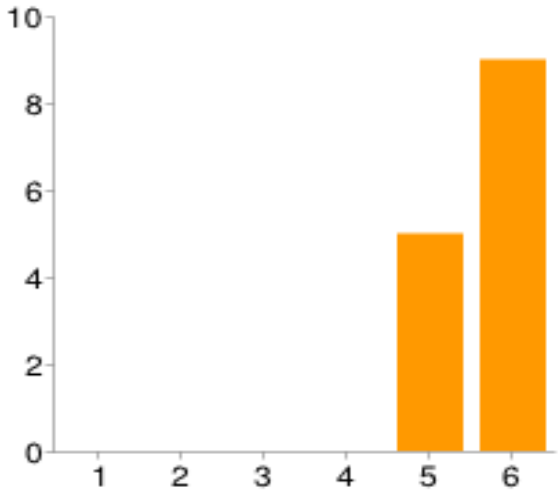
Table 8

Highest Mean and Median Ratings by Category

Item No.	Strategy	Round 1 and 2 Category
2	Have coaches and IT staffs provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication.	Professional Development
3	Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage.	Investment in Infrastructure
1	Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos).	Professional Development

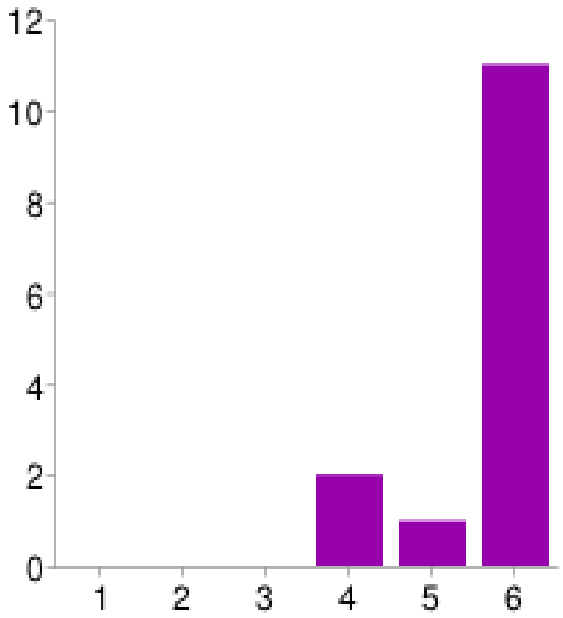
Note. No. = number

Likewise, Strategy 2 states: "Have coaches and IT staff provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication," and it had the highest frequency of the expert panel submitting a rating of 5 or 6 with no panelist rating this item lower than a 5 (Figure 2). Strategy 18 had the most number of panelists rating it as a six. However, it also had two panelists that rated the strategy as a four (Figure 3).



1	0	0%
2	0	0%
3	0	0%
4	0	0%
5	5	36%
6	9	64%

Figure 2. Strategy 2 Frequency of Ratings, *n = 14.* Strategy 2 had the highest frequency of ratings of all strategies with a 5 or a 6.



0	0%
0	0%
0	0%
2	14%
1	7%
11	79%

Figure 3. Strategy 18 Frequency of Ratings, *n* = 14. Strategy 18 had the highest frequency of a rating of 6.

In addition to the consensus found in the top four strategies, Strategy 6 had the next highest combined mean, median, and interquartile range score. Strategy 6 was identified as being in the Purposeful Purchase of Technology category (see Table 9).

Table 9

Strategy 6 Mean, Median, and Interquartile Range

No.	Strategy	Mean	Median	Interquartile Range
6	Any school district purchase of technology has to be accompanied by a corresponding expenditure plan for technology support and professional development	5.38	5	1

Note. No. = number

Of the four strategies which were deemed least influential for superintendents to prepare themselves and their districts for the changing nature of technology in the next 10 years, two were from the category of Stakeholder Buy-in, one was from the category of

Assessment, and the other was from the category of Policy. Strategy 17, also from the category of Policy, was not included in this list as consensus was not reached by the expert panel. Strategy 17 had an interquartile range score of 2.25. In their comments provided in Round 3, one expert stated that they believed Board policies were important, but were not the driving force for technology integration. Similar comments were made for both Strategy 10 and Strategy 16. Table 10 displays the four strategies with the lowest mean ratings.

Table 10

Round 3 Strategies with the Lowest Combined Mean, Median, and Interquartile Range

Item No.	Strategy	Mean	Median	Interquartile Range
13	Have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.	4	4	1.5
29	Conduct ongoing environmental scans to gain awareness of trends with stakeholders, education, technology, and college/career.	4.09	4	2
16	School systems must create policy and make provisions for students to "Bring Their Own Device" to school.	4.22	4.5	2
10	Create a parent education program so parents can understand that the technology tools and initiatives are an exciting opportunity to support their student's learning.	4.29	4	1

Note. No. = number

Summary

The analysis of the data was structured to address the three research questions in this study. Fourteen recognized experts of currently sitting superintendents from Northern California participated in each round of this Delphi study. The expert panel was asked to identify strategies that superintendents should do to prepare their districts for the changing nature of technology in the next 10 years. During Round 1, the expert panel identified 74 strategies that addressed Research Question 1. That list was then categorized by theme and narrowed to a list of 30 strategies by the researcher. During Round 2, the expert panel was asked to rate those 30 strategies on a 6-point Likert scale. The mean, median, and interquartile range scores were calculated from the expert panel responses. In Round 3, each expert was provided the opportunity to review their ratings for each item as compared to the mean ratings of the entire expert panel. Experts were then provided the opportunity to change their ratings. Four experts chose to change their ratings while eight experts kept their ratings as they were from Round 2. The Delphi process used for Round 2 and Three also served to address Research Questions 2 and 3.

Four strategies emerged with the highest mean and median ratings with an interquartile range of less than two. These strategies were identified as being part of the categories of Professional Development, Investment in Infrastructure, and Culture. In contrast, the four lowest mean and median ratings were determined to be from the categories of Stakeholder Buy-in, Assessment, and Policy. An additional strategy (strategy 17) also ranked in the lowest scoring mean and median, but had an interquartile range of larger than two (2.25).

CHAPTER V: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

Education in California, and the US at large, is in the midst of a crossroads. For several decades, the educational system has cycled through reforms to make it competitive in the global economy. Yet despite decades of time, billions of dollars, and complex systems of policy, schools look largely as they did a century ago (Christensen et al., 2011). The global marketplace is demanding that students enter the workforce with 21st Century Skills with the ability to collaborate, problem solve, and communicate. In addition to these skills, business leaders have identified the need for their employees to be able to effectively utilize technology to engage in these new skills.

As a result of this shift, superintendents, district administrators, and principals have been given the responsibility of leading change within their districts. Leaders must develop strategies to embed technology tools in the classroom to teach students skills of collaboration, problem solving, and communication. School districts have struggled to meet the demands to more effectively prepare their students. The evolving nature of technology has greatly outpaced school district's ability to prepare students for the modern workplace. This has led to tremendous waste in spending on ineffective professional development, lost time, and technology devices, tools and resources. Districts are attempting to develop strategies for addressing the evolution of technology, but they are often found to be obsolete by the time they are implemented.

Superintendents are expected to lead their districts through the complexities of how reform, accountability, collaboration, policy development, culture building, content, pedagogy, and technology all intersect and more importantly, interact in various settings. Understanding how superintendents can prepare their districts for the rapidly evolving

nature of technology in the coming decade can ensure that schools and districts are able to prepare their students for the demands of the 21st century workplace.

Purpose Statement

The purpose of this Delphi study was to identify what K-12 superintendents should do to position their districts to be prepared for the changing nature of technology in the next 10 years.

Research Questions

This study sought to answer the following research questions:

1. What strategies do experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years?
2. Of the strategies identified in Research Question 1, how do experts rank them as having the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years?
3. What can superintendents do to prepare themselves to lead their districts in the strategies identified in Research Question 1 and 2 in order to position their districts to be prepared for the changing nature of technology in the next 10 years?

Methodology

This study was designed to use an expert panel of K-12 superintendents with experience in technology integration to identify what strategies superintendents will need to do to prepare their districts for the changing nature of technology in the next 10 years.

The Delphi technique was used because it allows educators to identify trends within specific concentrated areas of education (Yousuf, 2007). Consistent with Olaf Helmer's 1967 model of a Delphi Study, an expert panel comprised of 14, K-12 superintendents from Northern California school districts responded to three rounds of surveys independent of each other. Two recognized experts, who are experienced superintendents, advised the researcher on the selection of each panel member. In total, 30 superintendents were nominated for inclusion in the panel. Sixteen superintendents accepted the invitation to participate. Of those 16, 14 superintendents completed all three rounds of the study.

During Round 1, experts (n = 14) were given an open ended question which asked them to provide five strategies they believed superintendents should use to position their districts to be prepared for the changing nature of technology during the next 10 years. Responses were completed using a Google Form. The experts in Round 1 contributed a total of 74 strategies. Four of the participants provided more than five strategies. The Round 1 data was organized into 12 categories, which assisted the researcher in creating the Round 2 form. The Round 2 form was made up of 30 strategies selected from each of the categories identified in Round 1.

For Round 2, the expert panelists were asked to rate the level of influence they believed each strategy would have on preparing districts for the changing nature of technology during the next ten years. The Round 2 form utilized a 6-point Likert scale to rate the level of influence. One hundred percent (n = 14) of the panelists from Round 1 responded to the Round 2 survey.

Round 2 data was organized and analyzed to determine the mean rating and interquartile range for each item. For Round 3, participants were instructed to review each strategy from Round 2 along with the mean rating of each item and each panelist's own rating for that same item. Panelists were invited to make changes to their Round 2 ratings. Each of the 14 panelists responded in Round 3. Four panelists chose to make changes to their scores. The remaining 10 experts confirmed with the researcher of their desire to keep their ratings the same as in Round 2.

Population

The population for this study was comprised of sitting superintendents in the state of California with knowledge of technology integration, experience in developing technology policy, professional development, and resource management. At the time of this study, there were 1,086 county and district superintendents in the state of California.

Sample

The sample in this study was a panel of experts that were selected from current sitting K-12 superintendents from Northern California counties (Contra Costa, Alameda, Santa Clara, Merced, Marin, Sonoma, Solano, and Sacramento counties) with three or more years of experience and who have led technology integration projects within their districts. A homogeneous sampling technique was used to nominate and select experts for the panel. Thirty superintendents from Northern California were identified as meeting at least two or more of the selection criteria. Of the 30 identified superintendents, 16 superintendents accepted the invitation to participate in the study. Fourteen superintendents completed all three rounds of the study. Two superintendents

that accepted the invitation to participate did not respond to any of the three rounds of the study.

Major Findings

When examining the body of research it becomes clear that the superintendent is important to the any efforts to integrate technology into the classroom. However, there remains a gap in the literature in understanding how superintendents prepare themselves and their districts for the changing nature of technology. Similarly, the role of the superintendent as it relates to technology integration needs to be further examined. It was found in the research of the literature review that a majority of superintendents do not feel it is their role to understand technology integration nor do they possess and skill to make decisions about how to best prepare their districts for the changing nature of technology.

Research Question One

Research Question 1 asked: *What strategies do experts believe superintendents should use to position their districts to be prepared for the changing nature of technology in the next 10 years?*

During Round 1 of the Delphi Study process, the expert panel was asked to identify five strategies that would position their districts to be prepared for the changing nature of technology during the next ten years. The expert panel identified 74 strategies that were grouped into 12 thematic categories. The three most frequent strategies received 10 or more responses. Those strategies were:

1. Professional Development (n = 14)
2. Stakeholder Buy-in (n = 11)

3. Purposeful Purchase of Technology (n = 10)

In contrast, the three strategies receiving the fewest responses were:

1. Equity (n = 1)
2. Culture (n = 3)
3. Assessment (n = 3)

Many of the strategies submitted in Round 1 were repetitive with other submitted items. Once these items were consolidated, 30 strategies, at least one from each of the 12 categories, were selected to include in the Round 2 survey. Of the strategies in the professional development category, eight strategies focused on providing time and resources to teachers and three strategies focused on providing coaches. This allowed the researcher to limit the number of Round 2 strategies to three. The category with the most unduplicated items represented in Round 2 was the Purposeful Purchase of Technology.

There were two unexpected findings in answering Research Question 1. First, were the low number of strategies identifying Culture (n=3) as something superintendents should do to position their districts to be prepared for the changing nature of technology in the next ten years. The literature review in Chapter 2 found school and district culture to be a very important element to technology integration in the classroom (Schrum et al., 2011). It is interesting to note that while Culture was among the fewest Round 1 strategies, it was highest scoring combined mean and median ratings in Round 2.

The second unexpected finding was in how Stakeholder Buy-in had the second highest number of identified strategies in Round 1 but was among the lowest combined mean and median ratings in Round 2. The primary reason that this serves as an unexpected finding is that the literature review found stakeholder buy-in to be central to

identifying meaningful professional development as well as building a strong school and district culture.

Research Question Two

Research Question 2 asked: *Of the strategies identified in Research Question 1, how do experts rank them as having the most influence in positioning school districts to be prepared for the changing nature of technology in the next 10 years?*

The expert panelists rated each of the 30 Round 2 strategies on level of influence using a 6-point Likert scale (one being a low level of influence and six being a high level of influence). The mean, median, and interquartile range were calculated for each strategy. During Round 3, each expert was asked to review their ratings in comparison to the mean rating of the group. Four experts chose to make changes to their scores in Round 3. These changes did impact the mean and median ratings of the group. They however had no impact on the interquartile range.

Following the Round 3 changes, four strategies were found to have the highest combined mean and median ratings. Additionally, the interquartile range ratings for each of the four strategies was less than two:

1. Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.
2. Have coaches and IT staffs provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication.

3. Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage.
4. Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos).

Likewise, four strategies were identified as having the least amount of influence and received the lowest combined mean and median ratings and had an interquartile range rating of less than two:

1. Have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.
2. Conduct ongoing environmental scans to gain awareness of trends with stakeholders, education, technology, and college/career.
3. School systems must create policy and make provisions for students to "Bring Their Own Device" to school.
4. Create a parent education program so parents can understand that the technology tools and initiatives are an exciting opportunity to support their student's learning.

Research Question Three

Research Question 3 asked: *What can superintendents do to prepare themselves to lead their districts in the strategies identified in Research Question 1 and 2 in order to position their districts to be prepared for the changing nature of technology in the next 10 years?*

Of all the strategies identified, strategy 18 had the highest mean (5.64), median (6), and interquartile range (.25). Additionally, of the Round 1 and 2 thematic categories, Culture, Professional Development, and Investment in Infrastructure were the highest rated categories. Additionally, Strategy 2 had the highest frequency of experts submitting a rating of five or six. On Strategy Two, no expert rated the item less than five. Likewise, strategy 18 had the highest number of experts that rated the item with a six (11). The least influential strategies identified were from the Stakeholder Buy-in, Assessment, and Policy. This is largely due to superintendents, while viewing each of these categories as necessary; they are not what drive successful technology integration. Additionally, superintendents may view Stakeholder Buy-in as being different than Stakeholder Feedback for building culture and creating professional development. Superintendents may also view Stakeholder Buy-in as a secondary result of building culture and quality professional development. In addition to the four strategies with the lowest influence, Strategy 17 also had very low mean and median ratings, but no consensus was found on the item with an interquartile range of 2.25.

Conclusions

The purpose of this study was to understand what superintendents can do to position themselves and their districts to be prepared for the changing nature of technology during the next ten years. Based on the findings of this study, superintendents need to focus their districts on three distinct areas:

1. Culture
2. Professional Development
3. Investment in Infrastructure

Culture

First and foremost, superintendents must establish a culture and climate that is safe for teachers and administrators to collaborate, take risks, and encourages innovation. Without this foundation, technology integration will not be effective in leading students to be proficient in 21st Century Skills. Too often, administrators and teachers are punished for taking risks or thinking differently about how their school and classrooms are run. Ultimately, as Horn and Evans (2013) found, this leads to a culture of compliance rather than one of innovation. When culture is ignored, technology integration, and more importantly, organizational change cannot be successful. In order to have a school and district that fosters innovation there must be a change in mindset in how superintendents, district administrators, principals, and teachers all view mistakes. Rather than failure, mistakes need to be seen as an opportunity for growth. New ideas must be accepted and tested. This will only take place with the establishing of a positive culture that is inclusive of all stakeholders.

Specifically as it relates to technology integration, a superintendent must be mindful of the influence their leadership has on a teacher's efficacy and their sense of feeling safe to try new strategies and approaches to teaching and learning. The importance of this is in the effect seen on students. The adult culture or a district or school site will act as a ceiling for student culture. If there is adult resistance to change and growth, it can be expected to see it reflected in student attitudes and performance. Compliance does not equal engagement. That rings true for administrators, teachers, and students alike. Bringing alignment between the values of the leadership, teachers, and students can bring about powerful learning outcomes for each level of the organization.

Professional Development

To support teachers and administrators in this change in culture, meaningful professional development must be provided. This includes providing the necessary time and resources to do the work teachers are learning about. Districts will be best served by developing a professional development model that caters to the individual needs and contexts of each teacher and administrator. Additionally, training should come from in-district coaches and IT staff and focus on technology's impact on student and teacher collaboration, curriculum, pedagogy, and communication. Accomplishing this means that superintendents and districts will align professional learning with the values, beliefs and strategies of their teachers.

There are two key areas that must be addressed here. First, professional development at the district level needs to be a customized approach and structure to learning for each individual. Teacher needs must be identified by the teacher's themselves rather than top down approach which has been so predominate for the past several decades. When there is a disconnect between what teachers identify as their needs and what a district provides, it is not likely that any professional development will be effective.

The second area to address is for technology professional development to be meaningful and to be provided within the context in which each teacher instructs. Superintendents, district administrators, and principals must provide their teachers with models that align with the ongoing work within teacher's classrooms. Likewise, professional development must support the goals and values of the organization itself.

When professional development is targeted and purposeful, there is a greater likelihood of sustained implementation having an increased positive impact on student learning.

Investment in Infrastructure

If superintendents and districts are to build a positive culture and create an effective system of professional development to support technology integration, there must exist a robust and flexible infrastructure that can meet and anticipate the growing demand of usage of technology on school sites. One of the largest barriers identified in the research was a lack of infrastructure to handle increased access to technology. This is largely due to the lack of knowledge superintendents have around technology (Closen et al., 2013). For schools and districts to be able to meet the demand of teaching 21st Century Skills, there must be infrastructure large enough to handle it. The expert panel made that clear in their responses that without the adequate infrastructure, no efforts to integrate technology will be successful.

While strategies identifying hiring qualified personnel did not score amongst the highest ratings, superintendents did state that they believe having the right qualified people were crucial for providing leadership and vision for technology integration. This should be seen in the hiring of a Director of Technology. More important than their knowledge and understanding of informational technology, is the Director of Technology's understanding of how important their role is to student learning. Many of the individuals filling this role in districts across the state of California are non-educators. It then becomes the role of the superintendent to also provide training to Information Technology (IT) staff in the areas of instructional strategies for the classroom. While they themselves may not be in a position to teach students, IT staff must understand the

contexts in which teachers work. Provided this context, better decisions can be made in how to shape networks, build out wireless access points, and purchase infrastructure and devices to meet this need. This will require districts to move beyond the rigid regulations and policies around technology infrastructure that have become prohibitive to innovation in the classroom. Teachers want to be able to turn on their devices and have them work. When they don't technology becomes a barrier to learning. When districts understand the interaction between infrastructure and instructional pedagogy, creative learning environments can be developed.

Implications for Action

This study collected data from expert superintendents on how they can position themselves and their districts to be prepared for the changing nature of technology in the next ten years. Findings showed that there are conditions that must exist in order for a district to best integrate technology within their classrooms. The following are recommendations for practice:

1. Districts must establish a culture of trust. Superintendents must work alongside teachers. It is vital that teachers have access to communicate with all levels of district leadership. This will allow staff from all levels of the organization to contribute ideas and innovations. This will lead districts to adopt a culture of "yes" and empower teachers to take responsibility for leading innovation at their sites.
2. Districts must redesign how professional development is designed and delivered. All district and site staffs, must be provided meaningful teacher directed technology professional development on topics that are relevant to

the jobs they are expected to complete. A system that collects teacher feedback and input must drive the topics offered to staff for technology professional development. These offerings must align technology with each teacher's content and pedagogy.

3. Districts should identify teacher leaders and IT staff as technology leaders and develop them as technology coaches. These staff members must be released from parts of their daily duties to focus on leading professional development and coaching for teachers. These coaches must be the staff to deliver professional development for their peers.
4. Districts must make investment in infrastructure a priority. A clear strategic plan must be developed that leads to a district's infrastructure being robust enough to handle its current demands as well as allowing it to grow and flex with increased future usage. This also includes hiring talented staff to install and manage technology infrastructure. These priorities must be clearly evident within their budget planning and design. No plan to integrate technology in the classroom will be successful unless their infrastructure is strong enough.
5. Districts must provide all teachers several hours of meaningful technology professional development before they can be expected to integrate technology effectively. To accomplish this, districts must have common bell schedules and extended planning times within the school day at both individual sites as well as across all sites in a district. Teachers cannot be expected to integrate

technology with expertise with only a few hours of training. Calendared non-student days must be embedded in a district's master calendar.

6. Superintendents must model and use the technology they are asking their teachers and students to access. District planning and communication must utilize the same technological tools as teachers and students.
7. Districts should create a Director of Innovation position whose job is to encourage, promote, and develop innovative technology practices across the district. Their main goal would be to help districts rethink how their school system operates and to identify technology tools to enable staff and students to achieve their learning objectives.
8. Districts should purchase open source materials when possible. Students and teachers need to access curriculum and tools that bend and grow as they do. Using open source digital curriculum will allow teachers to be able to customize learning to each classroom and student. This will also lead to significant monetary savings for districts. They will be able to reallocate money to fund their professional development and coaching systems.

Recommendations for Further Research

Findings from this study suggest the following recommendations for further research:

1. This study examined what superintendents could do to position their districts to be prepared for the changing nature of technology in the next 10 years. A study should be conducted to forecast what superintendents can do in the next

five or seven years to position their districts to be prepared for the changing nature of technology.

2. A comprehensive qualitative study should be conducted that examines the re-thinking of how and where K-12 education is delivered and identify what new models may lead to the increased success of students in achieving 21st Century Skills.
3. A qualitative study should be conducted to compare the strategies recommended by female superintendents to prepare their districts for the changing nature of technology to those of male superintendents.
4. A quantitative study should be conducted to compare the size of a school district to their ability to integrate technology into the classroom.
5. A replication of this study should be conducted to determine if there would be a difference in the findings from a site principal's perspective.
6. A replication of this study should be conducted to determine if there would be a difference in findings from a teacher's perspective.
7. A qualitative study should be conducted that examines the barriers that arise to classroom technology integration due to the impact of collective bargaining.
8. Conduct a quantitative study that examines the correlation of California's Local Control Funding Formula on a district's ability to integrate technology in the classroom.

Concluding Remarks and Reflections

The current educational climate of American schools is experiencing a shift that is awesome in magnitude. Technology has begun to change the way students learn,

teachers instruct, and how school districts operate. For several decades, schools and districts have attempted to keep pace with the rapidly evolving nature of technology, but to no avail. The key ingredient that has been missing from each of these efforts is the role of leadership. The willingness of the superintendent to model the use of technology, make planning and investment in infrastructure a priority, and provide teachers the time, resources, and support to integrate technology into their classroom instruction will lead districts to being successful in the integration of technology. More importantly, will be the achievement of the learning outcomes established by 21st Century Learning skills.

I have been fortunate to observe first hand as a principal over the past four years the level of passion teachers have for the growth and success of their students. Teachers work extremely hard to prepare themselves to best serve their students. Too often, especially with technology, programs, professional development, and curriculum are disseminated with a top down approach. This is compounded by investments in infrastructure that do not meet the needs of teachers and students. The crucial ingredient of the teacher voice is often missing. There is a responsibility of leadership to hear their teachers' voice and provide them with the time, resources, and supportive culture to create the most effective learning environment possible for our students. Administrators and teachers should not have to work at a frantic pace to learn and implement technology at the same time. A district that is sincere about technology integration will understand this and provide administrators and teachers the time, infrastructure, coaching, and professional development to learn.

Superintendents must provide this leadership for their districts. For too long superintendents, district administrators, principals, and teachers have all worked to

maintain the status quo. True systematic change in education has been very difficult to accomplish. Change can be risky and uncomfortable. The status quo in education is safe and known. Yet students are being asked to enter a job market where their future job is unknown and in many incidents, does not even exist yet. To prepare them for the unknown risks we are sending students into, educators must be willing to create environments that embrace technology integration and focus on the development of 21st Century skills and attributes of students. The leadership of the superintendent in becoming a learner themselves and embracing the very technology teachers are asked to use, will allow for dynamic and sustainable reform to take place in our schools. Superintendents must become knowledgeable about technology integration. Their ability and willingness to discuss content and pedagogy with teachers, talk and negotiate technology infrastructure with IT staff, and model the use of software, programs, and devices will create a climate that rather than fight and resist reform, stakeholders will buy-in and contribute to the reform itself.

Beyond these steps, superintendents and districts must begin to take bold steps that demonstrate their belief in technology integration. Districts must create a school calendar and bell schedules that represent the value they place in collaboration and professional development. Multiple non-student days need to be provided to teachers for professional development and planning. Also, schools must have common bell schedules that embed daily extended prep time for teachers to engage in professional development, collaboration, and planning for technology integration. Each of these steps greatly impacts a district's budget. However, they are the action steps that support their stated values. These efforts will ultimately lead to the establishment of an innovative schooling

system that reflects the skills and attributes the global marketplace is demanding of its employees.

The past 15 years as an educator have provided me the privilege of working with several amazing teachers and administrators. Through those experiences, I have found there exists a deep-rooted desire to see all students be highly successful. This has taught me that growing in our expertise and practice can be scary and uncomfortable. However, the tradeoff is the creation of a rich, safe, and dynamic learning environment for our students. The rapid evolution of technology is disrupting what has been the traditional classroom. Through the process of conducting this study, I was forced to examine my own practices as a leader and consider how I might be of better value to my district. Ultimately, it has increased my understanding of how important my contributions can be. This study has provided a starting point for helping districts plan and implement effective professional development and identifies the influence a positive school culture has on a district's ability to be innovative. It is my hope that future studies can be conducted and articles can be written to further expand on the findings of this study and will lead to a comprehensive rethinking of how, where, and when we educate our children.

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APPENDICES

APPENDIX A

Email Invitation to Participate in the Delphi Study and Delphi Study Initial Test Form

Date: January, 2015

To: Delphi Panel Member

From: Ean Ainsworth, Delphi Coordinator

Subject: Participation in the Delphi study

Dear expert panel member,

I want to start with thanking you for your interest and willingness to participate in the Delphi study. The goal of this study is to identify strategies superintendents should use to position their districts to be prepared for the changing nature of technology in the next ten years. This study will ask a panel of fifteen experts with experience as superintendents and technology integration to identify what superintendents should do and then rank them in order of having the most influence.

Delphi Study Process

This Delphi study anticipates having three rounds of input and feedback.

1. The first round will ask you to identify the top five strategies that superintendents should do to position their districts to be prepared for the changing nature of technology in the next 10 years.
2. The second round will list the responses from the expert panel in Round 1 and ask you to rank the influence that each strategy has on preparing districts to be positioned for the changing nature of technology in the next 10 years.
3. The third round will provide you feedback on your responses as well as the median responses of the entire expert panel. You will be asked to review your responses and feedback and decide if you want to change your responses or keep them as is. You will also be given the opportunity to provide additional comments on any of the items identified in Round 2. Additionally, interviews will be conducted to collect any additional feedback regarding participant responses.

4. If additional rounds are necessary to reach consensus, they will be conducted after Round 3.

Study Dates

The study will be conducted starting on December 15, 2014 and is estimated to finish on January 20, 2015. Each round's input is scheduled for one week, with the three rounds being separated by a minimum of one week. The time period has been selected to move quickly through the process, but has built in flexibility to accommodate response time of the expert panel and any logistical problems that may arise.

Study Requirements

There are requirements of the study design to ensure its validity and timely completion. As an expert panelist participant, you are asked to review these requirements and confirm your participation in the Delphi study process and your ability to complete the study.

Anonymity of the expert panel participants is essential to the Delphi process. Neither your name nor your answers will be shared with other members of the expert panel. You are asked not to discuss you participation in the process with others until completion of the study.

The selection criteria and selection process for the study has served to ensure that the chosen experts are qualified to both identify and rank the influence of strategies superintendents should us to position their districts to be prepared for the changing nature of technology in the next ten years. Therefore, you are assumed to have experience and expertise to contribute effectively. Your ideas for strategies and your opinions shared through the identification and ranking process are vital to the outcomes of the study.

Google Forms are being used as the primary vehicle for completing the study. Survey forms will be emailed directly to you with a link to complete and submit your responses. Each form is a secure document and only requires that you have the link to submit your response. Access to Microsoft Word and/or Excel may be needed to open documents.

In each round, instructions will be included to guide the process. Instructions are designed to inform you of the process and are not meant to influence your responses in any way.

Prompt response in each round of the study will assist in the timely completion of the process. The time to complete each round should range from fifteen to thirty minutes. The study timeline is based upon expert panel members responding within one week.

E-mail will be the primary means of communication with all panel members. E-mails will be send to inform you of each round. Your input within five working days will be appreciated and will assist with keeping the process on schedule.

In the event of e-mail or computer failure, survey instruments can be sent by fax, or hand delivered to participants. If either of these problems take place, please contact the Delphi Coordinator by cell phone to arrange an alternate delivery and collection of the survey instrument. The Delphi Coordinator can be reached at (925) 586-9441.

At the completion of the study, each participant will receive a copy of the results of the study. Individual members will be given recognition in the final summary of the results. **No individual responses will ever be published or shared by the researcher.**

All questions should be directed to me at eanainsworth@gmail.com , or you can call me at (925)586-9441. I will return you e-mail or phone call as soon as possible, in most cases, that will be within 24 hours.

Delphi Study Test Form

You can access the Delphi Study Test Form by going to:

http://goo.gl/forms/apZir0kiy5

Please take a few minutes to complete the form. This will provide the researcher your contact information and your informed consent to participate in the study. If you are unable to access the form, please contact the researcher to develop a solution as quickly as possible.

Please complete the test form by December 15, 2014.

Thank you for our participation in this study.

Ean Ainsworth

Delphi Coordinator

APPENDIX B

Delphi Study Initial Test

Delphi Study Initial Test

Thank you for participating in this Delphi Study designed to identify what superintendents should do to position their districts to be prepared for the changing nature of technology over the next ten years. This is the first input form and is designed to familiarize you to the forms you will be utilizing in the various rounds of the Delphi study process. Please give the information requested for each item. When complete, please click on the "Submit" button at the bottom of the form. You will receive a confirmation message of receipt of your submission within 24 hours. If you have difficulty, please e-mail me at eanainsworth@gmail.com or call: Cell Phone (925)586-9441.

Thank you.

To access the Patient's Bill of Rights, please click the following link: http://goo.gl/g3rASB

* Required

Last Name *

First Name *

E-mail Address *

Where do you prefer to be contacted by phone? *

Click all that apply.

- [ ] Office
- [ ] Home
- [ ] Cell Phone

Business Phone

Home Phone

Cell Phone

Will you be able to participate in all three rounds of the Delphi study, scheduled to last between November, 2014 and January, 2015? *

- [ ] Yes
- [ ] No

Following Round Three of the Delphi study, phone interviews may be conducted. Are you willing to participate in a face-to-face or phone interview regarding your responses and feedback within the three rounds of the Delphi study?

- [ ] Yes
- [ ] No

Please use the space below to ask questions and provide comments or concerns regarding the process of the study. Additional input can be e-mailed to the Delphi study coordinator at eanainsworth@gmail.com

Informed Consent: Selecting yes, means you understand and agree to the statement below. *

I understand that I may refuse to participate in or I may withdraw from this study at any time without any negative consequences. Also, the investigator may stop the study at any time. I also understand that no information that identifies me will be released without my separate consent and that all identifiable information will be protected to the limits allowed by law. If the study design or the use of the data is to be changed I will be so informed and my consent obtained. I understand that if I have any questions, comments, or concerns, about the study or the informed consent process, I may write or call the Office of the Vice Chancellor of Academic Affairs, Brandman University, 16355 Laguna Canyon Road, Irvine, Ca 92618 Telephone (949)349-7641. I acknowledge that I have received a copy of this form and the Research participant's Bill or Rights.

- [ ] Yes

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APPENDIX C

Round 1 Email and Survey Form

Delphi Study

Strategies Superintendents Should Use To Position Their Districts To Be Prepared For The Changing Nature Of Technology In The Next Ten Years.

Round One Input Form

Instructions:
Round One asks you to respond to the question:

What five strategies do you believe superintendents should use to position their districts for the changing nature of technology during the next ten years?

In the spaces below, please identify the top five strategies you have selected. Strategies do not need to be listed in order of priority, preference, or perceived influence. (You may choose more than five strategies, but you must submit at least one strategy.)

Each of your five strategies should be a summary statement of your concept or idea. The targeted length of the statement is 25 words, but you are not limited to that response length to describe your strategy. Please be thorough in communicating your strategy, but succinct in your description.

Strategy 1

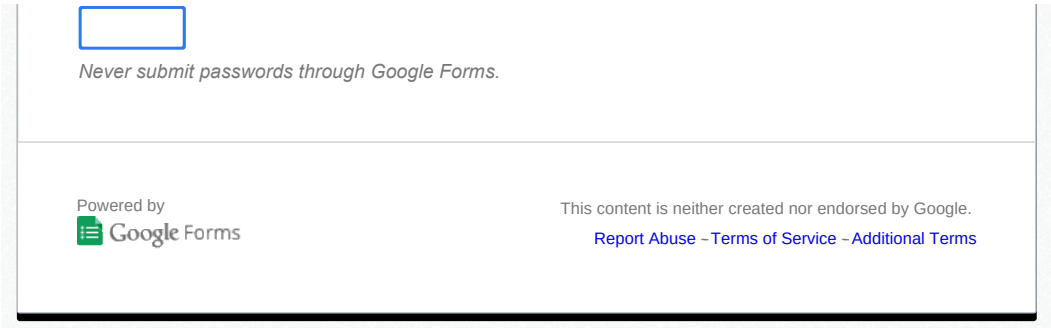
Strategy 2

Strategy 3

Strategy 4

Strategy 5

Additional Strategies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APPENDIX D

Delphi Study Round 1 Responses

Expert	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5	Additional Strategies
1	Creating a culture that is collaborative	Cultivating an inquiry mindset at all levels of the organization	Leading from the middle	Cultivating adaptive mindsets	Focus on 4 Cs for students and adults - create a learning organization	
2	School district need to nurture technological innovators by providing them time, resources and advanced professional development.	School districts need to invest in network infrastructure that will flex and grow with increasing usage	School districts need to make sure that technology is driven by a curricular need as opposed to technology being the driver	School district technology departments need to embrace that multiple platforms and devices will be accessing the network and prioritize instructional need as the driver of technology as opposed to ease of technology management	Any school district purchase of technology has to be accompanied by a corresponding expenditure plan for technology support and professional development	
3	Create a compelling vision- Help staff and parents understand the changing landscape of the world students inhabit and the world of work for which they need to be prepared.	Assure that adequate infrastructure is in place to support the growing demand. This requires long range planning to support not just current needs but plan for future demands like increased bandwidth. This requires technical expertise beyond the superintendent's level but it is the responsibility to make sure this is addressed.	Lead efforts to assure that technology's main purpose is to support teaching and learning. Provide differentiated professional develop that is ongoing with coaching support. Teachers are at many different levels in their use of technology. We need to support all levels and use teacher leaders to support others.	Work with the governing board to develop polices to address student and staff use of technology that promote responsible use and provide an appropriate level of security.	Identify sources of funding. Develop budget priorities that support infrastructure, new devices, replacement devices, and adequate levels of staff support.	Develop community partnerships to support efforts both for expertise and funding sources. Many businesses are able to support school district efforts.
4	Increase teacher understanding of CCSS technology expectations in math and ELA	Provide training/PD so teachers have the ability to implement (teach) the CCSS technology standards.	Increase technology devices so there is access and provide access to a variety of devices (desktop, lap top, iPads, etc.)	Budget for infrastructure maintenance and improvements, devices and PD	Employ additional support for teacher, such as tech coaches	
5	Mindset - The attitude of the organization is essential for long term success. Carol Dweck's work on growth mindset has had a profound impact on the way our District has approached the changing nature of technology.	Planning - An intentional plan to address the purpose, infrastructure needs and funding stream is of critical importance.	Professional Development - Change of this magnitude requires ongoing professional development delivered in varied formats and one that reflects best practices.	Stakeholder involvement - The voices of those impacted by the change (including students) should be an integral part of the planning and feedback process.	Coaching and ongoing support - Merely having devices will not bring long term sustainable change. This requires mentoring, support and feedback.	Creating a culture that supports risk taking, exploration and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.
6	We made sure the infrastructure was in place to move forward, Comcast partnered with our District to lay the cable more than five years ago, for free!	Began messaging the link between technology and instruction, we identified lead teachers that could model strategies and launched a marketing campaign.	Staff development, teachers were trained and trained and trained. The IT staff did much of the professional growth work, but we also partnered with Cisco and took teachers on fieldtrips to see their innovative ideas, as well as other schools, autodesk, etc.	Budgeted money with a long range plan for future expenditures so that the Board and the public knew that every year we would make large investments in technology in the classroom. We have demonstration classrooms for teachers and parents to tour so that we can keep the future in sight.	Websites and videos showing our teachers using technology in the classroom. Teacher coaches that work with other teachers to help them with tech in the classroom. Naviance, Aires, all of our systems now require parents and teachers to use the computer to access student information.	
7	Develop an ongoing funding source to adjust and meet the ever changing technology demands for your district - this includes the pipeline, wireless, technology devices (i.e., ipads, Chrome books, Apple TV, etc) and professional development.	Develop a clear and concise technology plan which includes the items listed above. Be sure to include teachers in the development of the plan and not just tech-savy teachers. You need to have quality teachers that have good standing at the school or order to support the early adopters. You need to have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.	Flexibility - with today's operating systems, there is no reason to not offer teachers a choice of devices - who cares if you have a mixture of carts, pcs, chrome books or ipads? Hit early adopters hard by giving them what they need and then show casing their best practices.	TIme - create the time for teachers to learn, try and adapt their teaching pedagogy to include the integration of technology.		
8	Involve the appropriate stakeholders to establish clear goals and objectives for both instructional technology and management technology.	Establish an ongoing budget to support the purchase, maintenance and life cycle replacement for technology.	Hire a Chief Technology Officer as a cabinet level position.	Ensure equal student and parent access to the technology.	View technology as a tool, but the solution.	
9	Bring Your Own Device Because the use of technology is ubiquitous throughout society on a 24/7 basis, school systems must make provisions for students to "Bring Their Own Device" to school.	Establish Digital Citizenship Policies and Procedures The digital world changes so rapidly,school system policies must be established to teach the rules and norms for the use of technology by students and staff and they must be reviewed and updated often to reflect those changes.	Teacher Professional Development School systems must provide professional development for teachers, staff, and administrators in the use of technology so that its use is seamless at the school site and in the classroom.	Create a System-wide Vision and Specific Goals for the Use of Technology School systems must establish a clear vision and framework as to how technology will be utilized as an engaging learning tool to accelerate learning both at the school site and outside the school gates after school hours.	Teacher Planning Time Teachers need to be provided with quality time to collaboratively identify and share what is working in the classroom and to learn how to better utilize technology to personalize and improve student learning through the use of data analysis to diagnosis student progress.	

Expert	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5	Additional Strategies
10	The district should have a current Strategic Plan which has three to five year goals for the district and technology should be a focal area of the Strategic Plan. In our district the Board of Trustees adopts annual goals in the five strategic goal areas of the district and in areas of governance. Technology goals are stand alone goals in the governance section of the plan and integrated in the other five strategic goal areas.	There should be a program plan specific to the implementation of technology in the district (District Technology Plan) which specifies goals and actions aligned with industry and educational standards for technology. This would include operational, managerial and instructional technology, equipment and materials, professional development and training and a staffing plan for the plan's implementation. This program plan and its goals and expenditures should be incorporated into the district's LCAP.	The district should identify through the Budget Development Process the fiscal needs and resources required to implement the District Technology Plan and LCAP Goals. This may include specific categorical allocations like the CCSS Funding and Spending Grant (a percentage expenditure is required for technology) or under LCFF general fund allocations.	There should be a continuous assessment of the district's "technology readiness", use and needs and aspirations. Assessments should be provided to staff, student and parents/guardians to inform the development of the district's program plans. LCAP and professional development plan. Our district participates in the Bright Bytes "technology readiness" survey and also assesses readiness through the site SPSA/LCAP surveys.	The district is required to develop a Five Year Facilities Master Plan which should include the infra-structure, facilities and hardware needs of the district (informed by the program plans) in order for appropriate funding to be designated for technology. Our district recently passed a general obligation bond and the implementation of technology was an identified expenditure for the bond measure and the bond will be used to improve and increase technology use in the district over the next 20 years.	Investigate professional partners which can support the Technology Plan's implementation and provide ongoing professional development, training and technical support to staff. We are currently partnering with three technology companies and the Sonoma County Office of Education for this support.
11	Employ staff who are current/forward thinking in the use of technology for the purpose of enhancing teaching and learning. Must have the lense of technology as a tool, not an end.	Implementation plans must include the infrastructure to sustain and a professional development/support plan for the "implementers" - teachers and support staff.	Cyber citizenship to be included from the beginning use of technology. Students need help in understanding use/abuse of technology. Issues of academic integrity, effects of social media, cyber bulling can not be assumed or regulated by network controls.	Technology changes for student use must include parent education.	Communicate the expectations that the educators are expected to model technology use expectations.	It is also essential to continue to have district staff whose job descriptions and responsibilities are meeting the changing demands of technology reporting and instructional implementation. Most districts will need to systematically increase their technology personnel over the next ten years to systems teams,which will be a shift for the school house from a skeletal technology crew and operational "gophers" to situational problem solvers.
12	Environmental Scanning and Sharing Sharing on-going awareness of education, world and college/career trends with stakeholders	Governance team capacity building... a school board that is proactively informed about technology trends.	Applying Learning and "Generations" Research Personalized learning and brain research examination and application by systems stakeholders. Understanding different needs of "generations"	Sustaining technology and learning staff to support colleagues in upcoming technology applications and address infrastructure needs	Multi-year strategic planning for learning that incorporates ubiquitous technology use for personalized learning	Eliciting youth insights for learning needs
13	Investigate\Study--know what is trending, where things are headed, and where the district has been.	Higher well--put strong people in the decision making roles.	Set realistic expectations for all stakeholders.	Listen to all stakeholders to gather input and buy in.	Clear hurdles--after gathering input and setting expectations the leadership needs to clear all of the hurdles for everyone to achieve success.	
14	Strong infrastructure support, with a particular focus on the network and wireless access. The wireless must be robust enough for uninterrupted high data demand.	Professional development programs with a focus on the opportunities for transformational change in communication, student collaboration, curriculum and instructional strategies tied to the common core shifts. PD to understand and use tech tools (iPads, chromebooks, apps, etc.) are secondary, but support the opportunities.	Develop leadership capacity of teacher-leaders to innovate, take risk, share findings and lead others. Have structures for communication and involve teachers/practitioners in decision-making.	Include parent education component so they understand that the tools and initiatives (such as 1:1) are an exciting opportunity for their students. Help parents be supportive of their student's learning.	Root work with technology in District mission, vision and LCAP goals. Have the end in mind with "experimenting" with or piloting new strategies and tools.	

APPENDIX E

Round 2 Email

Dear Superintendent,

Thank you for your willingness to participate in this study. Below is the link to the Round 1 survey of the Delphi Study. I appreciate the time you have committed to assist me in providing feedback. I know your time is valuable and you are pulled in many directions. The first round of this survey should only take a few minutes to complete. You will be asked to provide five strategies you believe superintendents should use to position their districts for the changing nature of technology during the next ten years.

When you are finished with your feedback, please be sure to click "Submit".

The goal for data collection for Round 1 is by Friday, February 13. If you need any assistance, please contact me at 925-586-9441 or through email at eanainsworth@gmail.com.

Round 1 Survey Link:

http://goo.gl/forms/7TTjgwnTMn

Thank you for your support.

Ean Ainsworth
Doctoral Student
Brandman University

APPENDIX F

Round 2 Survey

Delphi Study Round 2

What strategies should superintendents use to position their districts to be prepared for the changing nature of technology in the next ten years.

February 23 - February 27, 2015

Round 2

In Round 1, each participant identified at least five strategies they believed superintendents should use to position their districts for the changing nature of technology during the next ten years. During the first round the panel submitted over 70 items for Superintendents to consider. After combining duplicate responses, your input has been narrowed to 30 items. Instructions: Please complete the Round 2 survey by Friday, February 27, 2015 Based on your personal judgment, please rate each strategy (1/low to 6/high) on the scale of influence that each item will have on a district in being prepared for the changing nature of technology in the next ten years. A rating of 1 means the strategy will have a low level of influence in a school district's ability to be prepared for the changing nature of technology in the next ten years. A rating of 6 means the strategy will have the highest level of influence in a school district's ability to be prepared for the changing nature of technology in the next ten years When you have completed rating each strategy, please click submit at the bottom of the form. If you have questions or need clarification about any of the items, please contact the Delphi Coordinator at 925-586-9441 or email to eanainsworth@gmail.com

Please enter your name.

Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos).

	1	2	3	4	5	6	
Low Level of Influence	◯	◯	◯	◯	◯	◯	High Level of Influence

Have coaches and IT staff provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage.

This requires long range planning to support not just current needs but plan for future demands like increased bandwidth, robust wireless coverage, and maintenance.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

School district technology departments need to embrace that multiple platforms and devices that will be accessing the network and prioritize instructional need as the driver of technology as opposed to ease of technology management

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Any school district purchase of technology has to be accompanied by a corresponding expenditure plan for technology support and professional development

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Identify sources of funding. Develop budget priorities that support infrastructure, new devices, replacement devices, and adequate levels of professional development.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Transparently budget money with a long range plan for future expenditures so the Board and public know that every year large investments are made for technology in the classroom.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Give early adopters what they need and showcase their practices.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

School systems must establish a clear vision and framework as to how technology will be utilized as an engaging learning tool to accelerate learning both at the school site and outside the school gates after school hours.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Create a parent education program so parents can understand that the technology tools and initiatives are an exciting opportunity to support their student's learning.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Begin messaging the link between technology and instruction. Identify lead teachers that could model strategies and launch a marketing campaign.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Involve all stakeholders in the development of a technology plan with clear and concise goals and objectives.

This includes all levels of "tech ready", high quality, and respected teachers in the development of the plan.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.

This includes partnering with technology companies like Cisco, Google, and other local businesses to take teachers on field trips to see their innovative ideas and provide professional development.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Focus on the 4 Cs (Critical Thinking, Collaboration, Communication, and Creativity) for students and adults to create a learning organization.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Increase teacher understanding of CCSS technology expectations in math and ELA.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

School systems must create policy and make provisions for students to "Bring Their Own Device" to school.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Work with the governing board to develop polices to address student and staff use of technology that promote responsible use and provide an appropriate level of security.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Cultivate a growth mindset at all levels of the organization.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Hire a Chief Technology Officer as a cabinet level position.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Ensure equal student and parent access to the technology and technology education.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

The district should identify, through the Budget Development Process, the fiscal needs and resources required to implement the District Technology Plan and LCAP Goals.

This may include specific categorical allocations like the CCSS Funding and Spending Grant (a percentage expenditure is required for technology) or under LCFF general fund allocations.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Develop a Five Year Facilities Master Plan which should include the infrastructure, facilities and hardware needs of the district in order for appropriate funding to be designated for technology.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

The district should have a current Strategic Plan which has three to five year goals for the district and technology should be a focal area of the Strategic Plan.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Hire high quality district staff whose job descriptions and responsibilities are meeting the changing demands of technology reporting and instructional implementation.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Districts will need to systematically increase their technology personnel over the next ten years to systems teams, which will be a shift for the school house from a skeletal technology crew and operational "gophers" to situational problem solvers.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Implement continuous assessment of the district's "technology readiness", use, needs, and aspirations.

These should be given to staff, students, and parents/guardians to inform the development of the district's program plans.

1 2 3 4 5 6

Low Level of Influence ◯ ◯ ◯ ◯ ◯ ◯ High Level of Influence

Teach students cyber citizenship from the first use of technology.

Students need help in understanding use/abuse of technology. Issues of academic integrity, effects of social media, cyber bulling cannot be assumed or regulated by network controls.

	1	2	3	4	5	6	
Low Level of Influence	◯	◯	◯	◯	◯	◯	High Level of Influence

Conduct ongoing environmental scans to gain awareness of trends with stakeholders, education, technology, and college/career.

	1	2	3	4	5	6	
Low Level of Influence	◯	◯	◯	◯	◯	◯	High Level of Influence

Identify and remove barriers to technology integration as identified by the collective feedback of all stakeholders.

	1	2	3	4	5	6	
Low Level of Influence	◯	◯	◯	◯	◯	◯	High Level of Influence

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APPENDIX G

Round 3 Feedback Form

Instructions:

*On the chart below, review your rating of each strategy as compared to the mean rating of all participants. If you would like to change your rating from Round 2, enter it in the column labeled "New Rating." You may change one score, some scores, or all scores.

*There will be no other steps needed to complete the process. The sheet will automatically save and I will be able to access any changes. When you are finished with your changes, you may close out the window. If more than one sitting is needed, you may return to the link at any time to complete the form.

Name	Strategy	Mean Rating of All Participants	Your Ratings	New Rating	Rationale for Changing the Score
	Nurture teachers by providing them time, resources, modeling, and ongoing differentiated professional development (including the use of websites and videos).	5.36			

	Have coaches and IT staff provide professional development for teachers with a focus on technology's impact on student collaboration, curriculum and instruction, and communication.	5.64			
	Assure that adequate infrastructure is in place to support the growing demand and will flex and grow with increasing usage.	5.62			
	School district technology departments need to embrace that multiple platforms and devices that will be accessing the network and prioritize instructional need as the driver of technology as opposed to ease of technology management	4.79			
	Any school district purchase of technology has to be accompanied by a corresponding expenditure plan for technology support and professional development	4.71			

	Identify sources of funding. Develop budget priorities that support infrastructure, new devices, replacement devices, and adequate levels of professional development.	5.38			
	Transparently budget money with a long range plan for future expenditures so the Board and public know that every year large investments are made for technology in the classroom.	4.86			
	Give early adopters what they need and showcase their practices.	5.07			
	School systems must establish a clear vision and framework as to how technology will be utilized as an engaging learning tool to accelerate learning both at the school site and outside the school gates after school hours.	4.79			
	Create a parent education program	4.36			

	so parents can understand that the technology tools and initiatives are an exciting opportunity to support their student's learning.				
	Begin messaging the link between technology and instruction. Identify lead teachers that could model strategies and launch a marketing campaign.	4.43			
	Involve all stakeholders in the development of a technology plan with clear and concise goals and objectives.	4.93			
	Have stakeholders from tech companies to be think partners on what is needed at the backend of your platform-information highway, wireless & cloud capability.	4			
	Focus on the 4 Cs (Critical Thinking, Collaboration, Communication, and Creativity)	4.64			

	for students and adults to create a learning organization.				
	Increase teacher understanding of CCSS technology expectations in math and ELA.	4.77			
	School systems must create policy and make provisions for students to "Bring Their Own Device" to school.	4.07			
	Work with the governing board to develop polices to address student and staff use of technology that promote responsible use and provide an appropriate level of security.	4.07			
	Create a culture that is collaborative, supports risk taking, exploration, and innovation. Mistakes must be viewed as opportunities for growth in order for people to accept a new paradigm in teaching and learning.	5.64			

	Cultivate a growth mindset at all levels of the organization.	5.07			
	Hire a Chief Technology Officer as a cabinet level position.	4.5			
	Ensure equal student and parent access to the technology and technology education.	4.64			
	The district should identify, through the Budget Development Process, the fiscal needs and resources required to implement the District Technology Plan and LCAP Goals.	4.86			
	Develop a Five Year Facilities Master Plan which should include the infrastructure, facilities and hardware needs of the district in order for appropriate funding to be designated for technology.	4.62			
	The district should have a current Strategic Plan which has three to five year goals for the district and	4.57			

	technology should be a focal area of the Strategic Plan.				
	Hire high quality district staff whose job descriptions and responsibilities are meeting the changing demands of technology reporting and instructional implementation.	4.93			
	Districts will need to systematically increase their technology personnel over the next ten years to systems teams, which will be a shift for the school house from a skeletal technology crew and operational "gophers" to situational problem solvers.	4.36			
	Implement continuous assessment of the district's "technology readiness", use, needs, and aspirations.	4.36			
	Teach students cyber citizenship from the first use of technology.	5.14			

	Conduct ongoing environmental scans to gain awareness of trends with stakeholders, education, technology, and college/career.	4.21			
	Identify and remove barriers to technology integration as identified by the collective feedback of all stakeholders.	4.5			

APPENDIX H

Round 3 Expert Panelist's Ratings

Round 3 Ratings with Mean and Median Scores																
	Panelist 1	Panelist 2	Panelist 3	Panelist 4	Panelist 5	Panelist 6	Panelist 7	Panelist 8	Panelist 9	Panelist 10	Panelist 11	Panelist 12	Panelist 13	Panelist 14	Mean	Median	Interquartile Range
Strategy 1	6	6	6	6	5	6	6	6	5	6	5	5	1	6	5.36	6	1
Strategy 2	6	6	6	5	6	5	6	6	6	5	5	5	6	6	5.64	6	1
Strategy 3	6	6	6	5	5	6	6	6	6	5	5	5	6		5.62	6	1
Strategy 4	4	6	6	4	6	4	6	5	4	4	4	4	4	6	4.79	4	2
Strategy 5	4	6	6	5	6	5	3	5	3	5	4	2	6	6	4.71	5	2.25
Strategy 6	5	6	6	5	4	6	5	6	5	5	5	6	6		5.38	5	1
Strategy 7	4	6	4	5	5	6	5	5	4	4	5	4	5	6	4.86	5	1.25
Strategy 8	5	4	6	6	4	3	6	5	5	5	5	6	5	6	5.07	5	1.25
Strategy 9	4	5	5	5	4	5	4	5	6	5	6	3	5	5	4.79	5	1
Strategy 10	4	5	4	5	3	4	4	5	3	5	5	4	4	6	4.36	4	1
Strategy 11	4	6	4	5	4	4	5	5	4	4	5	4	2	6	4.43	4	1
Strategy 12	5	6	4	5	4	6	5	5	5	4	4	4	6	6	4.93	5	2
Strategy 13	3	5	5	4	2	4	5	5	4	4	4	2	5		4.00	4	1.5
Strategy 14	3	5	5	5	3	5	4	5	6	4	5	6	4	5	4.64	5	1
Strategy 15	5	5	4	5	4	5	5	5	5	4	4	5	6		4.77	5	1
Strategy 16	3	5	5	4	3	5	5	5	3	5	4	2	2	6	4.07	4.5	2
Strategy 17	3	4	4	6	3	6	5	6	1	4	4	2	5		4.08	4	2.5
Strategy 18	6	6	6	6	4	6	5	6	6	6	6	6	4	6	5.64	6	0.25
Strategy 19	3	6	5	6	4	5	6	5	6	5	5	6	3	6	5.07	5	1.25
Strategy 20	4	2	5	5	2	3	6	5	4	4	5	6	6	6	4.50	5	2.25
Strategy 21	5	5	5	6	2	6	6	6	3	4	5	4	3	5	4.64	5	2.25
Strategy 22	4	6	5	5	3	6	5	5	4	5	5	3	6	6	4.86	5	2
Strategy 23	4	5	5	4	3	6	5	6	4	4	5	3	6		4.62	5	1.5
Strategy 24	5	5	5	4	3	6	1	5	5	4	5	4	6	6	4.57	5	1.25
Strategy 25	6	4	4	5	5	5	5	4	6	4	5	4	6	6	4.93	5	2
Strategy 26	3	4	4	5	3	4	4	5	6	4	4	4	5	6	4.36	4	1
Strategy 27	3	4	4	5	4	5	4	4	5	4	4	3	6	6	4.36	4	1
Strategy 28	6	5	5	6	5	6	4	5	4	5	5	6	4	6	5.14	5	1.25
Strategy 29	4	5	4	4	3	3	5	4	5	5	5	3	3	6	4.21	4	2
Strategy 30	5	6	4	4	4	5	5	4	5	5	4	2	4	6	4.50	4.5	1