PLANNING FOR TECHNOLOGY IN SCHOOL FACILITIES

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Abstract

The purpose of this study is to examine the issue of planning for technology in existing, new, or renovated school facilities. The focus is to provide educators a technology profile to help with planning issues regarding school design and the integration of technology in school facilities. Very few counties in the Commonwealth of Virginia have a facility planner on staff. It is the intent of this author to provide support for those involved with planning for technology in school facilities. Principals can use this tool to help align school technology goals with the division long-term plan as well as the technology standards. Reviewing the components of the Virginia Educational Technology Alignment Report, the CEO Forum STAR indicators, the Florida Technology Resource Survey, as well as the TAGLIT survey tool provided insight to the technology profile. This tool was used throughout the Commonwealth of Virginia to assess current conditions and the perceptions of principals, teachers and division support staff in an attempt to assess current and long-range planning for technology in school facilities.

The literature reviewed clearly identifies that a continued commitment to long-range planning and effective statewide integration of educational technology into teaching and learning is essential. A close examination of the results of this study will assist those planning for and assessing schools readiness for technology and its impact on school design to ensure the accommodation of future technological needs of school facilities.

As a result of the data collected a user technology profile can be created for each participating school. This tool can help in a variety of ways. Possibilities include setting benchmarks and goals, applying for technology grants, determining funding priorities, and creating individualized assessment tools. The intent here is to provide a technology user profile for each school by participant. This would enable the principal to review the data separately or by comparison of principal and teacher.

DEDICATION

This dissertation is dedicated to my family, who has always been there for me throughout my life. For my mother and father who have given me the most precious gift of all, their love and support through every challenge. I especially want to thank and dedicate this project to my wife, Nikki, who has made this all possible. You are a remarkable person who makes life worth living. I love you! For my two sons Aaron and Ethan I am forever grateful. The two of you always manage to put things in perspective for me. Finally, although my grandfather did not live to see me reach this goal, my memory of his pride in my accomplishments was a source of inspiration for me. Thank you Pap for sharing with me the importance of strong values and the need to work hard in life no matter what the situation or challenge. I love you all so much.

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Working on this degree while trying to maintain a life as a husband, father, and high school principal presented some unique challenges. Throughout the beginning of this project the school staff at Falls Church High School along with the staff at West Potomac Academy have been extremely supportive of my work. I want to especially thank the students, faculty, and staff at Spotsylvania High School. Go KNIGHTS! A special thank you to my administrative team for doing “Whatever it Takes”, “As-One”. I believe everyone agrees “Its About Time”!

I would have never finished this project, however, without two individuals. Thank you Dr. Don Alvey for providing me the spark after a two-year lull. Your constant support is most appreciated. Dr. Vera Blake, what can I say? You are my friend, collogue, mentor, and inspiration. You have had a tremendous impact on my life and I am eternally grateful. Finally, I want to thank Mr. Patterson who, in his own way, provided me the motivation I needed to challenge myself to be the person I am today.

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Introduction

Today's administrators face a myriad of problems, but probably the most challenging problem of all is how to use limited financial resources in the most effective way. For this reason, the administrator must be wise regarding the expenditure of public funds for existing, new, or renovated facilities. Are schools technologically equipped? What factors need to be considered? Glen M. Kleiman (2000) writes, "only a clear-eyed commitment to using technology to help meet central educational goals will enable us to get a substantial return on our investment." The Virginia 2003-2009 Educational Technology Plan clearly communicates that careful planning for the inclusion of instructional technology in today's facilities is imperative in order to maximize efficiency.

Are schools technologically equipped for the 21st century? This is a question of paramount importance to America's educators, employers, parents and the public. "Our community vibrancy, personal quality of life, economic viability and business competitiveness depend on a well-prepared citizenry and workforce." (Partnership for 21st Century Skills, 2004, p.2) It is evident that the report on 21st century skills is calling on schools to change dramatically even as they are faced with difficult economic challenges and a vigorous discussion of student achievement and assessments. We can best prepare students to succeed in the 21st century by combining basic skills along with 21st century skills. Both are essential and when done concurrently reinforce each other. (Branigan, 2004)

Throughout history, schools have helped students of all ages prepare for the future. As we continue to move into the 21st century, schools are again being asked to prepare the next generation of citizens for an increasingly technological world. The student of tomorrow must be able to problem solve, be technologically literate, and be able to utilize a variety of instructional technology applications infused within a school facility and throughout the world.

Planning for the inclusion of technology in school facilities requires the thought of many variables from literacy to financial support. In Virginia, a six-year plan for technology is developed, assessed, and revised by the Virginia Educational Technology Advisory Committee (VETAC). The Educational Technology Plan for Virginia: 2003-2009 is the result of research, planning, and collaboration with Virginia educational technology stakeholders. This plan provides the strategic direction for the use of educational technology in schools and provides direction at the local level as plans are created. In Virginia, the plan emphasizes the importance of integrating technology into instruction. “And, most of all, the purpose of the state plan is to enhance students’ academic achievement through the use of technology” *Six-Year Educational Technology Plan for Virginia*, (2004, p.1).

The success of any facility plan is defined by having the financial support exactly when it is needed. (Earthman, 2000) It appears obvious that a serious waste of public school funds can occur through the development of a school facility with unnecessary items or through the omission of those that are necessary. There is the potential of generating a great deal of waste when school divisions hasten into architectural planning without first carefully considering the programs of the school or the collaboration of all stakeholders in the process. Expenditures to place technology into our schools are significant. According to recent government estimates, approximately $5 billion dollars is being spent annually in the United States to attain a computer to student ratio of 1:4 *American Institute of Research* (2005). With large amounts of taxpayer dollars being spent on technology, it is vital that school leaders align the resources to be meaningful and efficient. It is this issue that brings relevance to this study.

Statement of the Problem

Many questions come to mind when you think about planning for technology. Are schools technologically prepared for the 21st century? What factors does an administrator need to consider when planning for technology? Who should be involved in making decisions of this magnitude? How can the procedural efforts of developing educational specifications help to ensure technology is addressed and future technological needs are met? These are all difficult questions to ask as technology continues to change at an astronomical rate; however, it is imperative to continuously assess the progress and impact of instructional technology. (Brooks-Young, 2002) There must be a comprehensive plan when making decisions and encumbering large amounts of money to incorporate technology in schools of today and tomorrow.

Purpose of the Study

The purpose of this study is to help superintendents, directors, principals, supervisors, facility planners, and architectural firms plan for technology in school facilities. Planning for and assessing current technology ensures that contemporary technological issues are addressed in school facilities. According to the Educational Technology Plan for Virginia (2003-2009), history reminds us that it is difficult, at best, to predict the future. Even so, schools must plan for the purposeful use of new and emerging technologies and the infrastructure, professional development, and resources to support them. No one can predict which technologies will ultimately take root in education or how these applications will evolve, but it is important to consider the possibilities they offer. Carefully considering current trends and assessing current status is arguably the best way to identify ways or methods to improve. The intention of this study is to survey technology coordinators, building principals, and teachers throughout the Commonwealth of Virginia utilizing a tool for planning and assessing school technology and readiness. This tool will help in a variety of ways. Possibilities include but are not limited to setting benchmarks and goals, applying for technology grants, determining funding priorities, and creating individualized assessment tools.

Research Questions

Many questions come to mind when you think about planning for technology in today's school facilities. Are schools technologically prepared for the 21st century? The questions guiding this inquiry or study are:

1.) What factors need to be considered when planning for the technological needs of school facilities for the 21st century?

2.) What are the perceptions of teachers, principals, and division support staff regarding the level of planning for technology in their own school facility?

3.) With regard to technology planning, how does current practice correlate to what is ideal regarding the perceptions of principals, teachers, and technology support staff throughout the Commonwealth of Virginia?

In addressing each research question the dimensions of each issue, their current context, and the theoretical bases supporting the idea of technology planning in school facilities are reviewed. Relevant research studies are analyzed and major conceptual, methodological, and design/measurement issues are discussed.

Definition of Terms

For the purpose of this study, the following definitions apply.

1. **Instructional technology** is the method and material used to achieve an educational objective. This is a broad term that encompasses the application of our scientific knowledge about human learning to the tasks of teaching and learning. “Instructional technology is the theory and practice of design, development, utilization, management, and evaluation process and resources for learning” (Seels & Richey, 1994, p.9). This can include more traditional education technologies such as blackboards and pencils, or the full range of tools, voice, video, data, digital, network, and information systems available.
2. **STAR Assessment** identifies and defines school profiles ranging from the “Early Tech” school with little or no technology to the “Target Tech” school that provides a model for the integration and innovative use of educational technology. “The STAR Chart is a tool that can help all schools create and implement a plan for improving education with the help of information technology” (CEO Forum on Education and Technology, 2001, p.3). The STAR Chart is not intended to be a measure of any particular school’s technology and readiness, but rather to serve a benchmark against which other schools can assess.

3. **21st Century Skills** are a new set of skills necessary to prepare students for life and work in the digital age. The skills build on digital age literacy, inventive thinking, effective communication, and high productivity.
4. **School Design** is defined as the process or sequential steps in planning school facilities. For the purpose of this review, two aspects emerge: (1) instructional issues often referred to as the educational program; and (2) the physical issues of instruction, often referred to as the architectural program. School building design features and components have been proven to have a measurable influence on student learning. (Earthman, 2002)
5. **Educational specifications** are defined in different ways in each study. However, most of the studies aligned educational specifications as interrelated statements that communicate to various stakeholders what educators believe is required of a proposed educational facility to support a specific educational program. "Educational specifications are a set of statements that describe to the architect the types and kinds of educational activities that will take place in the proposed building and relate these activities to school planning factors such as spaces, square footage, and relationships." (Hawkins, 1991) Educational specifications serve as a link between the educational program and the school facilities.
6. **TAGLIT** stands for Taking a Good Look at Instructional Technology. TAGLIT is a set of on-line assessment tools designed to gather, analyze, and report information about how technology is used for teaching and learning. In

the past, TAGLIT has been a mandatory evaluation piece for all states participating in the Gates Foundation Technology Leadership Grant initiative.

Theoretical Model

The focus of this inquiry closely examines the technological issues in planning for school facilities of the 21st century. Figure 1 identifies a theoretical model leading to a technology assessment profile reflecting a series of existing surveys. Criteria includes items such as building conditions, the local composite index, local capital improvement plan, the school accreditation status, the school technology planning process, and the current status of technology issues in school facilities such as professional development. This information provided insight toward the development of eight domains making up three separate surveys. This instrument will aid in the process to identify future technological issues and how to build in the capacity to use technology within school facilities. This instrument provides structure for school divisions throughout the Commonwealth of Virginia to help develop a functional instructional technology assessment and plan for technological advances in school facilities. Figure 2 illustrates the theoretical model used for strategic planning and technology roadmapping to identify contemporary technological issues enhancing the development of educational specifications.

Strategic planning led to a synthesis of studies pertaining to facilities, student achievement and student behavior. A line of studies from Virginia Tech examined the relationship between school leadership and the condition of school buildings. Further research explored the areas of school design, facilities, and the future trends in technological advancements.

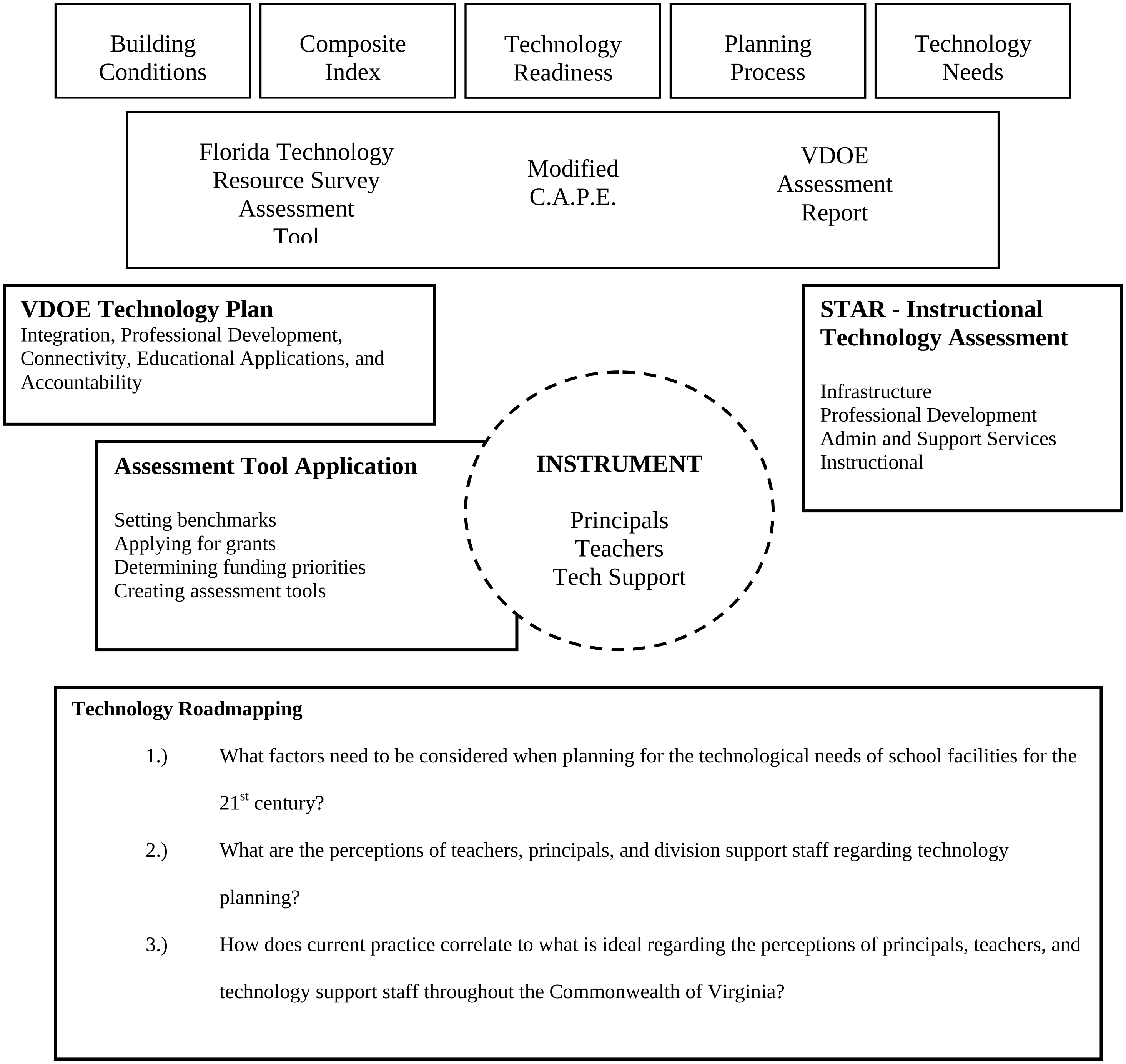

FIGURE 1. STRATEGIC PLANNING AND TECHNOLOGY ROADMAPPING USED TO PLAN FOR TECHNOLOGY IN SCHOOL FACILITIES

CEO Forum STAR Indicators

1. Educational Benefits
2. Hardware and Connectivity
3. Professional Development
4. Digital Content
5. Student Achievement and Assessment

STAR Chart

1. Teaching and Learning
2. Educator Preparation and Development
3. Administration and Support Services
4. Infrastructure for Technology

Florida Technology Resource Survey

1. Technology Administration and Support
2. Technology Capacity
3. Educator Competency and Professional Development
4. Learners and Learning
5. Accountability

The Educational Technology Plan for Virginia 2003-2009 Alignment Report

1. Stakeholders
2. Mission Statement
3. Gap Analysis
    a. Current status
    b. Division's vision for educational technology and student achievement
4. Duration
5. Goals, Objectives, and Strategies
6. Integration
7. Professional Development and Support Programs
8. Connectivity
9. Educational Applications
10. Accountability
11. Fiscal Analysis
12. Executive Summary

TAGLIT Survey Tool

FIGURE 2. TECHNOLOGY ROADMAPPING – PLANNING FOR TECHNOLOGY IN SCHOOL FACILITIES.

The process of planning for school facilities is a complicated series of interrelated steps starting with the identification of needs of the facility through the final phase of occupying the new or newly renovated facility. The development of educational specifications is the foundation of the facility planning process. It is only one part of a continuum. Given the intense national focus on student achievement and accountability, educational technology provides a powerful arsenal of tools to improve and help increase student learning and achievement ultimately providing greater return on investment in terms of function than any other step in the process. Developing educational specifications is, indeed, an arduous task, but one that is necessary if educators are to obtain the most efficient use of capital resources to facilitate proper planning for technology in school facilities to meet the needs of all community members (Hawkins, 1991).

Organization of the Study

A five chapter format will be used for this study. Chapter 1 includes the introduction, statement of the problem, purpose of the study, research questions, significance of the study, definition of terms, theoretical model, and the study's organization. Chapter 2 includes a review of the literature related to school design/facility planning and the process of developing educational specifications ensuring adequacy for technological advances. Also included in this chapter is the identification of technological needs for school facilities. Chapter 3 contains the research methodology, selecting the sample and preparing the survey, data collection, data analysis and summary. Chapter 4 describes the findings by identifying the survey response rate, summarizing the survey responses, as well as the types of data analysis used in the study. Chapter 5 contains discussion of survey responses, conclusions made, implications for practice, and recommendations for future research.

Chapter 2

Review of the Literature

The purpose of this chapter is to provide a review of the literature. This segment summarizes and critically analyzes various research studies and writings of significant leaders in the area of school design and facility planning. The purpose of the literature review is to provide a theoretical background and support for additional study in the area of school design and facility planning. Figure 3 illustrates a model developed from the literature review and focus of this inquiry. The theoretical framework is based on the literature reviewed. This framework encompassed the areas of instructional technology, strategic planning, facility planning, the relationship between school facility and student achievement, the technological needs of school facilities for the immediate future, and finally the methods and procedures for educational specifications.

Although research on this exact topic is limited, there is substantial literature on topics related to building condition and facility planning. In addition, there is valuable information on the procedures for developing educational specifications as it relates to facility planning.

Facility Planning

In studying facility planning, it is apparent that many Americans have imprinted in their minds the typical classroom simply from their own experience. Phrases like putting the desks back in rows, sitting down before the bell rings, and facing the board, describes a place that practically everyone within the past three generations can remember. The traditional school design has been a delivery system for “receiving an education.”

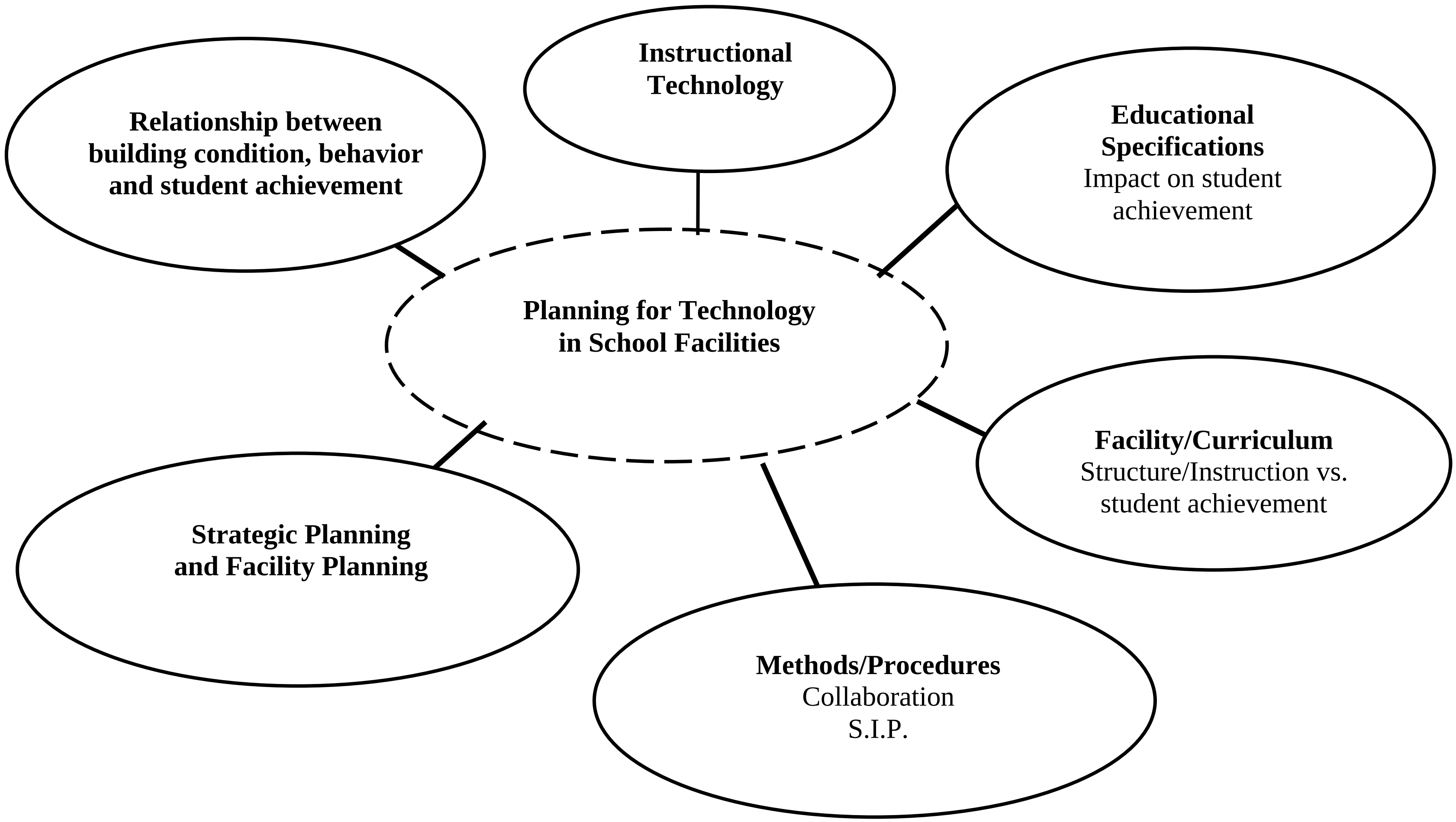

FIGURE 3. ILLUSTRATION OF THE THEORETICAL FRAMEWORK DEVELOPED FROM THE LITERATURE REVIEW AND FOCUS OF THIS INQUIRY TOWARD THE DEVELOPMENT OF SURVEY DOMAINS.

Steve Crane, a member of the Council of Educational Facility Planners International, views the future of school design to take a collaborative approach. “The schools of the 21st century will offer spaces that do not merely house an educational program. Instead, they will be learning environments that become an integral part of the educational program.” (Crane, 2000, p. 30) He states that the design of a facility will directly reflect how well a student performs. Historically, schools view a student as an individual competitor. In the future, educators will emphasize collaboration. Schools will focus on lifelong learning and master skills that will become part of their everyday lives. Crane continues by saying that no longer should schools adopt a curriculum to “fit the building.” The school’s organizational plan, educational programs, and the foundation of curriculum should be the basis of the building design.

Crane continues by stating that it will not be easy to fit a building to a curriculum. However, “tomorrow’s designs, while continuing to improve how students learn, must expand the interests and curiosity of young minds”(p. 30). Future learning spaces must provide mobility and flexibility, and offer diverse opportunities and activities. Crane talks about the classroom becoming a learning lab, fluid and evolving. Crane indicates that the quality of a learning space affects students’ attitudes, achievement and health; teacher productivity; and even parental or community involvement.

> Thoughtful design is critical to the success of any new schoolhouse. A school building affects students’ everyday lives – the way they learn and how they learn. A good design will improve a student’s socialization skills, and create spontaneous activities and learning opportunities. Good design will provide a total picture of the learning process and reinforce bonds between school and community. (Crane, 2000, p. 31)

When considering school design it appears necessary to consider many factors. In a book titled Turning Points 2000 by Gayle Davis and Anthony Jackson, it appears vital to factor in the need to organize relationships for learning. An essential truth about children's learning is that relationships matter. It was noted "research has shown that the degree to which students are engaged and motivated at school depends to a great extent on the quality of the relationships they experience there."(Eccles & Midglen, 1989, p. 140; Lee & Smith, 1993, pp. 164, 180). Supportive relationships are necessary to foster high performance among students.

When looking at school design, it is thought that educational specifications are based on a fundamental principle of modern architecture: form follows function. It is important to recognize the effects of a reconstructed curriculum on educational specifications. Educationally effective buildings must support the teaching and learning functions they are intended to address (Niece, 1988).

The environment can be seen as a learning tool. According to research from the California Department of Education's task force report titled The Form of Reform, the physical environment can directly affect the people housed there and the activities that take place there. It is critical that facility planners and educational leaders must give serious consideration to planning for schools (Ong, 1997).

The California's Department of Education's task force reviewed documents titled Here They Come: Ready or Not (1988), It's Elementary (1992), Caught in the Middle (1987), and Second to None (1992). This literature indicated that the design implications of a restructured curriculum demand cooperation and alignment between the educator and the designer if facilities are to support educational goals effectively. The roles and responsibilities of the educators and the designers were identified. The educational community must come to consensus as to which concepts in the curriculum and instructional systems are feasible. It was noted that the educational community and the architect must develop comprehensive educational specifications that align with needed programs. The architect must be able to translate the educational specifications into settings for activities and a facility that will support the desired results for all stakeholders.

In the review of literature, a two-year study entitled, “New Designs for the Comprehensive High School,” sponsored by the National Center for Research in Vocational Education, University of California-Berkeley. Bruce Jilk, architect, was discovered. The design group offered a plan that integrates technical and academic education in ways that have characteristics of modern offices than they do classrooms.

Jilk believes the instructional design of older school buildings no longer meets the needs of post-modern aims of education. With results based education, and the emphasis on student participation, education requires a new approach to the delivery of instruction. Jilk’s findings are the result of the research-based study previously mentioned. “Jilk calls personal work stations, which would accommodate work groups of five students, the building blocks of the new comprehensive high school.” (Shields, 1993, p. 9)

Strategic Technology Planning

From an organizational standpoint, the information age is in full swing and both public and private institutions are experiencing an increase in the use of a variety of information technologies. In education, it is apparent that an effective organization is one that is well planned. Planning appears fundamental to the ultimate effectiveness of technology implementation. Strategic technology planning is a widely discussed concept as the academic community has been bombarded with countless theories, models, frameworks, and approaches about planning for technology. The rise of strategic planning and the movement from strategic management to strategic leadership to strategic thinking continue to evolve. Mintzberg distinguishes between strategic thinking and strategic planning. He indicates that strategic planning activities tend to focus on incremental change. Mintzberg warns that, “Creativity, by definition, rearranges established categories. Planning, by its very nature, preserves them. That is one reason why planning does not easily handle truly creative ideas” (Mintzberg, 1993, p. 180).

According to Mintzberg, Corporate America has used various strategic planning models since the 1950’s. Adaptations along the way have been made to meet new challenges as they arise. Yet it has only been in the last decade that it has become a focus for decision-making in the educational field. Jayne Edge, Vice President of Strategic Planning and Marketing for Datatel Inc, clearly states the need for strategic planning in academia. Strategic planning is defined as “the process of determining a company or an institution’s long-term objectives, then identifying the best approach to achieve those objectives” (Edge, 2004, p. 40). Mintzberg identifies strategic planning as a continual process of monitoring performance against goals and making adjustments to attain the desired results.

There are numerous definitions of strategic planning, and there are a variety of different approaches used to plan strategically. Most definitions focus on aligning the organization with its environment in the future and are sequential and comprehensive. Olsen and Eadie define strategic planning as a disciplined effort to produce fundamental decisions and actions that help shape and guide what an organization is, what it does, and why it acts as it does. Strategic planning usually requires a wide-range of information gathering with a focus on future implications and decisions (Olsen & Eadie, 1982). Olsen and Eadie indicate that strategic planning typically includes: setting a vision for the organization; scanning the external environment; assessing internal capabilities; and establishing goals, performance, and implementation plans. Implementation entails the financial and human resources, as well as the structure and culture. Changes are identified to achieve long-range strategic goals (Bourgeois, 1984; Campbell & Garnett, 1989; Hill & Jones, 1995).

According to Cavalier, planning for technology requires the need to address a fundamental question: “What does the institution want to do with or accomplish through technology?” Planning and discussions around technical detail tend to overwhelm those who do not have the knowledge or experience with technology. What drives details must be a clear understanding of what the organization wants to do with the technology. Cavalier indicates, while planning for technology, if educational planners define it in terms of technical detail they do not address issues such as: Why do we want to use the technology in the first place? What do we want to accomplish with the technology? How will we know when we have achieved what we are trying to accomplish? Does what we are doing with technology align with the mission and vision of the organization? “If an institution answers these questions, the emphasis is shifted away from the overwhelming technical facts to a focused technology map for the future” (Cavalier, 2002). For facility planners and those developing educational specifications there must be focus to achieve technology goals. Each school division must answer the forgotten question - “What do we want to do with technology?”

Figure 4 illustrates a strategic Planning process. This model identifies a series of planning activities used to address strategic issues that face organizations. The steps are first aimed at gathering and assessing information, and then integrated in a decision-making process to help formulate a strategic plan for implementation (Bryson, 1995). Strategic planning is a process designed to align an organization with the individual needs of its clients as well as a tool referred to over time (Dowie, 2002).

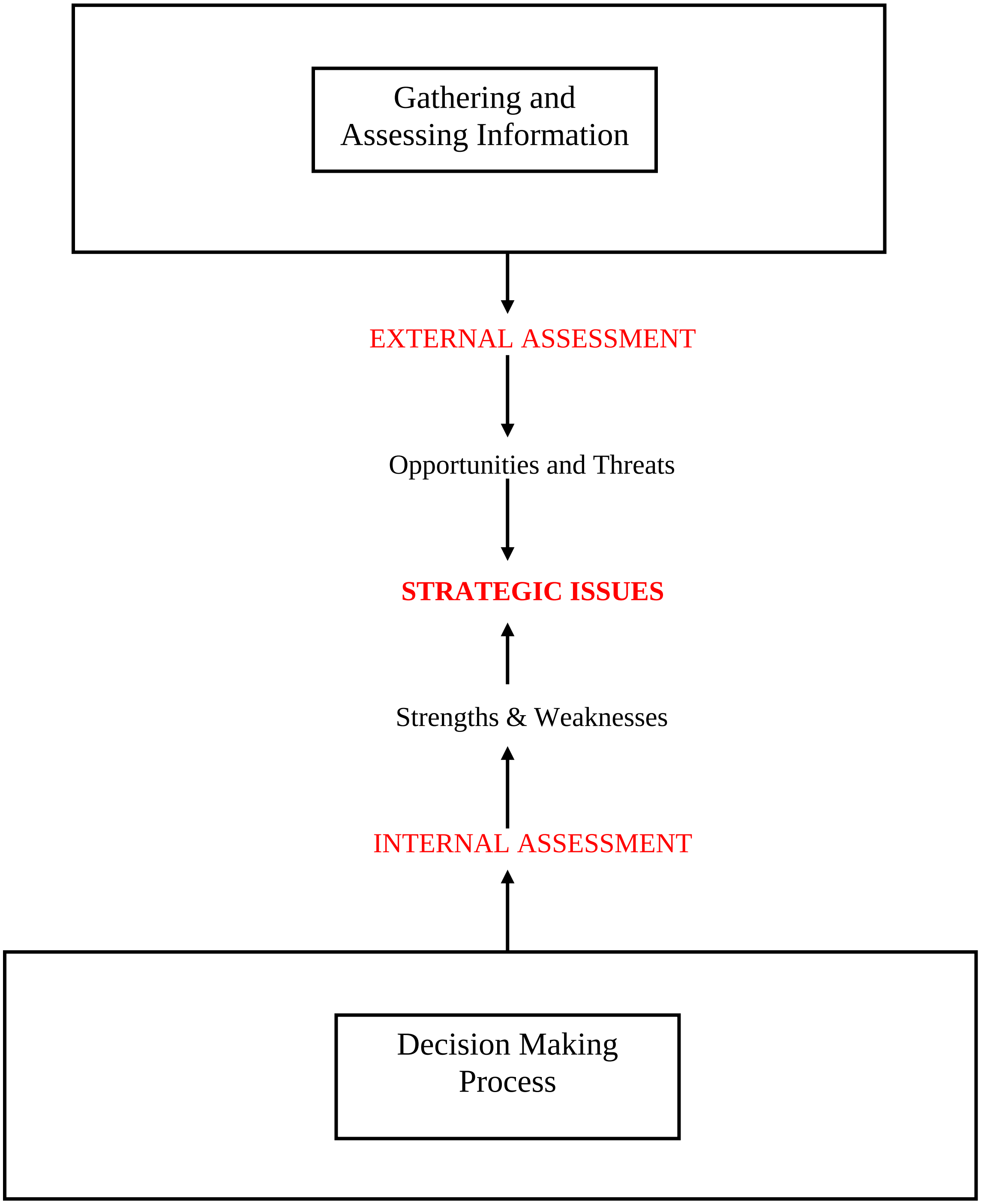

FIGURE 4. DIAGRAM OF STRATEGIC PLANNING

A critical issue with any strategic plan is the way an organization embraces the process. According to the EDUCAUSE annual research on current instructional technology issues, a strategic plan needs to be systematic and measurable, with decisions based on precise data that allow for change. Three basic questions should be answered in a strategic plan: Where are we? Where do we want to be? How do we get there? Strategic planning can be a guide if it is viewed as an on-going focus on improvement. "With strategic planning, an institution is positioned to monitor the environment, measure performance against goals, adjust yearly plans and achieve desired results" (DeBlois & Spicer, 2004).

Relationship between School Facility and Student Achievement

Cash's (1993) study reviewed the relationship between the condition of school facilities and student behavior and student achievement in small, rural high schools in Virginia. Figure 5 illustrates the theoretical model developed by Cash. The conclusion was that physical conditions of school buildings proved to impact student achievement and behavior. One could conclude that modifying the physical building environment could have a predicted impact on student achievement and behavior.

The entire population of small, rural high schools in Virginia was used in this study. An analysis of covariance, regression, and correlation analysis was used. "The building condition rating was derived from the Commonwealth Assessment of Physical Environment and subdivided into cosmetic and structural condition ratings." (Cash, p. 76)

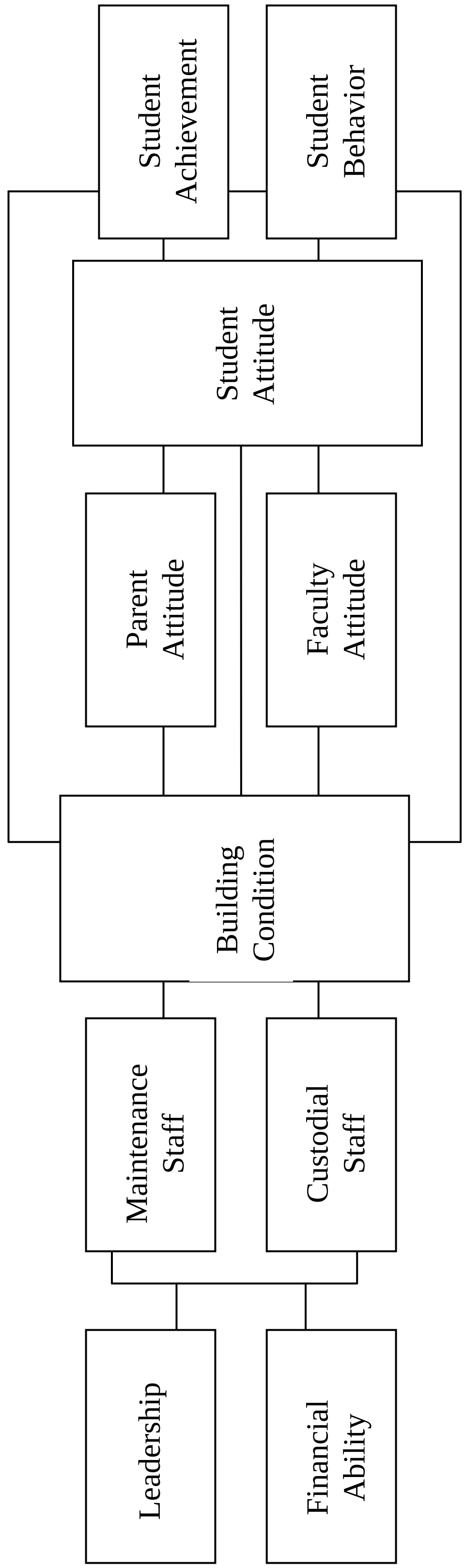

FIGURE 5. THEORETICAL MODEL DEVELOPED BY CASH (1993).

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Cash's study revealed that student achievement was found to be higher in those buildings with higher quality ratings. Cash subdivided building condition into structural and cosmetic conditions. Higher student achievement mean scale scores were found in schools with higher quality cosmetic building condition ratings. "Student achievement means scale scores were almost identical for both lower and upper scoring schools on structural ratings. Student achievement appeared to be more directly related to cosmetic factors." (Cash, p. 77) School facility and student behavior factors were also found to be related. The schools with higher quality facilities reported higher incidents per student ratios of violence/substance abuse, suspensions, and expulsions.

Lemasters (1997) study was a detailed synthesis of the research since 1980 pertaining to the relationships between school facilities and student achievement. Fifty-three studies were synthesized which included the independent variable of classroom structure. The independent variables such as noise, age, color, lighting, density, climate conditions, and classroom structure had significant findings or found a relationship of achievement or behavior of students to the school facility. Although not conclusive, data from the studies indicated that all the independent variables affected the dependant variables of student achievement. However, gaps were identified in the research indicating that studies were of short duration and lacking in the care taken with the methodology and the control of variables.

Figure 6 illustrates Lemasters revision to Cash's theoretical model. In Lemasters findings, 12 of the 13 studies including classroom structure found a significant relationship of student achievement and school facility design.

"In 1984, Cotterell found that students in open plan schools scored significantly higher on school work anxiety. Heubach (1984) confirmed in his study that a complex

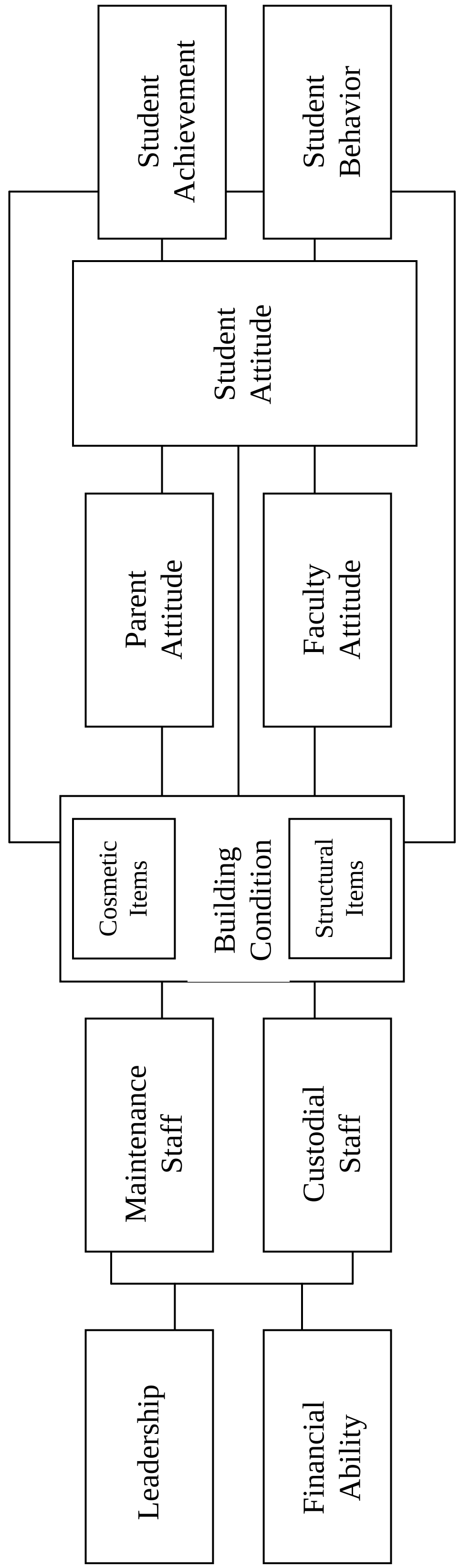

FIGURE 6. LEMASTERS (1997) REVISION OF CASH'S THEORETICAL MODEL.
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relationship existed between student privacy requirements and the structure of the classroom or the school. Students needed areas in which they could be monitored, yet have a feeling of privacy." (Lemasters, 1997, p. 186)

Facility planning and curriculum design are key ingredients for effective schools. Each component should complement the other. Unfortunately, many times they do not. Often the purpose, objective, and expectation of one seem to contradict, ignore, or conflict with the other. In the end both are needed to exist for the achievement of a common goal: learning.

Lanham's (1999) study explored the relationship between student achievement and the physical condition of school buildings and specific classrooms in Virginia's elementary schools. The role of the physical environment was discussed. It was apparent that Virginia educators must consider school facilities as they approach this era of increased accountability.

The Lanham study noted that there has been a gradual acceptance of the notion that a common-sense assumption of a "sense-of-place" does influence what goes on. "Identification of specific building and classroom factors that have a significant relationship to student achievement can help architects, facility planners, administrators, principals and teachers make improvements in instructional spaces that would help foster increased student learning and thus allow them to achieve higher scores on the new assessment instruments." (Lanham, 1999, p. 4) Brannon's (2000) study looked at the relationship between school leadership and the condition of school buildings. Several questions were identified. The first question examined the relationship between building conditions and perceptions of various stakeholders in the school community. The second question addressed the relationship between building conditions and the financial support of leadership positions. The third question examined the relationship between behavioral effort of leadership and the condition of school buildings. Figure 7 provides a visual.

Survey responses were used to develop descriptive statistics and correlations. Observation data from an independent contractor was analyzed by a percent of scaled scores in each category and compared to the perceptions of the leadership surveys on school building conditions. Information was categorized into ratings. The findings indicate that there is a positive relationship between building conditions, leadership, and financial support. The perceptions of leadership maintaining school facilities as a high priority were related to requests and allocations of funds.

The majority of the respondents felt that school facilities meet the needs of the educational program, but less than a majority of the principals reported that school facilities meet the needs. Brannon's study determined that "seventy-one percent of the school board members, 86 percent of the board of supervisors, and 94 percent of the principals reported that maintaining school facilities was one of their top priorities, while 54 percent of the central office staff and superintendents stated that maintaining school facilities was one of their top priorities. Figure 6 illustrates this relationship of the effect of leadership and the financial ability on the condition of school buildings. These positive responses can reflect that appropriate building conditions are recognized as a vital part of a child's educational process." (Brannon, 2000, p. 110)

Brannon identified schools being technologically adequate for the future as the largest percentage of perceptions given to a below standard rating, 46 percent. This included buildings that had classrooms without Internet access, no central television antenna or cable television system, and those with no wide-area network system. It is apparent that technological inadequacies need to be addressed in order to provide students with future needs.

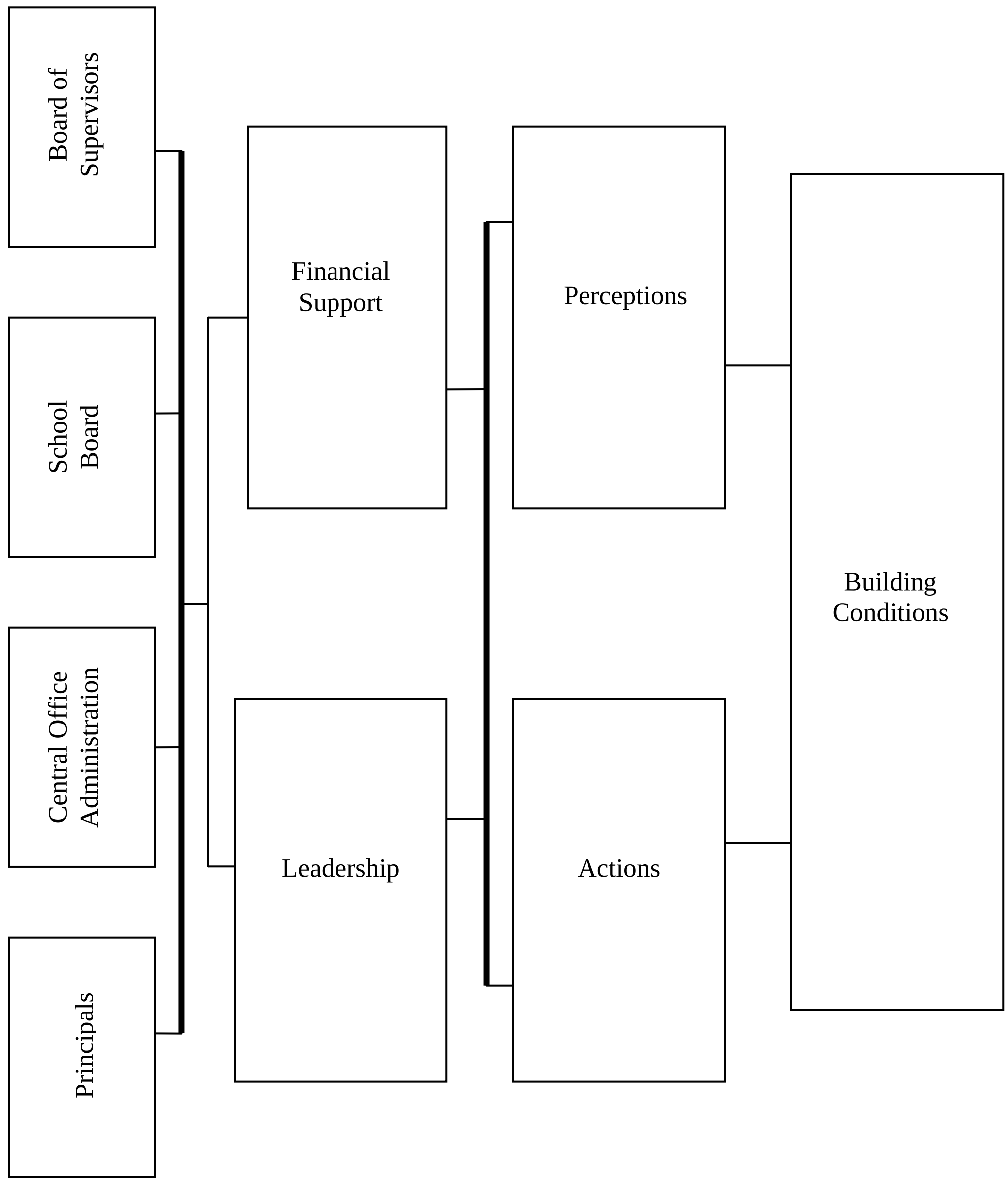

FIGURE 7. BRANNON'S STUDY ON THE EFFECT OF LEADERSHIP AND FINANCIAL ABILITY ON THE CONDITION OF SCHOOL BUILDINGS.

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renovation." (Lanham, 1999, p. 5) It is this series of studies that can provide the preliminary data regarding the availability of technology in the schools and its impact on student achievement.

Research Implications

To summarize the work of these studies it is important to recognize the work by Cash (1993) who developed a theoretical model to examine the relationship between school building condition and student achievement and behavior in Virginia's rural high schools. Hines (1996) applied this same model to urban high schools in Virginia as was recommended for further study by Cash. "In her meta-analysis of research linking building conditions and student achievement, Lemasters (1997) refined the Cash model by incorporating the results of both Cash and Hines studies. Building conditions were clarified in this revision as having both structural and cosmetic components." (Lanham, 1999, p. 6) It is the work of Lanham that extends the work of Cash, Hines, and Lemasters into the elementary school.

Methods and Procedures for Educational Specifications

Making flexibility a priority appears to be paramount in school design. However, people, resources, curriculum, and enrollment changes are making this a difficult task. It has become more apparent that planning ahead to design a school with spaces supporting the needs of the classroom are critical to help ensure we are meeting the needs of all students.

> Education is a people profession, so flexibility must be people friendly. Every district has a curriculum preference; each principal instills an educational philosophy; all teachers have a distinct teaching style; and every student has a best way to learn. It is imperative that schools make flexibility available and convenient to all. (Pettit, 1997, p. 87)

In the process of developing an effective facility design educational specifications are needed to provide a written structure related to the instructional and support activities to be offered in the new facility. This process helps to provide attention to details related to the needs of all categories of stakeholders who will use the school facility.

When building a new school or renovating an existing building an architect can make all the difference. According to Earthman, selecting the right architect is vital as it can make the difference between a project that goes relatively smoothly and one that goes seriously awry. Every project has to have an architect. According to Earthman (2000), some school divisions will employ a construction management firm, sometimes called a design/build firm that handles the entire design and construction process. However, most use a clerk of the works. Suggestions were made indicating that it is imperative to follow a sequential list or steps when hiring an architect.

There appear to be trends identified that influence the way today's schools are built – in turn are shaping school design. At one point in time a simple question like how many classrooms do you need began the process of designing a new school. Now educators talk instead about space standards – what kind of spaces the school needs to prepare students for the real world. According to Sabo (1996) it is evident that facility planners must balance the needs of students, teachers, administrators, and taxpayers. Sabo interviewed architects who work with school divisions. They traced a number of changes in education that are influencing how schools operate and, in turn, what they look like.

Sabo identifies five trends shaping school design. First, shrinking resources – renovating buildings that can be renovated. If there were a need for several new buildings one option would be to purchase a larger site and group buildings together. It is possible to reduce infrastructure costs by extending the sewers and improving access roads to just one site. Buildings could share athletic and other facilities. A full kitchen would not be needed in two sites close together. Satellite kitchens could help to reduce cost. Some school divisions are using prototype school designs. The one-size-fits-all approach can cut down on design costs, but should be used with caution.

Second, joint partnerships – more and more school divisions are working with developers to integrate schools into new subdivisions or planned communities. According to Sabo, it is now common practice to involve several representatives of the community on a school design team. Katherine N. Russ, a principal in the Raleigh, N.C., office of Boney Architects, noted that there is an increase in public-private partnerships as more stakeholders in communities see the value of involvement in the education of tomorrow's workforce.

Third, developments in curriculum – according to Sabo, architects say school design is evolving to accommodate new approaches in curriculum and instruction. There is an emphasis on meeting the individual needs of all students through individualized instruction. This requires teachers to act as facilitators of learning. Students are much more responsible for their own learning. Standardized classrooms are on the way out. Combinations of various-sized rooms are taking their place. Tables are replacing student desks to encourage teamwork and student interaction. Teachers facilitate smaller groups for hands-on work as well as larger settings for group presentations. More high schools are using the cluster concept from the middle and elementary levels to enhance multidisciplinary curriculum. Schools need more teacher planning and preparation areas, preferably closer to instructional areas. This approach applies to support services as well. Assistant principals and guidance counselors work within the individual clusters to be more accessible and less threatening to students.

Fourth, advancements in technology – even with new facilities it can be difficult to keep up with technology. Many technological advances occur throughout the design and construction of a new or renovated school. According to Sabo, many school divisions are holding back on bidding of a school's technological components. They wait until six months before awarding the computer contract.

Finally, extended use – year-round schools create nonstop wear and tear and call for more durable and more expensive materials. Schools are requiring a greater use for facilities after school hours, both by students and community members. Some of these trends point to radical changes in the way new schools are designed, look, and operate.

Holcomb (1995) indicates that educational specifications should prevent planning errors. He describes such planning errors as: building a facility without knowing and thinking through the needs of the facility, failing to consider or recognize the latest trends and developments in good instruction or educational practice, and not involving a broad base of individuals and groups in the responsibility for planning.

Holcomb states that it is important to pay particular attention to subject matter being taught in the facility. Holcomb states "many of these disciplines have adopted more of a laboratory approach rather than the 30x30 foot classroom where the teacher does all the talking." (Holcomb, 1995, p. 33)

An article by Mike Kennedy (2001) identified the top ten-facility design and planning solutions. Kennedy claims that many of our schools were designed and built without much consideration for the activities that take place within those walls. Schools should enhance student learning. Kennedy identified 10 examples of how the way a school is designed can impact student learning. (Kennedy, 2001, pp. 30-37) According to Kennedy, *technology* has become vital to 21^{st} century education and paramount to school design. New school designs mean not only that ability to connect computers throughout the facility but to create larger spaces for the application of the instructional technology. It is now imperative to ensure additional electrical power is available to support the equipment, and better climate control to ensure efficiency.

Earthman (2000), in his book entitled Planning Educational Facilities for the Next Century, describes one of the most difficult decisions toward the development of educational specifications is to define the program to be implemented in a new facility and to relate this program to building needs. It is noted that in developing educational specifications you should be clear, concise, and exact in what is requested in the building.

> Educational specifications are a set of statements that describe to the architect the types and kinds of educational activities that will take place in the proposed building and relate these activities to school planning factors such as spaces, square footage, and relationships. (Hawkins 1991, p. 38)

Establishing a procedure for developing educational specifications is not an easy task; particularly interpreting the needs of those who will use the facility. Many times school systems do not devote the needed time, funds, or energy to complete this task the most efficient way. “Developing these specifications demands a reasoned approach to school planning and a systematic procedure involving many people inside and outside the school system.” (Earthman, 2000, p. 157)

Earthman describes several reasons why many school systems fall short in developing educational specifications. He mentions that perhaps the main reason for not developing a good set of educational specifications may be the lack of leadership on the part of those responsible for the task. It appears that many school divisions without anyone willing to step up to the plate, asks the architect to complete the work an educator should have completed. In many instances this makes the architect feel compelled to provide that leadership. In the past educational specifications have been completed by architects and many feel they should continue to be responsible for this task simply because that is the way it has been done in the past. Many educators believe that their school system simply does not have the capacity or the staff to do the task and cannot afford to pursue outside services. Some educators feel they are inadequate in providing the needed leadership to guide their staff through this process. Earthman stresses the necessity for this leadership and points out that a designated member of the school staff needs to write the document or obtain the services of an educational consultant.

The developmental process begins with the understanding that important questions need to be answered. Through the process of answering specific questions will come a document, a set of educational specifications. Figure 8 identifies typical questions according to Earthman. Describing the various activities is important to the architect in order to provide a design that will support the activities. It is imperative to fully utilize the facility and materials from the outset of the new facility. Only by clearly describing the needs and types of activities can the educator hope to successfully communicate facility requirements to the architect. The principal may be released from a school assignment to complete this task. It is wise to assign only one person to actually write the educational specifications. (Earthman, 2000)

The educational specifications contain answers to questions about the building. Figure 9 identifies the typical content of educational specifications. Even though the educational specifications are clearly written, they need to be interpreted to the architect during the design stage. (Earthman, 2000)

- Earthman indicates that it is clearly the responsibility of the school system to prepare the educational specifications for a school facility. In smaller school systems a How many students will the facility serve?
- What are the age groupings, backgrounds, needs and capabilities of the students who will occupy this facility?
- What subjects will be taught?
- What methods of teaching will be used?
- What type of educational technology will be used and where?
- How long will the school day be?
- How many students will eat lunch or breakfast?
- Will the program offer drama, music, and sports?
- Will the community utilize the building?
- What kind of media center should the facility have?
- Will the program include science, mathematics and technical subjects?

FIGURE 8. TYPICAL QUESTIONS RELATING TO NEW FACILITIES TOWARD THE DEVELOPMENT OF EDUCATIONAL SPECIFICATIONS

Earthman, 2000, p. 159

All stakeholders in the process of developing educational specifications have a unique responsibility. According to the Council of Educational Facilities Planners, individual and group responsibilities for writing of educational specifications assume various roles to facilitate this process. For example, the Board of Education adopts permissive and guiding policies, and the administration provides leadership, guidance, and assistance to the working committee throughout the study. The working committee, made up of teachers, student, administrators, and citizens are responsible for the organization of the study and prepare a written report based upon the findings of the

- Educational situation and student body
- Description of the community to be served
- The site and site development
- Educational philosophy of the school system
- Educational program to be offered
- Educational trends in subject matter and methodology
- Space requirements in square footage
- Functional relationships of the facility
- Specialized facilities for technology education, science, physical education, family and consumer sciences, and music
- Indoor and outdoor recreational facilities
- Building communications and utility requirements
- Furniture and equipment
- Plant service area and facilities
- Parking and vehicular traffic
- Site and plant security
- Community use of the facility

FIGURE 9. AREAS TO BE ADDRESSED IN THE CONTENT OF EDUCATIONAL SPECIFICATIONS.

Earthman, 2000, p. 162

study. The educational consultant interprets discernible trends and new programs. The architect serves as an advisor on architectural considerations.

Although it has been noted that one individual can write the document for educational specifications, the end product must reflect the needs of all stakeholders. Community input is essential. Involving community participants provides an opportunity that participants will better understand the program to be carried out in the facility. This will help to provide community acceptance and ultimately utilization of the new facility (Herman, 1995). It has been emphasized in this study that both educators and selected community members should be organized into an educational specifications planning committee. The members of this committee, not the architect, should identify the needs of both the instructional and support programs. The written details about the programs to be offered should be provided to the architect. The architect can then design the architectural specifications in a way that will meet the needs of the school community (Carey, 2000). It is important to note here that planning teams take into consideration the idea that educational specifications must be projected into the future, as well as deal with the needs of the present. Through the literature review it appears that there is a significant amount of information describing the process of facility planning which indicates sequential steps and methods for collecting information to design a facility to meet the needs of the school community. What remains unclear is the issue of facility/technology infrastructure and its impact on increasing student learning and achievement. Are school structures and instructional ideals in conflict?

Instructional Technology

Technology is rapidly changing how people live and work. It is evident that we now need to harness technology to benefit our nation's schools and most importantly; students. Given the intense national focus on student achievement and accountability, educational technology provides a powerful tool to improve student achievement and to provide accountability frameworks based on systematic and continuous improvement Copa & Pease, 1992).

A unique five-year partnership was founded in 1996 bringing together business and education leaders. The CEO Forum was committed to assessing and monitoring progress toward integrating technology in America's schools. The CEO Forum hopes to ensure that students will increase achievement and be equipped for the 21^{st} century. The report from the CEO Forum is both a culmination and synthesis of five years of exploration on the impact of educational technology.

The STAR Chart, School Technology and Readiness, was created by the CEO Forum to help provide a clear framework for understanding how well schools are prepared to equip students and staff with the knowledge and skills they need to be successful in today's technological society.

The STAR chart is a tool that can help in the establishment of a plan for improving education with information technology. Virginia, Texas and North Carolina have adopted versions of the STAR Chart in state technology and accountability programs.

The Office of Educational Technology for the Virginia Department of Education has developed a School Division Technology Plan Alignment Workbook to serve as a resource for the development of the division technology plan. This can be useful in aiding each division record progression of the development of the technology plan. This can be extremely useful for technology advisory committees at the division level to help track progress and ensure that their plan reflects federal and state requirements. Throughout the literature review no evidence of a technology assessment tool has been found.

According to the Virginia Department of Education, Virginia's leaders have prepared the state to be attractive to companies and investors by providing the technology infrastructure and skilled workforce need to be competitive. Virginia has made tremendous advances in infrastructure, hardware, software, teaching and learning resources, professional development, and administrative applications (Davis, 2002). For Virginia to capitalize on this advantage, a continued commitment to long-range planning, effective, statewide integration of educational technology into teaching and learning will be essential.

Equity continues to be a concern as we look at the future of technology in schools. Considering the digital divide, planners continue to look at data such as the ratio of computers to students, the quality of computers, the type of Internet access, the access for students with disabilities, the quality of software, and the preparation and or professional development of teachers. It is this issue that brings relevance again to this study.

The future of technology in schools may be full of promise, but it is hard to foresee. Principals can prepare by joining or creating trend-watching groups to be alert to innovations and trends (Mason, 2005). Setting up BLOGS or web logs to continue dialogue with fellow school leaders may be a resource obtainable to review and contribute to at your own leisure.

21st Century Skills

Today's education system faces irrelevance unless we bridge the gap between how students live and how they learn (Davis & Jackson, 2000). New guides have been identified to help students acquire 21st century skills according to a recent article in eSchool News. The web-based tools were introduced by the Partnership for the 21st Century Skills, a public-private organization formed in 2002 to create a successful model of learning for this millennium that incorporates 21st century skills into our system of education (Branigan, 2004).

"Route 21", one of the new tools, takes you step by step through the process of creating plans to integrate technology skills into subject areas such as math, geography, and language arts. "Route 21" consists of nine guidelines with topics such as getting started, information and communication technology literacy, professional development, equitable access, assessment, collaboration, and technology capacity (Partnership for the

21st Century Skills, 2002). These items appear to match the STAR Readiness Chart, Florida Technology Resource Survey, and the components of the Virginia Technology Plan already mentioned in this study.

Chapter 3

Research Methodology

The purpose of this study is to help plan for technology in school facilities. A close examination of the relationship between the identified technological needs of school facilities in the 21st century and the perceptions of current technology planning in school facilities is analyzed. The four purposes of this chapter are to (a) describe the research design, (b) identify the sample population, (c) explain the methods of data collection used, and (d) present the procedures to be used to analyze the data.

The Design

This study is designed to provide an array of helpful information for anyone making decisions about technology in school facilities. Multiple variables were identified and checked for validity. Measures of validity are similar to measures of reliability. Reliability compares one measurement of a variable on a group of subjects with another measurement of the same variable on the same subjects (Creswell, 1998). This was done with several variables within each domain. According to Hopkins, with validity a comparison is made of two measurements on the same subjects. The first measurement is for the variable you are interested in, which is usually some practical variable or measure. Several variables identify what is current and what is ideal for each participant in the survey. The second measurement is for a variable that gives values as close as you can get to the true values of whatever you are trying to measure. This is sometimes referred to as the criterion variable or measure (Hopkins, 2000).

Descriptive statistics were used to describe the sample and look for the variability among the data and to determine how closely the data are related (Leedy & Ormrod, 2001). A descriptive research methodology is used to describe and interpret the planning in school facilities throughout the Commonwealth of Virginia. In essence, this is a validity study of a technology profile is created for each respondent. An educational specification design team or an administrator planning for technology in school facilities could use the profile results for planning purposes.

This study ultimately addresses the condition or relationships that exist, the opinions that are held, the on-going processes, the effects that are evident, or the trends that are developing. A web survey addressed the relationship between school technology coordinators, building principals, and teacher leaders and their identification of where they are now regarding technology compared to their perceptions of where they want to be. The main research question for this validity study was: How do you plan for technology in school facilities?

Selecting the Sample and Preparing the Survey

For this study, a systematic random sample was used to determine which divisions throughout the Commonwealth of Virginia would be surveyed. First, divisions were identified with at least two elementary, two middle, and two high schools. This list was then ranked by composite index and divided into quartiles.

The survey was submitted for the required approval from the Institutional Review Board for Research Involving Human Subject (IRB). All survey questions were field tested for validity and reliability by educators not involved in this study. When jurying the survey respondents were asked to decide which domain the statement should be classified into as well as decide the strength of the association. Clarity was also looked at to address any ambiguity or confusion.

Data Collection

Administering the survey instrument

All school divisions, throughout the Commonwealth of Virginia, were ranked from high to low by their composite index, which was identified from the Office of Information Technology via the Virginia Department of Education web site. 132 school divisions were identified. This list was divided into four quartiles. Two high schools, two middle schools, and two elementary schools were identified in each division selected. The interval size was 11. Six was the random integer selected to start with and every 11th division thereafter was selected to be surveyed. Within each quartile three divisions were identified for a total of 12 divisions. The six schools within each division were randomly selected. Within each division one technology coordinator, six principals, and six teachers were surveyed for a total of 156 surveys.

Organizing the survey responses

The Survey Monkey web survey tool was utilized to survey participants. The survey maker is a service that allows students to create surveys, publicize the survey, and collect data. The numerical responses were analyzed using the Statistical Package for the Social Sciences (SPSS). The data collected for this study was downloaded into SPSS for analysis. The download was imported from the Survey Monkey survey maker as an Excel file to be recoded into usable data before the analysis within SPSS.

Several benefits come to mind with the utilization of the Internet survey. First, the delivery and response time have the potential to be decreased. Second, there is the possibility of reduced cost in conducting the research. Finally, the coding time for the returns should be reduced, as this will be directly downloaded into SPSS for data analysis.

To gain a high response rate, Salant & Dillman (1994) suggest that the subjects be contacted in four stages. Four separate points of contact were utilized to follow up with selected participants. First, a personal phone call was made to contact each building level principal. It was left up to the principal to identify who the technology lead person is in their building. As data were being collected, it was important to determine the significance of nonrespondents as well as a plan to minimize the nonresponse error (Ary, Jacobs, & Razavieh, 2002). Next, an email was sent with a link to the web survey. After the deadline an automated phone call was made to non-respondents. Next, two follow up emails were sent to non-respondents with a revised message including a link to the survey. A copy of the emailed messages can be found in Appendix C, D, and E.

Individual data spreadsheets were used to collect individual responses by respondent's position. Eight separate worksheets were created for each of the survey's eight domains – The Planning Process, Technical and Instructional Support, Professional Development, Technology Resources-Hardware/Infrastructure, Technology Resources-Software, Learners and Learning, Technology Policies, and Related Community Connections.

Validity

Survey statements were juried by non-participants to help identify potential questions for each domain. A complete description of each domain is identified in Appendix A and was distributed to each respondent to provide further clarification. Each question was measured for its association and clarity to the domain. Evidence for the validity of the technology profile is derived mainly from its performing according to expectations, or it's construct validity. Construct validity is the extent to which an instrument can be shown to measure the construct being studied (Gall, Gall, & Borg, 2003).

Data Analysis

When analyzing the data for this study, attention was given to ensure each research question was addressed. An instrument was developed to provide a profile to address planning for technology in school facilities in Virginia. Again, the focus was to provide schools with information to help plan for technology in school facilities ultimately answering the question: How do you plan for technology in school facilities? This study has three data components. For each proposed research question there is a proposed method of analysis and measurement. The components are (a) what factors need to be considered when planning for technology in school facilities? (b) What is your schools current technology profile? (c) How does current practice correlate to what is ideal regarding the perceptions of principals, teachers, and technology support staff throughout the Commonwealth of Virginia?

The findings from three separate surveys of principals, lead technology teachers, and division technology support staffs are reported. Specific survey responses and demographic information about principals and teachers in the sample are summarized. Descriptive statistics would describe the basic features of the data in this study. This study, using descriptive inferential statistics, would be describing what is – what the data show. The basic descriptive statistics would include descriptions of the data distributions, measures of central tendency and dispersion or variability, and correlation. The data analysis for this study responded to each research question. A descriptive analysis for each variable was conducted. This descriptive analysis included the mean, standard deviation and range. Frequency tables and percentage of responses were developed to display the results of each survey question that was administered to the participants.

The survey data was analyzed using a One-Way Analysis of Variance to test the equality of multiple means. Analysis of variance (ANOVA) was used to uncover the main effects of categorical independent variables on an interval dependent variable. A "main effect" is the direct effect of an independent variable on the dependent variable. A close look was given to each demographic and domain scores for both the principal and teacher survey. The key statistic in ANOVA is the F-test and was used to determine if the means of the groups formed by values of the independent variable are different enough not to have occurred by chance.

Correlations between demographics and survey domain scores were also identified and discussed using a Pearson's Product and Moment Correlation matrix. Chi Square was also used to test for statistical significance. It was this test that helped determine the degree of confidence in accepting or rejecting the hypothesis. According to Connor-Linton, "the hypothesis tested with chi square is whether or not two different samples (of people, texts, whatever) are different enough in some characteristic or aspect of their behavior that we can generalize from our samples that the populations from which our samples are drawn are also different in the behavior or characteristic" (Connor-Linton, 2003, p. 1).

Finally, specific questions were analyzed using a T-Test to correlate respondent's current practice to what is ideal regarding the perceptions of principals, teachers, and division technology support staff throughout the Commonwealth of Virginia.

Summary

The purpose of this chapter was to describe the methodology of this study, to identify the sample, to describe the instruments used in collecting the data, the data collection procedures, and the methods used in analyzing the data collected. Graphs and tables provide a means for cross-referencing between the respondents' as well as the categories or domains identified in the survey. Data were analyzed using Chi Square, frequency distributions, correlations, and ANOVAs. This study has the possibility of providing useful information for schools throughout the Commonwealth of Virginia to help with the continuation of planning for technology in existing, new, or renovated school facilities.

This study surveyed technology coordinators, building principals, and teachers throughout the Commonwealth of Virginia to help test the validity of a tool for planning and assessing school technology and readiness. This tool could possibly help in a variety of ways. Possibilities include but are not limited to setting benchmarks and goals, applying for technology grants, determining funding priorities, and creating individualized assessment tools.

Chapter 4

Findings

In Chapter 4, the findings from three separate surveys of principals, lead technology teachers, and division technology support staffs are reported. Specific survey responses and demographic information about principals and teachers in the sample are summarized. Correlations between demographics and survey domain scores are identified and discussed using a Pearson's Product and Moment Correlation matrix. The survey data are analyzed using a One-Way Analysis of Variance to test the equality of multiple means. Finally, specific questions are analyzed using a T-Test to correlate respondent's current practice to what is ideal regarding the perceptions of principals, teachers, and division technology support staff throughout the Commonwealth of Virginia.

Survey Response Rate

One hundred and fifty six surveys were distributed as the sample for the study identifying seventy-two principals, seventy-two teachers, and twelve division technology support staff. An analysis of the returns is found in Table 1.

TABLE 1
SUMMARY OF SURVEY RESPONSES

Sample by Subjects	N Distributed	N Returned	%
Principals	72	39	54.2
Teachers	72	50	69.4
Division Support	12	7	58.3
Total N	156	96	61.5

The frequency of responses of demographics for principals and teachers by level can be found in Table 2.

TABLE 2
FREQUENCY OF DEMOGRAPHICS BY LEVEL

	Principals		Teachers	
Level	N	%	N	%
Elementary	11	28.2	14	28.0
Middle	16	41.0	14	28.0
High	8	20.5	19	38.0
Secondary*	4	10.3	3	6.0
TOTAL	39	100.0	50	100.0

* Secondary schools consist of grades 9-12 but also include grades lower the 9.

Principal Survey Responses

The principal survey instrument demographics include school enrollment, age of facility, and accreditation status. Each demographic can be found separately in Table 3. The survey administered to principals asked them to complete 23 questions in four separate domains; The Planning Process, Professional Development, Technology Policies, and Related Community Connections. Part 1 of the survey included demographic questions (1-5). Part 2 of the survey included questions (6-8) related to the planning process. Part 3 included questions (9-12) aimed at professional development. Part 4 of the survey with questions (13-17) related to technology policies. Finally, Part 5 of the survey with questions (18-23) focused on the final domain entitled related community connections. Principals were asked to use their own experience as a building administrator to respond to the survey to help plan and assess for school technology and readiness. Their responses are summarized in Appendix F.

TABLE 3
PRINCIPAL DEMOGRAPHICS

Current Enrollment	**N**	**%**
< 500	9	23.1
501-1000	16	41.0
1001-1500	8	20.5
>1500	5	12.8
No Response	1	2.6
Total N	39	100.0
Age of Facility		
< 5 Years	5	12.8
6-10 Years	3	7.7
11-15 Years	3	7.7
> 15 Years	27	69.2
No Response	1	2.6
Total N	39	100.0
Accreditation Status		
Accreditation Withheld	0	0.0
Conditionally Accredited	1	2.6
Accredited with Warning	2	5.1
Fully Accredited	36	92.3
Total N	39	100.0
School Meeting AYP		
No	4	10.3
Yes	35	89.7
Total N	39	100.0

The teacher survey instrument demographics include educational setting, school AYP status, and division AYP status and can be found in Table 4.

TABLE 4
TEACHER DEMOGRAPHICS

Educational Setting	**N**	**%**
Rural	27	54.0
Suburban	22	44.0
Urban	1	2.0
Total N	50	100.0
School AYP		
No	5	10.0
Yes	45	90.0
Total N	50	100.0
Division AYP		
No	7	14.0
Yes	43	86.0
Total N	50	100.0

Teacher Survey Responses

The survey administered to teachers asked them to complete 17 questions in two separate domains; Learners and Learning, and Teacher Planning. Part 1 of the survey included demographic questions (1-4). Part 2 of the survey included questions (5-8 and 13-17) related to Learners and Learning. Part 3 of the survey with questions (9, 10, and 12) related to Teacher Planning. Teachers were asked to use their own judgment and experience to respond to the survey to help plan and assess for school technology and readiness. Their responses are summarized in Appendix G.

Scoring

Survey items are constructed to obtain a selection from a list of responses. For each item a rating scale was employed with clear explanations of the ratings provided. In all cases the responses are structured to offer the most positive response first, followed by less positive responses in ascending order. The most positive response was coded as a “4”, the next response a “3”, and so on. For questions requiring a yes or no answer, yes was coded as “2” and no was coded as “1”. For all survey questions “0” was used if there is no response. These numerical responses were analyzed using the Statistical Package for the Social Sciences (SPSS).

Data Analysis

SPSS was used to conduct a Pearson’s Product Moment Correlation matrix. A pre-determined alpha of .05 was used for all tests as this significance has been used throughout most studies in this field. This means that the odds that the correlation occurred by chance are no more than 5 out of 100.

Domain scores were determined by averaging each section of each survey for a specific score. Domain scores were used as a comparison to specific demographic data. A One-Way Analysis of Variance was used to test the equality of three or more means at one time by using variances. An Analysis of Variance for Teacher Domains was created for each of the following sources: Building level, educational setting, school AYP status, and division AYP status. Looking at the key statistic in ANOVA, the F-test, if the group means do not differ significantly then it is inferred that the independent variables did not have an effect on the dependent variable. Table 5, illustrates the results for building level as the source.

TABLE 5
ANALYSIS OF VARIANCE FOR TEACHER DOMAINS

Source - Level	df	SS	MS	F	Effect Size	Sig.
Learners and Learning						
Between	3	.860	.287	1.647		.194
Within	40	6.960	.174			
Total	43	7.819			.110	
Planning						
Between	3	.257	.086	.356		.785
Within	40	9.609	.240			
Total	43	9.866			.026	
Domain Total Score						
Between	3	.449	.150	.821		.490
Within	40	7.292	.182			
Total	43	7.741			.058	

Table 5, illustrates that using the building level as the independent variable did not have an effect on the dependent variable. However, the domain Learners and Learning had an F of 1.647 with a significance of .194 indicating a small effect.

Table 6, illustrates that using the building setting, as the independent variable did not have an effect on the dependent variable. The whole idea behind the analysis of variance is to compare the ratio of between group variance to within group variance. If the variance caused by the interaction between the samples is much larger when compared to the variance that appears within each group, then it is because the means are not the same. That is not the case here.

TABLE 6
ANALYSIS OF VARIANCE FOR TEACHER DOMAINS

Source - Setting	df	SS	MS	F	Effect Size	Sig.
Learners and Learning						
Between	1	.024	.024	.128		.722
Within	42	7.795	.186			
Total	43	7.819			.003	
Planning						
Between	1	.003	.003	.013		.910
Within	42	9.862	.235			
Total	43	9.866			.000	
Domain Total Score						
Between	1	.011	.011	.059		.809
Within	42	7.730	.184			
Total	43	7.741			.001	

Table 7, illustrates that using the school AYP status as the independent variable also did not have an effect on the dependent variable. School AYP status as the independent variable had more of an effect with the domain Learners and Learning, but still had a 52 out of 100 chance that the effect was by chance.

Table 8, illustrates that using the division AYP status as the independent variable did not have an effect on the dependent variable. However, the Mean Square Between groups was much closer for all three domain scores yielding a lower significance ratio and higher F-test.

TABLE 7
ANALYSIS OF VARIANCE FOR TEACHER DOMAINS

Source – School AYP	df	SS	MS	F	Effect Size	Sig.
Learners and Learning						
Between	1	.077	.077	.417		.522
Within	42	7.742	.184			
Total	43	7.819			.010	
Planning						
Between	1	.008	.008	.033		.856
Within	42	9.858	.235			
Total	43	9.866			.001	
Domain Total Score						
Between	1	.033	.033	.182		.672
Within	42	7.708	.184			
Total	43	7.741			.004	

An Analysis of Variance for Principal Domains was created for each of the following sources: building level, school enrollment, age of facility, accreditation, and school AYP status. Table 9, illustrates the results for building level as the source.

Table 9, illustrates that using the building level as the independent variable did not have an effect on the dependent variable. However, the domain Technology Policies had an F of .1764 and a significance of .172 even higher than the effect on teacher domains.

Table 10, illustrates that using the building enrollment as the independent variable also did not have an effect on the dependent variable. However, the domain Technology Policies again had the highest F-test at 1.366 with a significance of .270.

TABLE 8
ANALYSIS OF VARIANCE FOR TEACHER DOMAINS

Source – Division AYP	df	SS	MS	F	Effect Size	Sig.
Learners and Learning						
Between	1	.221	.221	1.223		.275
Within	42	7.598	.181			
Total	43	7.819			.028	
Planning						
Between	1	.260	.260	1.136		.293
Within	42	9.606	.229			
Total	43	9.866			.026	
Domain Total Score						
Between	1	.240	.240	1.345		.253
Within	42	7.501	.179			
Total	43	7.741			.031	

Table 11, illustrates that using the building age as the independent variable did have an effect on the dependent variables of Planning Process and Related Community Connections. The Planning Process had an F-test of 4.802 and the Related Community Connections at 2.759. The Planning Process was even significant at the .01 level. Using a Post Hoc test it was found that the Planning Process was aligned with schools > 15 years.

TABLE 9
ANALYSIS OF VARIANCE FOR PRINCIPAL DOMAINS

Source - Level	df	SS	MS	F	Effect Size	Sig.
Planning Process						
Between	3	.546	.182	1.020		.395
Within	35	6.241	.178			
Total	38	6.786			.080	
Professional Development						
Between	3	.248	.083	.665		.579
Within	35	4.351	.124			
Total	38	4.599			.054	
Technology Policies						
Between	3	.436	.145	1.764		.172
Within	35	2.883	.082			
Total	38	3.319			.131	
Community Connections						
Between	3	.167	.056	.194		.900
Within	35	10.048	.287			
Total	38	10.215			.016	
Domain Total Score						
Between	3	.025	.008	.109		.954
Within	35	2.615	.075			
Total	38	2.639			.009	

TABLE 10
ANALYSIS OF VARIANCE FOR PRINCIPAL DOMAINS

Source - Enrollment	df	SS	MS	F	Effect Size	Sig.
Planning Process						
Between	3	.650	.217	1.231		.313
Within	34	5.984	.176			
Total	37	6.635			.098	
Professional Development						
Between	3	.410	.137	1.111		.358
Within	34	4.188	.123			
Total	37	4.599			.089	
Technology Policies						
Between	3	.349	.116	1.366		.270
Within	34	2.894	.085			
Total	37	3.243			.108	
Community Connections						
Between	3	.890	.297	1.083		.369
Within	34	9.306	.274			
Total	37	10.196			.087	
Domain Total Score						
Between	3	.198	.066	.933		.435
Within	34	2.404	.071			
Total	37	2.601			.076	

TABLE 11
ANALYSIS OF VARIANCE FOR PRINCIPAL DOMAINS

Source – Age of Facility	df	SS	MS	F	Effect Size	Sig.
Planning Process						
Between	3	1.974	.658	4.802		.007
Within	34	4.660	.137			
Total	37	6.635			.298	
Professional Development						
Between	3	.440	.147	1.200		.324
Within	34	4.158	.122			
Total	37	4.599			.096	
Technology Policies						
Between	3	.241	.080	.910		.446
Within	34	3.002	.088			
Total	37	3.243			.074	
Community Connections						
Between	3	1.996	.665	2.759		.057
Within	34	8.200	.241			
Total	37	10.196			.196	
Domain Total Score						
Between	3	.556	.185	3.082		.040
Within	34	2.045	.060			
Total	37	2.601			.214	

Table 12, illustrates that using the building accreditation status as the independent variable also had an effect on the dependent variable of Professional Development. The F-test was 4.367 yielding a significance of .02.

TABLE 12
ANALYSIS OF VARIANCE FOR PRINCIPAL DOMAINS

Source - Accreditation	df	SS	MS	F	Effect Size	Sig.
Planning Process						
Between	2	.425	.213	1.203		.312
Within	36	6.361	.177			
Total	38	6.786			.063	
Professional Development						
Between	2	.898	.449	4.367		.020
Within	36	3.701	.103			
Total	38	4.599			.195	
Technology Policies						
Between	2	.089	.044	.496		.613
Within	36	3.230	.090			
Total	38	3.319			.027	
Community Connections						
Between	2	.535	.267	.994		.380
Within	36	9.681	.269			
Total	38	10.215			.052	
Domain Total Score						
Between	2	.226	.113	1.689		.199
Within	36	2.413	.067			
Total	38	2.639			.086	

Table 13, illustrates that using school AYP status as the independent variable did not have an effect on the dependent variable. However, Technology Policies had an F-test of 1.527 with a significance of .224.

TABLE 13
ANALYSIS OF VARIANCE FOR PRINCIPAL DOMAINS

Source – School AYP	df	SS	MS	F	Effect Size	Sig.
Planning Process						
Between	1	.012	.012	.064		.802
Within	37	6.775	.183			
Total	38	6.786			.002	
Professional Development						
Between	1	.006	.006	.049		.826
Within	37	4.593	.124			
Total	38	4.599			.001	
Technology Policies						
Between	1	.132	.132	1.527		.224
Within	37	3.187	.086			
Total	38	3.319			.040	
Community Connections						
Between	1	.083	.083	.304		.584
Within	37	10.132	.274			
Total	38	10.215			.008	
Domain Total Score						
Between	1	.044	.044	.625		.434
Within	37	2.595	.070			
Total	38	2.639			.017	

Formulas used to determine correlations differ based on the type of data used, but the idea is still the same; they estimate the relationship between two variables as a number between -1 and +1. The Pearson Correlation is identified in each table for each pair. “The correlation is one of the most common and most useful statistics. A correlation is a single number that describes the degree of relationship between two variables.” (Trochim, 2001, p. 272) The Statistical Program for the Social Sciences (SPSS) was used to conduct a Pearson’s Product Moment Correlation matrix. The correlation was completed with 17 variables ultimately identifying 136 unique correlations. Of the 136 pairs, 13 were found to have statistical significance. Each item from the correlation matrix is identified in a table with significance at either the .01 or .05 level. When determining the correlations, 27 principals and teachers from the same schools were identified.

Table 14, illustrates three correlations with significance for the Teacher Building Level. One being quite obvious was the Principal Building Level with a correlation of .810 and the Principal Building Enrolment at .545. There was a .398 correlation with the Principal Planning Process Domain Score.

TABLE 14

CORRELATIONS FOR TEACHER BUILDING LEVEL

	Principal Building Enrollment	Principal Planning Process
Pearson Correlation	.545**	.398*
Sig. (2-tailed)	.003	.040
Sum of Squares	11.926	2.794
Covariance	.459	.107
N	27	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 15, shows the only negative correlation for the Teacher Building Setting of -.407 for the Principal Building Age.

TABLE 15

CORRELATIONS FOR TEACHER BUILDING SETTING

	Principal Building Age
Pearson Correlation	-.407*
Sig. (2-tailed)	.035
Sum of Squares	-6.185
Covariance	-.238
N	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 16, identifies three correlations with significance for Teacher Division AYP status. First, the Principal Building Accreditation aligns with a significance level of .01 and a Pearson Correlation of .605. Second, the Principal Professional Development has a Pearson Correlation of .485. Finally, the Principal Total Domain score with a .408 correlation.

TABLE 16

CORRELATIONS FOR TEACHER DIVISION AYP

	Principal Building Accreditation	Principal Professional Development
Pearson Correlation	.605**	.485*
Sig. (2-tailed)	.001	.010
Sum of Squares	1.778	1.306
Covariance	.068	.050
N	27	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 17, identifies three different correlations with significance for Teacher Learners and Learning. First, Teacher Planning aligns with a significance level of .01 and a Pearson Correlation of .766. This table illustrates that both of the teacher domain score correlate. The Teacher Learner and Learning Domain also correlates with the Principal Building Age particularly with principals in buildings >15 years.

TABLE 17

CORRELATIONS FOR TEACHER LEARNERS AND LEARNING

	Teacher Planning	Principal Building Age
Pearson Correlation	.766**	.409*
Sig. (2-tailed)	.000	.034
Sum of Squares	3.852	4.781
Covariance	.148	.184
N	27	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 18, lists two correlations for the Teacher Planning Domain. One of which is the Principal Domain Score for Related Community Connections. The Pearson Correlation is .482 at a .011 significance level.

TABLE 18

CORRELATIONS FOR TEACHER PLANNING

	Principal Community Connections
Pearson Correlation	.482*
Sig. (2-tailed)	.011
Sum of Squares	2.934
Covariance	.113
N	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 19, identifies one correlation for the Principal Building Level and the Principal Building Enrollment. There is a strong correlation of .514 at the .01 significance level.

TABLE 19

CORRELATIONS FOR PRINCIPAL BUILDING LEVEL

	Principal Building Enrollment
Pearson Correlation	.514**
Sig. (2-tailed)	.006
Sum of Squares	13.667
Covariance	.526
N	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 20, finds a strong correlation between the Principal Building Accreditation and the Principal Professional Development with a Pearson Correlation of .604. This clearly aligns the principal schools with a high accreditation status with a strong professional development program.

TABLE 20

CORRELATIONS FOR PRINCIPAL BUILDING ACCREDITATION

	Principal Professional Development
Pearson Correlation	.604**
Sig. (2-tailed)	.001
Sum of Squares	2.583
Covariance	.099
N	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 21, correlates the Principal Building Age with two principal domain scores. The Principal Planning Process and the Principal Technology Policies. Both scores are high with principals in buildings >15 years in age.

TABLE 21

CORRELATIONS FOR PRINCIPAL BUILDING AGE

	Principal Planning Process	Principal Technology Policies
Pearson Correlation	.457*	.484*
Sig. (2-tailed)	.017	.011
Sum of Squares	4.466	3.941
Covariance	.172	.152
N	27	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 22, lists a correlation between two principal domain scores. The Principal Professional Development Domain and the Principal Related Community Connections Domain. The pair aligns with a .393 correlation at a .043 significance level.

TABLE 22
CORRELATIONS FOR PRINCIPAL PROFESSIONAL DEVELOPMENT

	Principal Community Connections
Pearson Correlation	.393*
Sig. (2-tailed)	.043
Sum of Squares	1.905
Covariance	.073
N	27

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 23, identifies specific questions analyzed using a t-test to correlate each respondent's current practice to what is ideal regarding the perceptions of teachers throughout the Commonwealth of Virginia. The identified t-value describes the difference between groups relative to the variability of the scores in the groups (Trochim, 2001).

TABLE 23
T-TEST TO CORRELATE CURRENT PRACTICE TO WHAT IS IDEAL REGARDING THE PERCEPTIONS OF TEACHERS THROUGHOUT THE COMMONWEALTH OF VIRGINIA.

Question - I model the routine, intentional, and effective use of technology

Teacher Survey	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Current	44	3.66	.568	42.711	43	.000
Ideal	44	3.86	.409	62.710	43	.000

Note. Judgments were made on 4-point scales (1 = Disagree, 4 = Agree).

Table 24, identifies specific questions analyzed using a t-test to correlate each respondent's current practice to what is ideal regarding the perceptions of principals throughout the Commonwealth of Virginia.

TABLE 24
T-TEST TO CORRELATE CURRENT PRACTICE TO WHAT IS IDEAL REGARDING THE PERCEPTIONS OF PRINCIPALS THROUGHOUT THE COMMONWEALTH OF VIRGINIA.

Question – Throughout the past year, approximately how many hours of technology-related professional development did you participate?

Principal Survey	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)

Current	39	2.23	.485	28.749	38	.000
Ideal	39	2.54	.600	26.409	38	.000

Note. Judgments were made on 4-point scales (1 = None, 2 = 1-20 hours, 3 = 21-40 hours, 4 = > 40 hours).

Table 25, identifies specific questions analyzed using a t-test to correlate each respondent's current practice to what is ideal regarding the perceptions of division technology support staff throughout the Commonwealth of Virginia.

TABLE 25
T-TEST TO CORRELATE CURRENT PRACTICE TO WHAT IS IDEAL REGARDING THE PERCEPTIONS OF DIVISION TECHNOLOGY SUPPORT STAFF THROUGHOUT THE COMMONWEALTH OF VIRGINIA.

Question – The amount of time that support personnel are available to design and deliver technology-related professional development activities is appropriate.

Division Support Survey	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Current	6	3.17	.753	10.304	5	.000
Ideal	6	3.50	.548	15.652	5	.000

Note. Judgments were made on 4-point scales (1 = Disagree, 4 = Agree).

Table 26, identifies an additional question analyzed using a t-test to correlate each respondent's current practice to what is ideal regarding the perceptions of division technology support staff throughout the Commonwealth of Virginia.

TABLE 26
T-TEST TO CORRELATE CURRENT PRACTICE TO WHAT IS IDEAL REGARDING THE PERCEPTIONS OF DIVISION TECHNOLOGY SUPPORT STAFF THROUGHOUT THE COMMONWEALTH OF VIRGINIA.

Question – The amount of time that support personnel are available to develop and teach lessons that use technology collaboratively with teachers is appropriate.

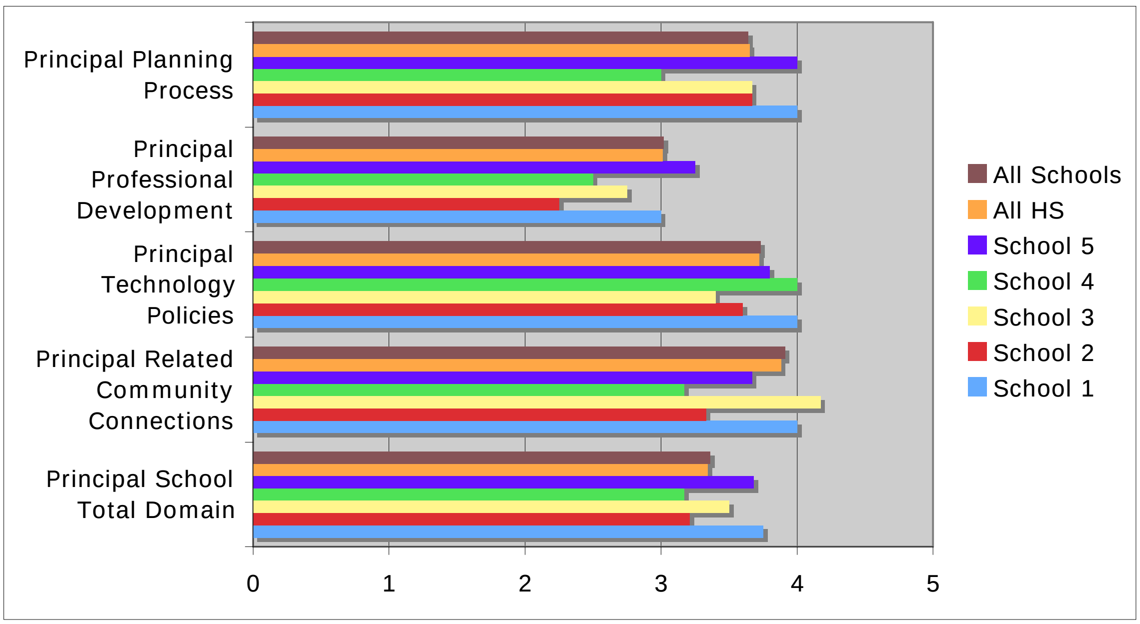
Division Support Survey	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Current	6	3.17	.753	10.304	5	.000
Ideal	6	3.33	.816	10.000	5	.000

Note. Judgments were made on 4-point scales (1 = Disagree, 4 = Agree).

Table 27, illustrates a Principal Technology Profile, a snapshot of performance of five random schools based on principal responses. This chart could be used as a tool for Principals to determine how their school compares to others regarding the four individual domains as well as a total domain score by finding the mean. Again, principals can view how their school results compare with all high schools that responded as well as comparing their scores with all schools that responded regardless of educational level.

TABLE 27

PRINCIPAL TECHNOLOGY PROFILE

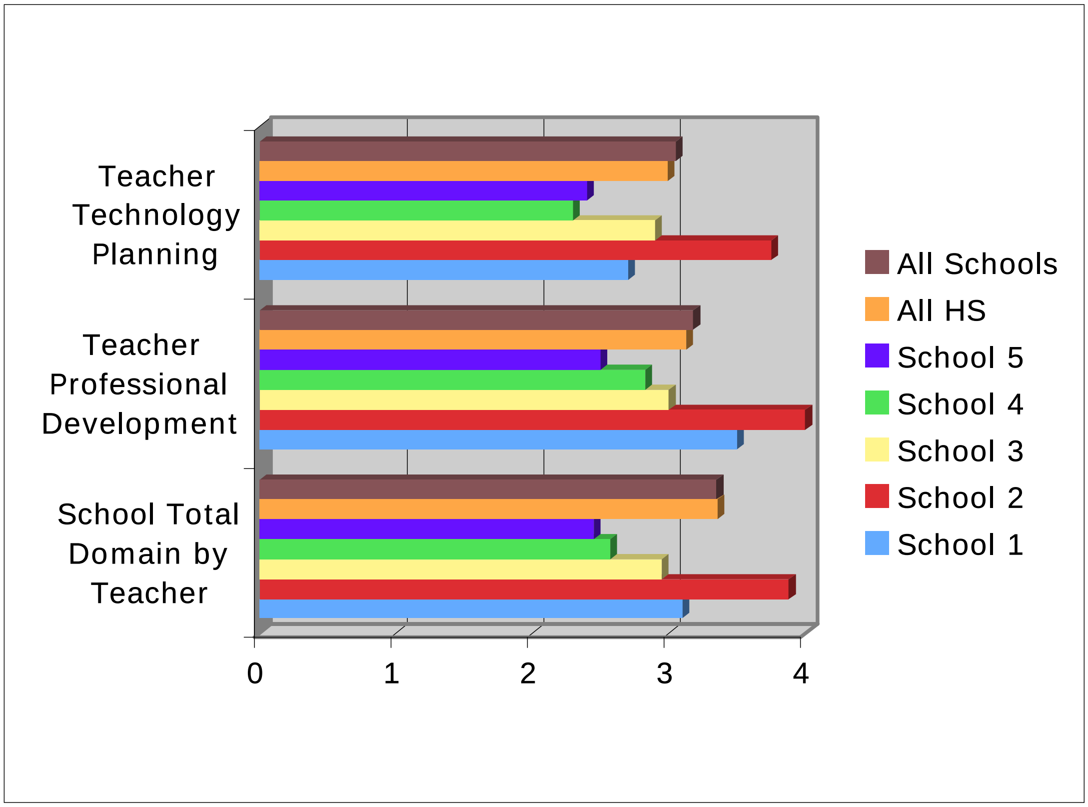


	School Total Domain	Related Community Connections	Technology Policies	Professional Development	Planning Process
All Schools	3.36	3.91	3.73	3.02	3.64
All H.S.	3.34	3.88	3.72	3.01	3.65
School 1	3.75	4.0	4.0	3.0	4.0
School 2	**3.21**	**3.33**	**3.6**	**2.25**	**3.67**
School 3	3.5	4.17	3.4	2.75	3.67
School 4	3.17	3.17	4.0	2.5	3.0
School 5	3.68	3.67	3.8	3.25	4.0

Table 28, illustrates a Teacher Technology Profile, a snapshot of performance of five random schools based on teacher responses. This chart could be used as a tool for Principals to compare teacher perceptions to others regarding both domains as well as a total domain score by finding the mean. Again, principals can view how their school results compare with all high schools that responded as well as comparing their scores with all schools that responded regardless of educational level.

TABLE 28

TEACHER TECHNOLOGY PROFILE



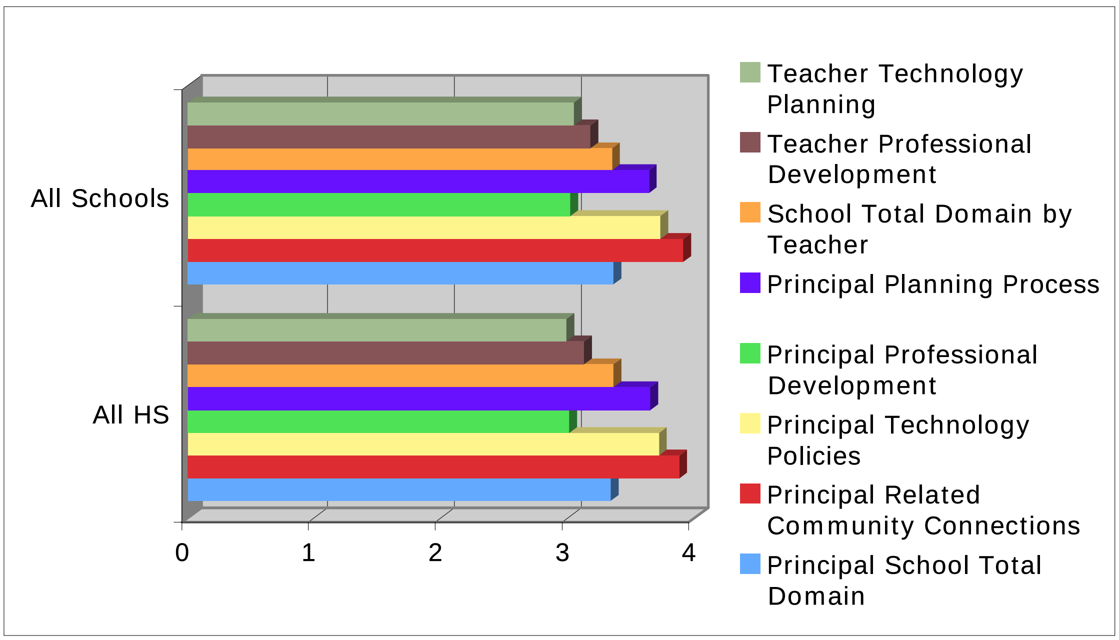
	School Total Domain	Professional Development	Technology Planning
All Schools	3.35	3.18	3.05
All H.S.	3.36	3.13	2.99
School 1	3.1	3.5	2.7
School 2	**3.88**	**4.0**	**3.75**
School 3	2.95	3.0	2.9
School 4	2.57	2.83	2.3
School 5	2.45	2.5	2.4

Table 29, illustrates a Principal/Teacher Technology Profile, a snapshot of performance of five randomly selected schools based on principal and lead technology teacher responses. This chart is used as a tool for Principals to determine how their school compares to others regarding the four principal domains, the two teacher domains, as well as a total domain score by finding the means.

Again, principals can view how their school results compare with all high schools that responded as well as comparing their scores with all schools that responded regardless of educational level. This table also illustrates that principal domain scores when compared to all high schools are aligned and similar to the scores when comparing all schools.

TABLE 29

PRINCIPAL/TEACHER TECHNOLOGY PROFILE



	All High Schools	All Schools
Teacher Technology Planning	2.99	3.05
Teacher Professional Development	3.13	3.18
School Total Domain by Teacher	3.36	3.35
Principal Planning Process	3.65	3.64
Principal Professional Development	3.01	3.02
Principal Technology Policies	3.72	3.73
Principal Related Community Connections	3.88	3.91
Principal School Total Domain	3.34	3.36

Summary

This chapter reports findings from surveys of paired school principals and lead technology teachers throughout the Commonwealth of Virginia. Data were analyzed using a t-test, one-way analysis of variance, and a Pearson's Product Moment Correlation matrix. The majority of survey responses of teachers were at the middle level and for principals in schools between 501-1000 current enrollments.

Technology profiles are created to provide educational leaders a snapshot of performance from five random schools based on principal and lead technology teacher responses. This tool provides an opportunity to compare individual school results with all high schools that responded as well as comparing their domain scores with all schools that responded regardless of educational level. Table 29 provides a comparison of teacher and principal domain scores between all responding high schools and all schools regardless of educational level.

Chapter 5

Discussion of Findings, Implications for Practice, Conclusions, Recommendations for Future Research, and Reflections

In Chapter 5, the results reported in Chapter 4 are analyzed, discussed, and conclusions provided. Implications of the results for educational practice are provided. Recommendations for future research to clarify and extend this study are also made as well as reflections from the author.

Discussion of Findings

Data were analyzed using a One-Way Analysis of Variance to test the equality of multiple means. An analysis of variance for teacher domains was created for each of the following sources: building level, educational setting, school AYP status, and division AYP status.

Finding #1

- School building level has a small effect in enhancing the teaching and learning process.

Explanation

- The domain for Learners and Learning had an effect size of .110, which is considered a strong effect when measuring the effect size for ANOVA. The Learners and Learning domain had a significance of .194 indicating a small effect with building level.
- The research indicates the schools of the 21^{st} century not only offer spaces that just house and educational program. Instead, they are learning environments integral to desired outcomes.

An analysis of variance for principal domain scores was also completed for each of the following sources: building level, school enrollment, age of facility, accreditation, and school AYP status.

Finding #2

- Principals in older buildings are aligned with schools with an enhanced level of technology planning than those in newer buildings. This indicates that the age of facility has a strong effect with schools with an enhanced level of technology planning.

Explanation

- The research identifies planning with the ultimate effectiveness of technology implementation. According to Mintzberg, strategic planning has become a focus for decision-making throughout the past decade. Strategic planning is a continual process measuring performance against goals. When looking further between the Planning Process domain score and building age it was determined that the majority of the schools, 69.2 %, were greater than 15 years old. Statistical significance was found at the pre-determined alpha of .05 between several of the principal domain scores and demographics.
- The Planning Process had an effect size of .298, which is considered a strong effect when measuring the effect size for ANOVA. The Planning Process was statistically significant at the .01 significance level with a .007 level of significance. It is important to examine a significant difference and determine if it is meaningful or important (Creighton, 2007).

- The Related Community Connections domain had an effect size of .196, which is considered a strong effect when measuring the effect size for ANOVA. The Related Community Connections was statistically significant at the .05 significance level with a .057 level of significance.
- Using building age as the independent variable appears to have an effect on the dependent variables of Planning Process and Related Community Connections.

Finding #3

- The school accreditation status has a strong effect with professional development and related activities designed to increase the knowledge of technology and integrated services.

Explanation

- The research points to the importance of equity as we look at the future of technology in schools. According to Davis, Virginia has made tremendous advances in professional development. A continued commitment to long-range planning, effective, statewide integration of technology into teaching and learning is essential. Mason indicates that principals can prepare by joining or creating trend watching groups to be alert to new innovations and trends.
- Using school accreditation as the independent variable has a strong effect on the dependent variable of Professional Development with an effect size of .195, which is considered a strong effect when measuring the effect size for ANOVA. The Professional Development domain was statistically significant at the .05 significance level with a .020 level of significance.

- If the idea here is to test the equality of multiple means it has been tested and proven that the school accreditation status has an effect with the Professional Development domain score.
- The data here strongly indicates that there is a connection between schools that are fully accredited and a professional development program focused on technology.

Correlations between survey domain scores and survey demographics are analyzed using a Pearson's Product and Moment Correlation matrix. Table 30, displays the breakdown of correlations between the 136 pairs.

Finding #4

- School divisions that have met AYP are aligned with principals focused on technology professional development.

Explanation

- Research indicates a strong correlation between schools that have met AYP and school principals focused on technology professional development. The Partnership for the 21st century skills identifies a tool, "Route 21", that walks principals through a step-by-step process of creating plans to integrate technology skills into various subject areas with professional development a primary topic.
- When analyzing the correlations visually in Table 30, it is apparent that the majority with statistical significance is aligned with either principal demographics or principal domains.
- Teacher demographics have three correlations with principal demographics.

- An interesting correlation is identified with a Pearson Correlation of .605 and a significance of .001 between Teacher Division AYP status and Principal Professional Development.

TABLE 30
CORRELATIONS FOUND TO BE STATISTICALLY SIGNIFICANT

	Teacher Demographics	Teacher Domains	Principal Demographics	Principal Domains
Teacher Demographics	Teacher Building Level		Principal Building Enrollment**	Principal Planning Process*
	Teacher Building Setting		Principal Building Age*	
	Teacher Division AYP		Principal Building Accreditation**	Principal Professional Development*
Teacher Domains	Teacher Learners and Learning	Teacher Planning**	Principal Building Age*	
	Teacher Planning			Principal Community Connections*
Principal Demographics	Principal Building Level		Principal Building Enrollment**	
	Principal Building Accreditation			Principal Professional Development**
	Principal Building Age			Principal Planning Process* Principal Technology Policies*
Principal Domains	Principal Professional Development			Principal Community Connections*

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Finding #5

- There is a correlation with principals involving and connecting the community with teacher planning and principal professional development with respect to technology.

Explanation

- Pettit reminds us that education is a people profession. As principals plan for school improvement, it is imperative that schools be flexible and inclusive. The research describes the process of facility planning to meet the needs of the school community.

- Taking a close look at the correlations between principal and teacher domains identifies the Principal Related Community Connections Domain correlating with both Teacher Planning and Principal Professional Development Domains.
- The strongest correlation within principal demographics is with the principal professional development domain.
- This indicates that the schools that have met AYP status also have a strong connection with a professional development program encompassing technology.

Specific questions in each of the three surveys are analyzed using the t-test to correlate respondent's current practice to what is ideal regarding the perceptions of principals, teachers, and division technology support staff throughout the Commonwealth of Virginia. The identified t-value describes the difference between what is current and what is ideal relative to the variability of the scores in the groups.

Finding #6

- Teachers measure far below what they feel is ideal when modeling the routine, intentional, and effective use of technology.

Explanation

- According to Copa & Pease, it is evident that we now need to harness technology to benefit our nation's schools and most importantly; students. Given the intense national focus on increasing student learning and achievement, educational technology provides a powerful tool to improve student achievement based on systematic and continuous improvement.

Lead technology teachers feel they need to do a better job modeling the routine, intentional, and effective use of technology.

- The first question asked lead technology teachers if they model the routine, intentional, and effective use of technology. This question yielded the highest t scores with a current t score of 42.711 and an ideal t-score of 62.710.
- This clearly indicates that the teachers' current effort with a mean score of 3.66 measure far below what they feel is ideal at 3.86. This ratio shows that the difference between the groups is not likely to have been a chance finding. The risk level or alpha level was .000.

Finding #7

- Principals' measure far below what they feel is ideal when analyzing their level of participation in technology related professional development.

Explanation

- Davis indicates that Virginia has made tremendous advances in infrastructure, hardware, software, teaching and learning resources, professional development, and administrative applications. For Virginia to capitalize on this advantage, a continued commitment to long-range planning, effective statewide integration of educational technology into teaching and learning is essential.
- The second question asked principals, throughout the past year, how many hours of technology-related professional development they were involved with. This question yielded the second highest t scores with a current t score of 28.749 and an ideal t-score of 26.409.

- This clearly indicates that the principals' current effort with a mean score of 2.23 measure far below what they feel is ideal at 2.54. This ratio indicates that the difference between the groups is not likely to have been a chance finding. The risk level or alpha level was .000.

Implications for Practice

This study has implications for public educators across the country as they continue to confront demands for higher levels of accountability in using limited financial resources in the most efficient way. For this reason, the administrator must be wise regarding the expenditure of public funds for new, existing, or renovated facilities. With large amounts of taxpayer dollars being spent on technology, it is vital that school leaders align the resources to be meaningful and efficient. It is this issue that brings relevance to this study.

As a result of the data collected a user technology profile can be created for each participating school. This tool can help in a variety of ways. Possibilities include setting benchmarks and goals, applying for technology grants, determining funding priorities, and creating individualized assessment tools. The intent here is to provide a technology user profile for each school by participant. This would enable the principal to review the data separately or by comparison of principal and teacher.

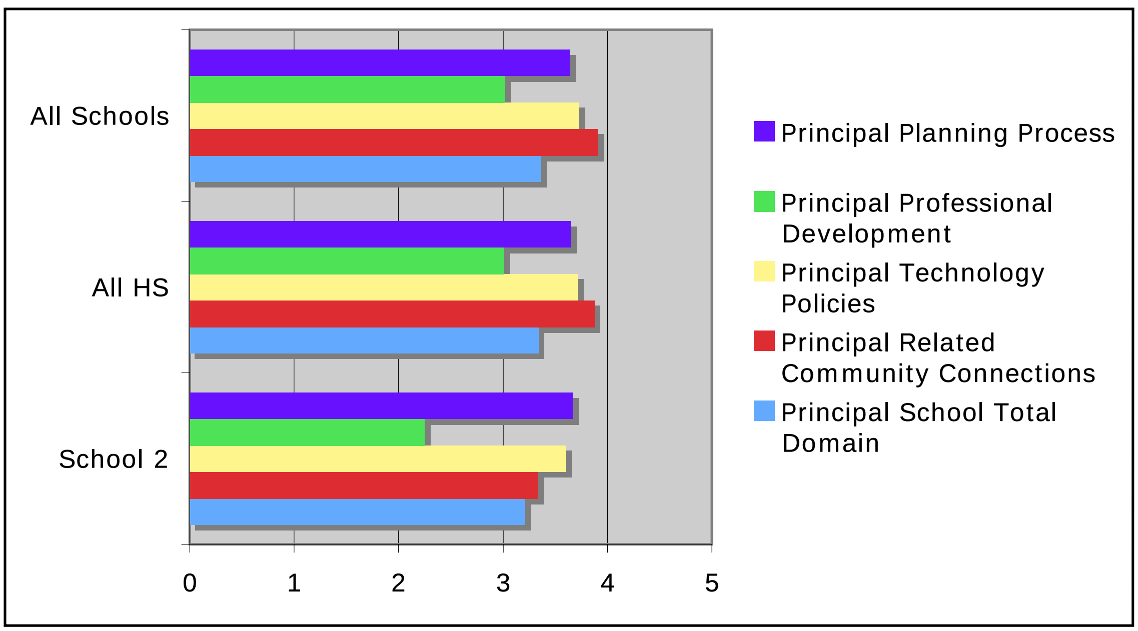
Table 31, illustrates the principal user profile for school 2. This chart indicates the domain scores for each of the principal domains. First, the information is broken down by all schools participating, including elementary, middle, high, and secondary. Next, all high schools responding are identified separately. Finally, the data are aligned to the individual school. This tool provides the opportunity to compare one school with other schools at the same level as well as with all schools in reference to each of the domains.

Table 32, illustrates the teacher user profile for school 2. This chart indicates the domain scores for each of the teacher domains. First, the information is broken down by all schools participating, including elementary, middle, high, and secondary. Next, all high schools responding are identified separately. Finally, the data are drilled down to the individual school. This tool provides the opportunity to compare one school with other schools at the same level as well as with all schools in reference to each of the domains.

Table 33, illustrates the principal/teacher user profile for school 2. This chart indicates the domain scores for each of the principal and teacher domains. Enabling a comparison of data. First, all schools participating, including elementary, middle, high, and secondary break down the information. Next, all high schools responding are identified separately. Finally, the data are drilled down to the individual school. This tool

TABLE 31

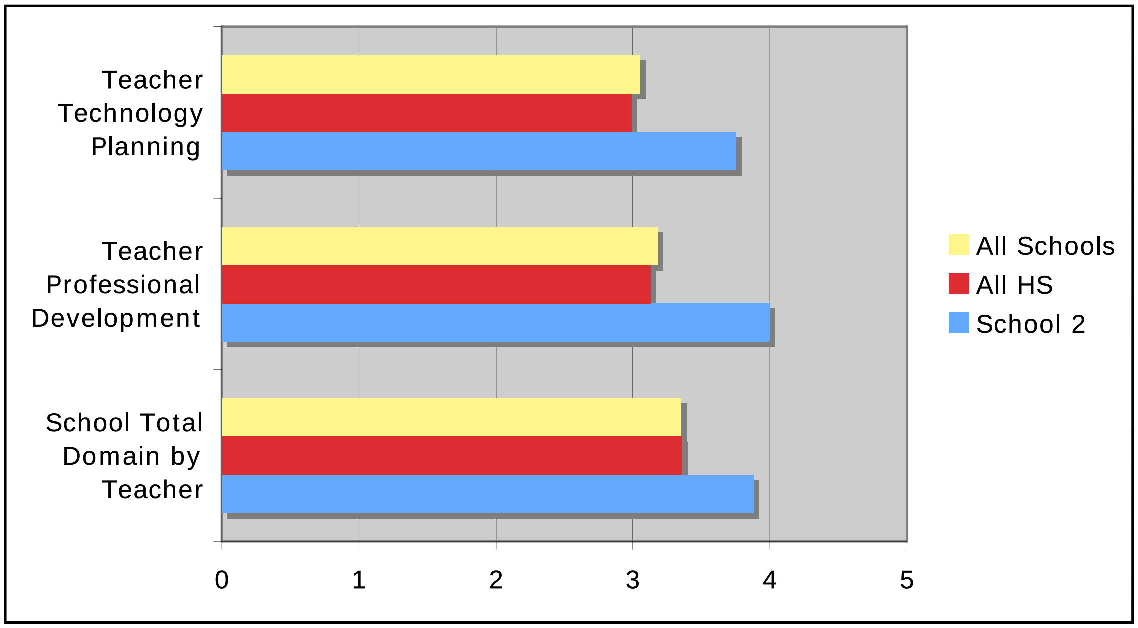
SCHOOL 2 PRINCIPAL TECHNOLOGY PROFILE



	School Total Domain	Related Community Connections	Technology Policies	Professional Development	Planning Process
All Schools	3.36	3.91	3.73	3.02	3.64
All H.S.	3.34	3.88	3.72	3.01	3.65
School 2	**3.21**	**3.33**	**3.6**	**2.25**	**3.67**

TABLE 32

SCHOOL 2 TEACHER TECHNOLOGY PROFILE



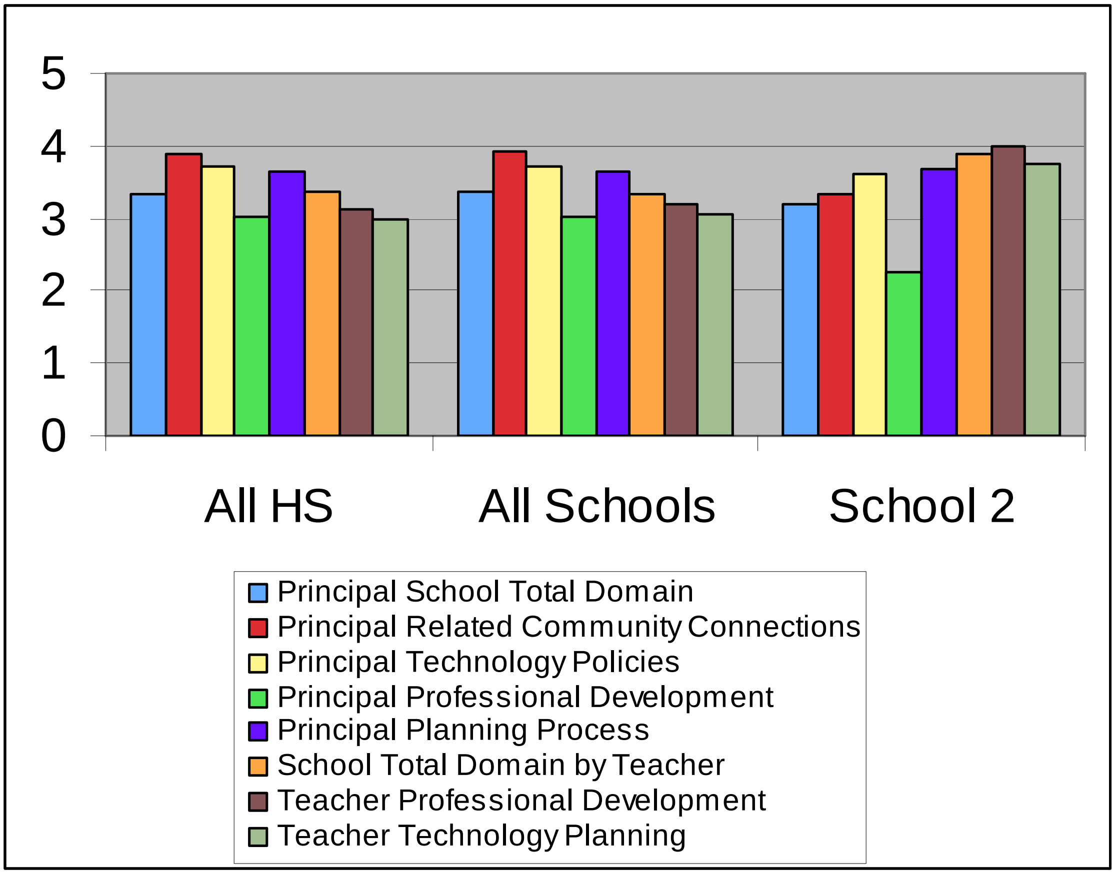
	School Total Domain	Professional Development	Technology Planning
All Schools	3.35	3.18	3.05
All H.S.	3.36	3.13	2.99
School 2	**3.88**	**4.0**	**3.75**

provides the opportunity to compare one school with other schools at the same level as well as with all schools in reference to each of the domains.

Further implications can be made for administrators looking for assistance in planning for technology in their own school facility. This study could be carried further with the possibility of selected resources aligned with identified weaknesses in the eight domains. Embedded in the user profile results would be specific resources to support administrators in their efforts of planning for technology in school facilities ultimately impacting student achievement.

TABLE 33

PRINCIPAL/TEACHER TECHNOLOGY PROFILE (SCHOOL 2)



	All High Schools	All Schools	**School 2**
Teacher Technology Planning	2.99	3.05	**3.75**
Teacher Professional Development	3.13	3.18	**4.0**
School Total Domain by Teacher	3.36	3.35	**3.88**
Principal Planning Process	3.65	3.64	**3.67**
Principal Professional Development	3.01	3.02	**2.25**
Principal Technology Policies	3.72	3.73	**3.6**
Principal Related Community Connections	3.88	3.91	**3.33**
Principal School Total Domain	3.34	3.36	**3.21**

Conclusions

It is apparent when looking at the data for school 2 that this information could be useful in setting benchmarks and school technology goals, applying for grants, determining funding priorities, and creating individualized assessment tools. When running correlations between the eight domains and demographics you find the strongest correlation between Teacher Building AYP status and Principal Professional Development. This indicates that the school divisions that have met AYP are aligned with principals focused on technology professional development. School 2 has met AYP status. The principal/teacher profile for school 2 indicates the lowest score for school 2 with Principal Professional Development at 2.25. This clearly indicates an area to address.

When looking at the teacher user profile it is evident that the scores in both domains are higher for school 2 than both all high school and all schools. This is interesting as it conflicts with the data results from the principal user profile. One could conclude that there is teacher planning and professional development taking place but it may not be in line with the school goals or school improvement plan.

Recommendations for Future Research

Several topics for future research emerge from this study. They include:

1. This study could be repeated to a much larger scale. When analyzing the principals and teachers data, the results were grouped into pairs of respondents. Out of 156 surveys, this left to analyze only 29 pairs of principals and teachers from the same buildings. This process was not random and is considered a limitation to the study.
2. This study could be repeated on a national level. The survey instrument is aligned to domains that are research based. It would be helpful to administer on a national level to determine if similar relationships exist between the domain scores and demographics.

3. This study, with minor modifications to the survey instrument, could be administered not only to a larger sample but also suggested to leave out the technology support respondents. This group was too small to measure with only 12 divisions identifying one support person for each division. These same persons results were then compared with all six principals and all six teachers in the division. It may be more useful to devise a separate survey entirely for division support staff where several different positions could be measured to get a better snapshot of the perceptions of support staff.

4. Finally, a more detailed study of the technology domains could be conducted to gain more insight in the factors influencing the technology profile domain scores. With the massive investments of state and federal dollars already made in technology as well as the increased pressure on schools and school divisions to utilize technology in daily instruction, technology is emerging as an important research topic.

Reflections

Strategic planning is imperative to continuously assess the progress and impact of technology. There must be a comprehensive plan when making decisions and encumbering large amounts of money to incorporate technology in the schools of today and tomorrow. A reflection of this study clearly indicates several factors needed by administrators to effectively plan for technology in school facilities for the 21st century. The Virginia 2003-2009 Educational Technology Plan communicates that careful planning for the inclusion of technology in today’s facilities is imperative in order to maximize efficiency. Research indicates that we can best prepare students to succeed in the 21st century by combining basic skills along with 21st century skills.

It is difficult, at best, to predict the future. Even so, schools must plan for the purposeful use of new and emerging technologies and the infrastructure, professional development, and resources to support them. No one can predict which technologies will ultimately take root in education or how these applications will evolve, but it is important to consider the possibilities they offer. Carefully considering current trends and assessing current status is arguably the best way to identify ways or methods to improve.

According to the research a strategic plan must be systematic and measurable, with decisions based on precise data that allow for change. Previous research identified several existing technology assessment surveys. This information provided insight toward the development of the established eight domains within three separate surveys. As a result, a technology profile emerged providing a tool for school divisions throughout the Commonwealth of Virginia to help assess current conditions and plan for future technology issues within their school.

When an organization strategically plans for technology the technical detail is typically a starting point. What drives detail must be a clear understanding of what the organization wants to do with the technology. When this is accomplished, emphasis shifts from technical facts to a focused technology map for the future. As a result of this study, the technology user profile can provide just that.

It is apparent when reviewing the technology profile for school 2, randomly selected in chapter five, that this information would be useful in setting benchmarks, school technology goals, applying for grants, and determining funding priorities. For facility planners and those developing educational specifications there must be focus to achieve technology goals or domains. Each school division must answer the forgotten question – What do we want to do with technology?

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APPENDIX A: PERMISSION LETTER #1

David Eshelman
Spotsylvania High School, Principal
6975 Courthouse Road
Spotsylvania, Virginia 22553
Ph: 540-582-3883
Fax: 540-582-3890

January 11, 2007

Dear Dr. Cash:

Hello, my name is David Eshelman and I am completing a doctoral dissertation at Virginia Tech entitled "Planning for Technology in School Facilities." I would like your permission to reprint in my dissertation excerpts from the following:

Cash, Carol S. (1993). *Building Condition and Student Achievement and Behavior.* Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg.

The excerpt to be reproduced is the figure attached.

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If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,

David Eshelman

PERMISSION GRANTED FOR THE
USE REQUESTED ABOVE:

Carol S. Cash
Dr. Carol Cash

Date: 3-16-07

APPENDIX B: PERMISSION LETTER #2

David Eshelman
Spotsylvania High School, Principal
6975 Courthouse Road
Spotsylvania, Virginia 22553
Ph: 540-582-3882
Fax: 540-582-3890

January 11, 2007

Dear Dr. Lemasters:

Hello, my name is David Eshelman and I am completing a doctoral dissertation at Virginia Tech entitled "Planning for Technology in School Facilities." I would like your permission to reprint in my dissertation excerpts from the following:

Lemasters, Linda Kay (1997). *A synthesis of studies pertaining to facilities, student achievement, and student behavior.* Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg.

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If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,

David Eshelman

PERMISSION GRANTED FOR THE
USE REQUESTED ABOVE:

Linda Lemasters

Dr. Linda Lemasters

Date: 01.12.07

APPENDIX C: PERMISSION LETTER #3

David Eshelman
Spotsylvania High School, Principal
6975 Courthouse Road
Spotsylvania, Virginia 22553
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Fax: 540-582-3890

January 11, 2007

Dear Dr. Brannon:

Hello, my name is David Eshelman and I am completing a doctoral dissertation at Virginia Tech entitled "Planning for Technology in School Facilities." I would like your permission to reprint in my dissertation excerpts from the following:

Brannon, William L. (2000). *A study of the relationship between school leadership and the condition of school buildings.* Unpublished doctoral dissertation, Virginia Polytechnic Institute and State University, Blacksburg.

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If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,

David Eshelman

PERMISSION GRANTED FOR THE
USE REQUESTED ABOVE:

William E. Brannon
Dr. William Brannon

Date: 1-11-07

Appendix D: Summary of Findings

Author	Topic	Methodology/Population or Sample	Findings/Implications
Cash, C. S. (1993). This study examined the relationship between the condition of school facilities and student achievement and student behavior.	Building condition and student achievement and behavior.	**Quantitative study** Entire population of small, rural high schools in Virginia. Schools with a senior class population of less than 100 were identified. 47 schools in 36 divisions were identified. **Instrumentation –** A survey was used to determine the physical condition of each school facility. CAPE, Commonwealth Assessment of Physical Environment. Subdivided into structural and cosmetic items. 43 of 47 (91%) of schools in the population responded. The variables were investigated using an analysis of covariance, correlations, and regression analysis. **Data analysis** – The data was analyzed using analysis of covariance to compare adjusted means of schools with different building assessment ratings. Total achievement means were compared to the scores in the CAPE – related to science lab quality. Behavior rating means compared among 3 building conditions using	**Findings –** Student achievement was found to be higher in buildings with higher quality ratings. Student discipline incidents were higher in schools with higher quality ratings. Science achievement scores were better in buildings with better science lab conditions. Cosmetic building condition appeared to impact student achievement and student behavior greater than structure building condition. Climate control, locker and graffiti conditions were positively related to student achievement.

		analysis of covariance. A covariate of socioeconomic status used to adjust achievement means and behavior rating means.	
Lemasters, L. K. (1997). This study is a synthesis of research from 1980 to 1997 pertaining to the relationships between school facilities and student behavior.	A synthesis of studies pertaining to facilities, student achievement, and student behavior	**Synthesis of 53 studies.** A meta-matrix table was developed. The matrix identified researchers and the areas in which research was conducted. Studies identified using several sources; (a) Eric search, (b) Avery index to architectural periodicals that provided an international search of literature, (c) a search for unpublished studies from the database dissertation abstracts was used, and (d) colleagues, noted scholars, and experts in the field were interviewed. Each study critically reviewed and contained the following components: research, title, statement of the problem, hypothesis, methodology, population, variables, and findings.	**Findings –** School facilities that are well-maintained have a positive impact on student achievement. School facilities that are well maintained have a positive influence on student behavior. Students seek areas of privacy in classrooms and reduce student anxiety. Full-spectrum fluorescent lighting with trace amounts of ultraviolet content has a positive effect on student health. Non-instruction noise has an adverse effect on the student learner.
Lanham, J. W., III. (1999). This study examined the relationships between	Relating building and classroom conditions to student achievement	**Quantitative study** A closed form survey was administered to building principals with 32 questions. From a population of 989 elementary schools, a random sample of 300 Virginia elementary	**Findings –** The theoretical model extends the work of Cash, Hines, and Leasers into the elementary school. This model illustrates how building and classroom conditions may

student achievement and a number of variables relating to building and classroom conditions in Virginia elementary schools.	in Virginia's elementary schools.	schools with grades 3-5 was used for the study. The actual sample was 299 due to one school found to have a different grade configuration. Of the 299 principals surveyed, 197 or 66% returned the survey. Modified survey used by Cash and Hines. Principal components factor analysis was used to examine the independent variables. The purpose was to determine if any common factors within the variables. **Data analysis** – SPSS was used. A Pearson's product moment correlation matrix and a step-wise multiple regression analysis. This was used to determine the relationship between dependent variable and two or more independent variables. A pre-determined alpha of .05 was used for all tests. Common significance throughout most studies in the field.	directly and indirectly influence student achievement of elementary school students. Indirect influences may exist through the attitudes and behaviors of parents, community, faculty and staff, and the behaviors of students. Improving certain building conditions such as air conditioning can improve student achievement. Air conditioning was identified as a significant factor in 3 of the 5 regression analyses as well as studies by cash, Hines, and Earthman, Cash and Berkum. Building cleanliness was also a significant factor in 3 of the 5 regression analyses as well as the Hines study. Elementary schools are in better overall condition. However, expenditures on building infrastructure are needed to address specific structural weaknesses.
Brannon, W. L. (2000). This	A study of the	**Quantitative study** - A Descriptive statistical research	**Findings** – Slightly more than 25% of the total responses

study examined the relationship between school leadership and the quality, condition, maintenance improvements, and renovations of public school buildings.	relationship between school leadership and the condition of school buildings.	study. The population used was a local school division in Southwest Virginia. A survey was used to collect data from 7 school board members, 13 administrative staff in central office, 7 board of supervisors, 16 principals, and 1 assistant principal for the principal as he was the researcher. 100% response rate from survey. Data Collection – Assessment of Physical Environment survey instrument developed using a combination of CAPE instrument and the Assessment and Building and Classroom Conditions in elementary schools in Virginia (Lanham, 1999). **Data Analysis** – Survey responses used in compiling descriptive statistics and correlations. Observation data compared to the perception of the leadership surveys on school building conditions. Data placed into three categories; (1) standard, (2) above standard, and (3) below standard. Frequency tables were constructed from survey questions.	reported that all school facilities were adequate. Over 40% reported less than half of the facilities were adequate for the future. The largest percentage of perceptions given to a below standard rating 46%, in relation to schools being technologically adequate for the future. Findings show a trend toward perception of principals regarding school building conditions being lower than central office leadership positions. The principals are in the buildings everyday and have the opportunity to be more familiar with the conditions of their building. School facilities being technologically adequate, 59% of principals rated below standard. Adequate money spent on improvement and renovation of school facilities 23% rated below standard. Analysis of three sets of data to form conclusion that there is a relationship between leadership and the financial ability of

			school divisions and the condition of buildings.

Appendix E: Principal Questions

Question	Agree		Tend to Agree		Tend to Disagree		Disagree		Total	
	N	%	N	%	N	%	N	%	N	%
Data use when planning for technology	27	69.2	10	25.6	1	2.6	1	2.6	39	100.0
Written technology plan aligned to SIP	21	53.8	13	33.3	3	7.7	2	5.1	39	100.0
Technology used to analyze data	34	87.2	5	12.8	0	0.0	0	0.0	39	100.0
Sustained professional learning	27	69.2	10	25.6	2	5.1	0	0.0	39	100.0
Technology professional development	29	74.4	8	20.5	2	5.1	0	0.0	39	100.0
Culture of risk-taking innovation	30	76.9	9	23.1	0	0.0	0	0.0	39	100.0
Policies ensuring compatibility	23	59.0	15	38.5	1	2.6	0	0.0	39	100.0
Support technology replacement cycles	27	69.2	10	25.6	2	5.1	0	0.0	39	100.0
Advocate for equal access to technology	33	84.6	6	15.4	0	0.0	0	0.0	39	100.0
Advocate for security of student data	32	82.1	7	17.9	0	0.0	0	0.0	39	100.0
Advocate for home access for all	25	64.1	9	23.1	3	7.7	2	5.1	39	100.0
Involve others in technology planning	15	38.5	15	38.5	8	20.5	1	2.6	39	100.0
Involve community in technology	5	12.8	21	53.8	10	25.6	3	7.7	39	100.0
Availability of technology resources	8	20.5	19	48.7	8	20.5	4	10.3	39	100.0

Appendix F: Teacher Questions

Question	Agree		Tend to Agree		Tend to Disagree		Disagree		Total	
	N	%	N	%	N	%	N	%	N	%
Environment meets diverse needs	10	22.7	24	54.5	10	22.7	0	0.0	44	88.0
Tech supports instructional methods	12	27.3	20	45.5	12	27.3	0	0.0	44	88.0
Model effective use of technology	31	70.5	11	25.0	2	4.5	0	0.0	44	88.0
Model effective use of technology	39	88.6	4	9.1	1	2.3	0	0.0	44	88.0
Integrate tech resources in planning	8	18.2	17	38.6	18	40.9	1	2.3	44	88.0
Plan for classroom management	8	18.2	25	56.8	11	25.0	0	0.0	44	88.0
Teach strategies to assess info.	7	15.9	15	34.1	18	40.9	4	9.1	44	88.0
Authentic assessments	13	30.0	19	43.0	11	25.0	1	2.0	44	88.0
Samples of student work	14	32.0	24	55.0	6	14.0	0	0.0	44	88.0
Classroom exams	22	50.0	20	45.0	2	5.0	0	0.0	44	88.0
Standardized tests	24	55.0	15	34.0	4	9.0	1	2.0	44	88.0
Delivery of instruction	13	30.0	17	39.0	14	32.0	0	0.0	44	88.0
Supplement instruction	20	45.0	19	43.0	5	11.0	0	0.0	44	88.0
Providing instruction	11	25.0	18	41.0	15	34.0	0	0.0	44	88.0
Integrating into core curriculum	9	20.0	21	48.0	14	32.0	0	0.0	44	88.0
Embedding in daily instruction	6	14.0	12	27.0	24	55.0	2	5.0	44	88.0
Enhance teaching with email	16	36.0	12	27.0	12	27.0	4	9.0	44	88.0
Enhance teaching with the Internet	19	43.0	23	52.0	2	5.0	0	0.0	44	88.0
Enhance teaching with online ref.	14	32.0	21	48.0	8	18.0	1	2.0	44	88.0
Enhance teaching with graphic org.	12	27.0	19	43.0	13	30.0	0	0.0	44	88.0
Support active learning strategies	12	27.0	20	45.0	11	25.0	1	2.0	44	88.0
Support higher level thinking	8	18.0	18	41.0	16	36.0	2	5.0	44	88.0
Support interactions outside of class	6	14.0	11	25.0	21	48.0	6	14.0	44	88.0

Appendix G: Support Staff Questions

Question	Agree		Tend to Agree		Tend to Disagree		Disagree		Total	
	N	%	N	%	N	%	N	%	N	%
Equity of access to resources	5	83.3	0	0.0	1	16.7	0	0.0	6	85.7
Appropriate technical support	4	66.7	2	33.3	0	0.0	0	0.0	6	85.7
Appropriate hardware support	3	50.0	3	50.0	0	0.0	0	0.0	6	85.7
Appropriate support for use	1	16.7	5	83.3	0	0.0	0	0.0	6	85.7
Appropriate staff development	2	33.3	3	50.0	1	16.7	0	0.0	6	85.7
Appropriate staff development	3	50.0	3	50.0	0	0.0	0	0.0	6	85.7
Availability to develop and teach lessons collaboratively	2	33.3	3	50.0	1	16.7	0	0.0	6	85.7
Availability to develop and teach lessons collaboratively	3	50.0	2	33.3	1	16.7	0	0.0	6	85.7
Adequate availability for students with disabilities	3	50.0	2	33.3	1	16.7	0	0.0	6	85.7
Division ensures equity of access for all	4	66.7	2	33.3	0	0.0	0	0.0	6	85.7
Adequate access to: projectors	2	33.3	0	0.0	4	66.7	0	0.0	6	85.7
Digital cameras	1	16.7	3	50.0	2	33.3	0	0.0	6	85.7
Digital probes	2	33.3	2	33.3	2	33.3	0	0.0	6	85.7
DVD players	4	66.7	1	16.7	1	16.7	0	0.0	6	85.7
Graphing calculators	5	83.3	1	16.7	0	0.0	0	0.0	6	85.7
Scanners	3	50.0	3	50.0	0	0.0	0	0.0	6	85.7
Hand-held devices	1	16.7	2	33.3	3	50.0	0	0.0	6	85.7
Availability for home use	1	16.7	3	50.0	1	16.7	1	16.7	6	85.7
Frequent Internet delays	0	0.0	1	16.7	0	0.0	5	83.3	6	85.7
Access to specific software	5	83.3	1	16.7	0	0.0	0	0.0	6	85.7

Appendix H: Domains and Descriptions

Domain 1: The Planning Process

Description: This domain will assess the process of strategic planning in terms of involving stakeholders and reviewing literature and studying innovation.

Domain 2: Technical and Instructional Support

Description: This domain will assess the level of support a school receives from setting up, maintaining, and repairing hardware to developing lessons that integrate instructional technology.

Domain 3: Professional Development

Description: This domain will assess the length and type of related activities designed to increase the knowledge of technology and integrated services.

Domain 4: Technology Resources – Hardware/Infrastructure

Description: This domain will assess the technology within schools that is used exclusively for instructional purpose checking for adequacy, quantity, and accessibility.

Domain 5: Technology Resources - Software

Description: This domain will assess the basic tools as well as research and problem solving tools and how the computers in schools are used exclusively for instructional purposes.

Domain 6: Learners and Learning

Description: This domain will assess how far along you are in enhancing the teaching and learning process.

Domain 7: Technology Policies

Description: This domain will assess the current school policies with regard to technology as well as the assessment of technology competencies of staff.

Domain 8: Related Community Connections

Description: This domain will assess how schools involve the community in the instructional technology program including participation in the decision-making process as it relates to technology.

APPENDIX I: PRINCIPAL EMAIL SURVEY REQUEST #1

Dear Colleague:

As a Virginia school principal, you have been selected to participate in a study regarding *planning for technology in school facilities.*

My name is David Eshelman and I am a doctoral candidate at Virginia Tech. I have developed the following instrument to help plan and assess for school technology and readiness. This survey is being sent to only a small but representative sample of principals throughout the Commonwealth of Virginia. The response of every individual is important. Your participation in this research by completing the survey is appreciated.

Here is a link to the survey:
http://www.surveymonkey.com/s.asp?A=126288538E32154

The survey should take no more than 10 minutes to complete. Your responses will be anonymous and cannot be attributed to you or your school. No individual, school, or school division will be named in any report.

Data collected will be used to help determine the perceptions of teachers, principals, and division support staff regarding the factors needed for planning for the technological needs of school facilities for the 21st century. It is my hope that this study will lead to benefits such as setting benchmarks and goals, applying for technology grants, determining funding priorities, as well as creating individualized assessment.

Please reply to this email if you are interested in data summary results. Again, thank you for your participation!

David Eshelman
Doctoral Candidate, Virginia Tech
Principal, Spotsylvania High School, Spotsylvania County Public Schools

There are no anticipated risks, further compensation, or other direct benefits to you for your voluntary participation. You are free to withdraw your consent to participate at any time without consequence. Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
http://www.surveymonkey.com/r.asp?A=126288538E32154

APPENDIX J: TEACHER EMAIL SURVEY REQUEST #1

Dear Colleague:

As a lead technology teacher in your building, you have been selected to participate in a study regarding *planning for technology in school facilities.*

My name is David Eshelman and I am a doctoral candidate at Virginia Tech. I have developed the following instrument to help plan and assess for school technology and readiness. This survey is being sent to only a small but representative sample of technology leaders throughout the Commonwealth of Virginia. The response of every individual is important. Your participation in this research by completing the survey is appreciated.

Here is a link to the survey:
http://www.surveymonkey.com/s.asp?A=126288538E32154

The survey should take no more than 10 minutes to complete. Your responses will be anonymous and cannot be attributed to you or your school. No individual, school, or school division will be named in any report.

Data collected will be used to help determine the perceptions of teachers, principals, and division support staff regarding the factors needed for planning for the technological needs of school facilities for the 21st century. It is my hope that this study will lead to benefits such as setting benchmarks and goals, applying for technology grants, determining funding priorities, as well as creating individualized assessment.

Please reply to this email if you are interested in data summary results. Again, thank you for your participation!

David Eshelman
Doctoral Candidate, Virginia Tech
Principal, Spotsylvania High School, Spotsylvania County Public Schools

There are no anticipated risks, further compensation, or other direct benefits to you for your voluntary participation. You are free to withdraw your consent to participate at any time without consequence. Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
http://www.surveymonkey.com/r.asp?A=126288538E32154

APPENDIX K: SUPPORT STAFF EMAIL SURVEY REQUEST #1

Dear Colleague:

As a technology leader in your school division, you have been selected to participate in a study regarding *planning for technology in school facilities.*

My name is David Eshelman and I am a doctoral candidate at Virginia Tech. I have developed the following instrument to help plan and assess for school technology and readiness. This survey is being sent to only a small but representative sample of technology leaders throughout the Commonwealth of Virginia. The response of every individual is important. Your participation in this research by completing the survey is appreciated.

Here is a link to the survey:
http://www.surveymonkey.com/s.asp?A=126288538E32154

The survey should take no more than 10 minutes to complete. Your responses will be anonymous and cannot be attributed to you or your division. No individual, school, or school division will be named in any report.

Data collected will be used to help determine the perceptions of teachers, principals, and division support staff regarding the factors needed for planning for the technological needs of school facilities for the 21st century. It is my hope that this study will lead to benefits such as setting benchmarks and goals, applying for technology grants, determining funding priorities, as well as creating individualized assessment.

Please reply to this email if you are interested in data summary results. Again, thank you for your participation!

David Eshelman
Doctoral Candidate, Virginia Tech
Principal, Spotsylvania High School, Spotsylvania County Public Schools

There are no anticipated risks, further compensation, or other direct benefits to you for your voluntary participation. You are free to withdraw your consent to participate at any time without consequence. Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
http://www.surveymonkey.com/r.asp?A=126288538E32154