Make It So: How Low-resourced School Districts Implement a Virginia State Mandate to Prepare K-12 Teachers to Integrate Technology Into the Classroom

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Make It So: How Low-Resourced School Districts Implement a Virginia State Technology Mandate to Prepare K-12 Teachers to Integrate Technology Into the Classroom

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(Abstract)

This study investigates how four urban school districts, serving low socioeconomic status (SES) student populations, define, prepare teachers for, and implement integration of computer technology into the K-12 classroom in response to a Virginia state mandate. Factors influencing computer integration into the curriculum were also studied. Semi-structured interviews were conducted with 50 educators representing 2 state-level administrators, 12 district level-administrators, 8 school-level administrators, 23 classroom teachers, and 5 school-level technology specialists. Interviews were supplemented by classroom observations, teacher lesson plans, and district technology plans to provide data for an in-depth, multi-case study. Based on the access provided, one to two weeks were spent in each setting conducting interviews and recording the availability and use of computer technology in the classroom and its integration into instruction. All four districts met the mandate as stated and used similar definitions of integration and approaches to teacher preparation and implementation. Results indicate, however, that computer technology use within these schools is still confined primarily to laboratory settings and that students' technology experiences are not directly integrated into daily classroom instruction or lesson planning. Leadership, planning, funding, access to resources, time, training, and support were identified as factors when integrating technology into daily instruction. The mandate required a level

of accountability, which served as a device to encourage and motivate more reluctant users of computer technology to gain necessary technical skills and adopt technology as a tool to support instruction. Response to the mandate has (1) increased dialogue between administrators, support staff, and teachers regarding technology and its integration; (2) provided an impetus for districts to use funds to purchase computers and other technology resources; and (3) provided an impetus for districts to begin to look at and monitor, if not evaluate teachers' use of technology for instruction.

Dedication

This study is dedicated to my family. To my wife, Jeannie, who positively affects my life in more ways that I can possibly imagine. Her advice, encouragement, and gentle pushes along the way have proven to be invaluable. To my children, Nicholas and Samantha, their patience, understanding, and support have allowed me to maintain my perspective of the world and realize what is truly important. This study has genuinely been a family endeavor.

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Chapter 1: Introduction

State and federal mandates are often implemented through a top-down, one-size-fits all approach for the purpose of educational change (Heflin & Bulock, 1999; Milstein, 1993). Whether the mandates of educational reform are desirable is not at issue here. The issue for this study arises from my personal experiences and curiosity about the phenomena of mandates. As a fan of the television series *Star Trek: The Next Generation*, I am frequently reminded of educational mandates by the directive of the Captain of the Starship Enterprise, Jean Luc Picard, to “make it so.” This phrase may well exemplify the process by which educational reform mandates are handed down. It implies a focus on getting to the end result without a full understanding of the ultimate consequences of carrying out the mandate. This may be especially problematic in the area of computer technology and its integration into classroom instruction. In spite of increased spending on technology for K-12 education nationally, many classrooms continue to lack basic access to computer technology (Milken Exchange, 1998). This thinking has guided me to a fundamental question. What happens when the “make-it-so” approach of state mandates is applied to classroom technology integration? Federal and state mandates and their application to K-12 school districts and classrooms are not new. Many opportunities are available to study how mandates affect school districts and classrooms ranging from curriculum standards to accommodations of special needs students. However, only recently have computer technology and its integration into classroom instruction become subject to such mandates. A timely opportunity to study how school districts respond to and implement such a mandate presented itself in the spring of 1998 when the Virginia Department of Education released the *Technology Standards for Instructional Personnel* (Virginia Department of Education, 1998). This important document outlined a state policy that mandated eight technology standards for all professionally licensed teachers in K-12 classrooms in Virginia. The standards, to become effective as of July 1, 2003, included requirements for teachers to be knowledgeable about computers, to be able to use computers for productivity, to be able to access and exchange data, and to integrate technology into their classroom instruction (see Appendix A).

It is important to understand how districts respond to and implement mandates to use and integrate technology into classroom instruction. First, while such mandates attempt to reform or improve education through a make-it-so approach, mandates are simply words transmitted to communities of practice, or those individuals or groups affected by the mandate, in the form of publications, legal documents, or memoranda. This transmission may be depicted as water flowing through a channel with a series of small locks or dams. States develop reform goals; passing these on to school districts as mandated standards. Districts, in turn, pass these on to school administrators, finally ending up with the individual classroom teacher. From the perspective of the state then, it is at this local district and school level that these mandates are carried out. The classroom teacher, as the major change agent, is typically far removed from the thinking of state-level policymakers and administrative officials. As such, mandates are open to local interpretation, interests, and experiences.

Second, teacher training is an important issue in preparation for technology skills attainment, use, and integration. While pre-service education can play a vital role in the technology skill development of students aspiring to become classroom teachers; historically, college preparation of pre-service teachers does not provide required training in use and integration of technology into their core subject areas. Additionally, school districts have provided only minimal training opportunities for practicing teachers. Usually these are through beginning-of-the-year workshops that lack follow-up or one-shot professional development in-service opportunities that are offered after the school day, when teachers are tired and least able to learn new concepts. Given this, it seems likely that teachers remain unprepared to use and integrate technology into their classroom instruction despite a mandate requiring such use and integration.

Third, once new technology concepts and skills are attained, teachers may have difficulty in transferring these skills into classroom practice due to such influencing factors as lack of access to resources and lack of technical support. For example, a teacher may know how to integrate computer technology into their writing class, but lack access to functioning computers or software targeted to grade-level needs. Likewise, computers that are malfunctioning and lying idle for long periods awaiting service may discourage their use once repaired. A Milken Foundation study on the status of technology availability within Virginia emphasizes this as one area of concern (Milken Exchange, 1998). One of the major findings of this study cites that "the Commonwealth lacks many of the essential conditions necessary for effective use of technology in schools" (p. 35). The study cited, among others, such conditions as lack of access and lack of technical support. Thus, technology use and integration are likely to be influenced by such factors.

Fourth, research involving teacher integration of technology in technology-rich environments has shown that when individuals integrate technology into classroom instruction they proceed from various points along a continuum from non-use to use of technology to enhance learning, productivity, and collaboration (Sandholtz, Ringstaff, & Dwyer, 1997). This may well be true of any given district or school in which teachers integrate technology. Therefore, mandates that require an established level of performance by all teachers will likely meet with wide variations of compliance within and between teachers, schools, and districts.

Finally, through such documents as the *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States* (President's Committee of Advisors on Science and Technology, 1997), it has become a national imperative that teachers and students alike become users of computers and other technologies to meet the workforce demands of the twenty-first century. Given the importance placed on technology at the federal level, it is not unreasonable to believe that the number and variety of mandates regarding technology and its use in education will only increase in the coming years.

Given these reasons, it seems important to study the issue of how school districts define and implement mandates requiring teachers to integrate technology into their classrooms. Such a study may assist in technology planning and preparation at the district and school level as well as inform policymakers about the results of such mandates. It may also assist in development of future mandates that deal with technology and its integration into K-12 instruction.

Technology integration is a broad conceptual area and, therefore any study of such must be limited in scope. First, the technology being integrated must be defined. Secondly, limits on the group or target population under study must be established.

Since the terms “technology,” “instructional technology,” and “educational technology” are often used interchangeably and are defined and interpreted from a number of perspectives (see Gentry’s 1995 discussion of technology and its definitions); limits must be placed on its use before undertaking such a study. While computers have been the focus of much of the research on technology integration, it is from this perspective that data may be most easily collected. For computers are more easily observable within the classroom environment than other smaller, less noticeable technologies (e.g., PDAs, calculators) or those technologies that have become part of the tradition of classroom instruction (e.g., chalkboards, pencils, and textbooks). For this reason, the terms technology, educational technology, and instructional technology are limited to desktop and laptop computers and their related software.

As the number and variety of technology mandates increase, meeting these demands could become especially problematic for urban school districts. Unlike its rural counterpart, the urban school district’s ability to provide and support technological resources is hindered by such factors as high faculty turnover, high student mobility, and aging facilities. These urban schools are often considered low-resourced since the size of the districts is larger than their rural counterparts, their needs often outstrip their ability to fully fund programs and initiatives. Higher income districts tend to provide greater access than those with lesser incomes and increased percentages of African-American students (Hess & Leal, 2001, Hindman, 2000). Additionally, school serving students from lower income populations have lowered expectations that they can handle newer technologies (Moore, Laffey, Espinosa & Lodree, 2002). Even with increased funding through special grants, school districts often must target special programs and are unable to implement these programs in all schools within the district (Walker, 1997). Often schools serving low-income students are years behind their wealthier counterparts (Swain & Pearson, 2002). These issues have helped create a disparity between low-resourced urban schools and their more affluent counterparts. This disparity has come to be termed the digital divide (Tapscott, 2000). Therefore, it seems equally important to focus on this response and implementation within the context of those districts most likely to struggle to meet the requirements of state mandates – low-resourced urban school districts. For it is within these districts that teachers work with students least likely to benefit from technology-rich learning environments – those living in transient, minority, and poor communities.

In order to explore how low-resourced urban school districts define and implement a mandate to integrate technology into the classroom, a case study of four school districts was conducted during the spring of 2002. Such a qualitative approach provides an opportunity to identify and understand what factors assist or inhibit the integration of technology into classroom instruction from the perspective of the targets of the mandate – certified school personnel; as well as provide comparative data within and between districts relative to their approaches to training and integration of computer technology. There are many studies that focus on technology integration in non-mandated, technology-rich educational settings. However, this study focuses on how computer technology is integrated in low-resourced educational settings operating under a state mandate. This study attempted to answer four questions. These questions were:

1. How do school low-resourced urban school district personnel define the terms “state mandate” and “technology integration” and how are these definitions similar or dissimilar?
2. What approaches were taken to train low-resourced urban school district personnel in computer technology use and integration into classroom instruction and are these approaches similar or dissimilar?
3. How do low-resourced urban school district personnel implement computer technology integration, and what factors promote or inhibit such integration for low-level, mid-level, and high-end users of technology?
4. How do these approaches to training and implementation compare to one another as well as to the intent of the mandate as stated?

To answer these questions, a backward-mapping approach was taken in this study to comparatively analyze district and school definition, training, and implementation relative to the integration mandate. Backward mapping (discussed in more detail in Chapter 3) proceeds from district to mandate rather than from mandate down to district level analysis (Dyer, 1999; Elmore, 1980; 1983). This approach was taken in order to reduce possible bias. Four urban school districts were studied. Descriptive case studies are provided for each of the four districts under study. These include Anderson City (Appendix B), Fort Campbell City (Appendix C), Grainger City (Appendix D), and Cheatham City (Appendix E)

Chapter two provides a review of the literature. This chapter opens with a description of and rationale for the selection of low-resourced urban school districts as the focal point of this study. The remainder of the chapter presents the literature on issues arising from mandating technology integration in the K-12 classroom.

Chapter three presents the methodology used and describes the analysis used to conduct this study. A discussion of the backward mapping approach used in the study is included. District, site, and participant selection are discussed as well as data analysis and collection procedures. The chapter concludes with a discussion of trustworthiness and ethical considerations.

Chapter four is a discussion of the *Technology Standards for Instructional Personnel (TSIP) as a* state mandate. The state context is presented as well as a comparative cross-case analysis of each of the four districts studied and their response to the *TSIP* and their approach to technology integration.

Chapter five contains a summary and relevant conclusions. A recommendation for future research is also provided.

Chapter 2: Review of the Literature

The research on computer integration into classroom instruction was derived from multiple sources. These sources include the Internet, EBSCO Host Professional Collection, Proquest Professional Collection, ERIC, Dissertation Abstracts International, as well as book and journal resources at the Virginia Tech library. The review of literature is organized into three sections. The first section provides a definition of mandates and the requirements for implementing them as a function of policy. . The second section provides a definition of integration and the approaches taken to integrate computer technology into classroom instruction. The third section includes identification of thematic elements drawn from the research that inhibit or enhance technology integration into the classroom. Major themes and concepts identified in the review of literature were used in the development of coding tables for the case studies. The coding tables are presented in Appendix F.

Mandates and Their Implementation

Within the last decade technology has become an issue of national policy. This is reflected in the numerous documents released during this period that connect American public schools to technology and its integration (Committee on Workforce Needs in Information Technology, 2001; *Goals 2000: Educate American Act*, 1994; Jennings, 1995; President's Committee of Advisors on Science and Technology, 1997; Reich, 1991; 21st Century Workforce Commission, 2000; U.S. Department of Education, 1991; 1996; U. S. Department of Labor, 1992). The mandate seems clear that all American schools must use and integrate computer technologies to improve teaching and learning and prepare students for the workplace of the 21st century. These policies derived from the public's urgency to move technology into the classroom has resulted in the expenditure of $37.9 billion to put computer technology and Internet access into the nation's schools (Dickard, 2002). While educators and policymakers alike have assumed that activities, such as integration of technology, would automatically occur once schools were connected to the Internet, this has not been the case (Burniske & Monke, 2001; Mitchell, 2000). Instead most teachers still teach in the same manner they were taught (Ball, 1990; Barron & Goldman, 1994; Bolt & Crawford, 2000; Gooden, 1996; Knapp & Glenn, 1996; Lortie, 1975; Marcinkiewicz, 2000, 1996; McCain & Jukes, 2001; Norman, 1998; O'Donnell, 1996; Sandholtz, Ringstaff, & Dwyer, 2000; Tynack & Cuban, 2000). To understand the factors underlying this problem, it is reasonable to begin with an investigation of how such policies are carried out.

The term "policy" as defined by Longest (as cited in Friedman, 2003, p. 11) are "authoritative decisions that are made in the legislative, executive, or judicial branches of government" for the purpose of directing or influencing actions, behaviors, or decisions of others. These are often initiated as a response to a real or perceived crisis, such as the one posed in *A Nation at Risk* (National Commission of Excellence in Education, 1983), in which change or reform is seen as desirable (Warren, 1990). Elmore (1978) identifies four instruments through which policy is carried out. These instruments include system change, capacity building, inducements, and mandates. System change transfers authority among individuals or agencies in an effort to alter the system through which services are delivered. Capacity building conditionally transfers funds to individuals or institutions in an effort to invest in future human, intellectual, or material resources. Inducement funds are transferred to individuals or agencies, on a conditional basis, in order to obtain short-term performance or insure certain actions. The fourth instrument is that of mandates. Mandates are defined as a command or order to obey (Black, 1990) and “to put into one’s hand” or “to entrust” (Kinnaman, 1999, p. 962). Mandates are the rules governing the behaviors of individuals or institutions. They are designed to achieve performance goals by producing compliance. Mandates are generally packaged as a collection of standards, penalties, and enforcement procedures that will deliver an acceptable level of compliance with incurring excessive cost (Elmore, 1978). Hutjes (1991) identifies three elements that must be in place in order to carry out the implementation of policy mandates. First, relevant information must be provided to those who implement the mandate. Second, the individual or institution that is designated to carry out the mandate must have the capability or capacity, including the necessary resources such as time, money, and personnel, to carry out the directives of the policy mandate. Third, the individual or institution implementing the policy mandate must have the willingness to carry out the directives. Thus, to understand implementation of a mandate, it is important to understand the communication of and meaning behind policy mandates, the factors that build or detract from capacity to carry out the mandate, and an understanding of the beliefs and attitudes that surround policy implementation.

Communication as a Function of Mandate Implementation

The communication about and understanding the intent of a mandate is a vital element in its proper implementation. As Joiner (2000) states, “There needs to be an understanding of what a mandate is supposed to produce” (p. 34). However, the language of policy mandates may be far removed from its intended audience (Townsend, 1995). Terminology that is not expressly defined can cause confusion and failure to implement a mandate (American Association of Colleges for Teacher Education, 1973; Hill, 2001; Kannapel, Aagaard, Coe, & Reeves, 2000). In some cases language has become such an issue with policy mandates that litigation must ensue in order to define concepts and terms for the implementers (Etscheidt & Bartlett, 1999; Thomas, 1998; Welner & Oakes, 1996). McVoy (1990) notes that “laws tend to be both complicated and ambiguous” and “dissemination of legal information to guide schools is seldom done on a systematic basis; oftentimes, those expected to comply with legal mandates simply do not understand what is required of them” (p. 250). This understanding of concepts and terms extends to technology as well (Pedersen & Liu, 2003; Pierson, 2001).

Capacity as a Function of Mandate Implementation

Capacity has been broadly defined as having the resources necessary to carry out decisions (Firestone, 1989). These resources may include human, social, and financial capital, including personnel, materials, knowledge, and money (Fairman & Firestone, 2001). Capacity issues can also include leadership and professional development (Goertz, 2001). This issue of capacity is described by Ertmer (1999) in terms of first- and second-order barriers to technology integration. First-order barriers are defined as “those obstacles that are extrinsic to teachers” (p. 50) while second order barriers are “typically rooted in teachers’ underlying beliefs about teaching and learning” (p. 51). There is an abundance of literature that discusses factors that affect the implementation of technology in terms of district capacity to respond (Adams, 1985; Beacham, 1994; Burnett, 1994; Burniske and Monke, 2001; Byrom & Bingham, 2001; Cafolla & Knee, 1995; Cohen, 1987; Cuban, 1986; David, 1994; Dewert, 1999; Dickard, 2002; Duffield, 1997; Ely 1995; Ertmer, 1999; Finkel, 1993; Fuhrman, 2001; Harrington-Lueker, 1999; Hoerup, 2001; Hope, 1997; Kearsley & Lynch, 1994; Leggett & Persichitte, 1998; Lumley & Bailey, 1993; McCarthy, 1993; O'Donnell, 1996; Pachon, Macias, & Bagasao, 2000; Sheingold & Hadley, 1990; Shelton & Jones, 1996; Swan, 1995; Tyack & Cuban, 2000; Ward, 1997; Virginia Department of Education, 1993). The discussion of capacity issues in terms of technology integration may be classified into eight broad categories. These categories are (1) leadership and planning; (2) funding; (3) time, such as required time for planning, personal exploration, online access, and skill development; (4) training, including models, mentors, and collaboration, (5) access to resources, including hardware and software; (6) personnel and support, including mentor teachers, on-site experts, technical and administrative support; (7) teacher beliefs, such as fear and resistance, passivity, school cultures, and traditions, and (8) accountability, which is a more recent addition to the conditions for technology integration.

Beliefs and Values as a Function of Mandate Implementation

The willingness of institutions and individuals to implement a policy mandate is tied to the culture of the school and the beliefs, attitudes, and perceptions of teachers, administrators, and other school staff. This often results in a culture of low expectations (Fuhrman, 2001). Mandates that disrupt the existing belief structure are generally seen coercive and are met with extreme resistance. Although adopted at the district level, they may not be implemented at the classroom level. Teachers confronted with such a mandate may meet this challenge in one of two ways. First, they may subvert or ignore the implementation of it or they may change or re-purpose it to assist with their existing practice (Hodas, 1993; Kelly, 1999). Change itself cannot be mandated (Fullan, 1993) and the process of changing perceived beliefs cannot be hurried (O'Donnell, 1996).

Additionally, second-order barriers may not be easily observed and often may only be seen through the reasons teachers offer for technology integration being inhibited by first-order barriers (Ertmer, 1999).

A Definition and Integration of Technology Into Instruction

Ertmer (1999) notes that technology integration has evolved over the past three decades and has moved from teaching about technology to using it as a tool to communicate and interact with one another. For the purposes of this study, it is necessary to establish a working definition of technology integration and for this Ertmer provides one that is a both “curriculum based an future oriented” (p. 49). His definition of integration is when technology “adds value to the curriculum not by affecting quantitative changes (doing more of the same in less time) but by facilitating qualitative ones (accomplishing more authentic and complex goals).

Technology integration has been shown to be an evolutionary process. In *Diffusion of Innovations,* Rogers (1995) provides a model for innovation diffusion, such as that of technology integration, across individuals or organizations. In this model innovativeness is measured across five dimensions categorized as laggards, late majority, early majority, early adopters, and innovators. Another study, the Apple Classrooms of Tomorrow project or ACOT Project, which provides much of what we know about technology integration today, also provides a model of integration. The stages identified from the ACOT study, roughly approximating Rogers’ (1995) five-stage innovation diffusion model, are entry, adoption, adaptation, appropriation, and invention (Sandholtz, Ringstaff & Dwyer, 1997). Another dimension model of integration is presented by Fogarty (1991) and provides ten integration models for teachers to use with the curriculum. Across the ten models three integration strategies are presented. These are single discipline, multiple discipline, and within and across learners. The first strategy involves integrating technology within a single discipline in which teachers begin to use technology as an extension of their traditional practice. An example of this strategy would be to use a single piece of application software to study a specific subject being taught in the classroom. The second strategy allows integration across several disciplines of study or classes. An example of this would be students studying ways to create spreadsheet formulas (e.g., to calculate interest) in a computer technology class and studying interest and percent in a math class. The final, and most ambitious strategy is that of integration within and across learners. This strategy involves student collaboration and creation of an end product. Using this strategy, classrooms are student-centered and teachers increasingly take on the role of a facilitator of learning. While with each model there are subtle differences between each category, it would seem logical that they may be broken down into three groups, low-end, mid-range, and high-end user of technology and technology integration.

Recent Research Studies on Integration

While the articles presented in this chapter comment on the factors the authors see as issues they are not all technology integration studies per se. They range from policy documents to technology planning to expansion of the Internet in school settings. When looking at recent research regarding technology integration relative to factors that inhibit or enhance integration of technology, it provides support for these categories. Research studies were reviewed from those conducted since the *Technology Standards for Instructional Personnel* were released. Twenty-five studies were selected for their recency and relevance to technology integration. Their findings and integration factors identified are summarized in Appendix G.

Recent studies on technology integration support the notion that approaches to technology and its integration into the classroom may be determined by such factors as teacher grade level, teacher subject area, and teacher definitions regarding technology. Additionally, the recent studies support the literature regarding factors that enhance or inhibit technology integration into the classroom.

Barron, Kemker, Harmes and Kalaydjian (2003) in a study of 2,156 K-12 teachers found that elementary teachers were more likely to use computers for problem solving and as a communications tool than secondary teachers. They also found that science teachers were more likely to use computers as research tools and for problem solving than other subject area teachers.

Two of the recent studies on technology integration point out that teachers' definitions of terms regarding technology may enhance or inhibit their integration of technology. Pedersen and Liu (2003) studied the implementation of a computer-based learning (CBL) project in fifteen middle schools. They found that teachers defined terms, such as CBL, differently. As a result they varied in their implementation of the project. Additionally, Pierson (2001) found that the individual definitions teachers have for technology integration directed their management of student computer use.

In discussing leadership and planning, Byrom and Bingham (2001) point out that leadership may be the single most important factor in the success of integrating technology into the classroom. This often includes comprehensive planning for technology. In schools that do not have a leadership that has positive expectations for computer use or that do not instill or support a culture of technology use, integration is inhibited (Dexter, Anderson & Becker, 1999; Parr, 1999). Leadership that can plan and implement whole district or whole school approaches to integration enhances both the use and integration of technology (Prain & Hand, 2003).

Of the studies selected only one mentioned funding as a factor. Byrom and Bingham (2001) noted that economically disadvantaged schools have greater barriers than their affluent counterparts. For these disadvantaged schools funding becomes an issue that inhibits integration of technology.

Time is an important factor for integration as reflected in recent research. Teachers need greater amounts of time when integrating technology into classroom practices. This includes time for technical skill improvement, time to become acquainted with how the various technologies operate, and time to become aware of new pedagogical strategies made possible through the technology (Gonzales, Pickett, Hupert & Martin, 2002; Mouza, 2003). Time for teachers to learn how to use new software entering into the school or classroom is one of the biggest obstacles to its use (Chiero, 1997). Two additional aspects of time as a factor in integration is that of time for planning use of technology (Saye, 1998) and time for personal reflection about its use (Dexter, Anderson & Becker, 1999).

Training can positively enhance the integration of computers into instruction, while lack of training inhibits integration and teacher use of technologies (Butzin, 2001). Technology training must not be taught in isolation or as a separate subject from core subject content (Halpin, 1999). Dusick and Yildirum (2000) note that training must be geared to the skill level of the end-user. They distinguish between non-technology-using teachers and technology-using teachers. While using teachers tend to want skills training, non-users want training on the benefits of technology in classroom instruction. Christensen (2002) found that needs-based technology integration training coupled with classroom use increases the chances that both teacher and student technology use will increase. Collaboration as part of the training process can positively enhance technology adoption and integration (Ertmer & Hruskoey, 1999; Gonzales, Pickett, Hupert & Martin, 2002; Hoerup, 2001; Pedersen & Liu, 2003). Collaboration and training can enhance the potential for technology integration when model lessons are provided (Brush, Glazewski, Rutowski, Berg, Stromfors, Van Nest, Stock, & Sutton, 2003). Mulqueen (2001) found that additional in-service days beyond traditional in-service training opportunities as well as intensive summer workshops also aided teachers' use and integration of technology.

Studies by Becker and Ravitz (1999) and Byrom and Bingham (2001) found technology support was a factor in inhibiting or enhancing technology integration. In a study by Chiero (1997) one of the findings was that technology support was not generally available. A study by Saye (1998) finds that providing personnel to support the technology and those using it is one of the conditions that must be met before teachers will admit computers into their classrooms. This type of support extends to supporting not only the teacher but support of the actual computer hardware and software being used.

In the recent research personal beliefs and values about technology continue to be a factor in its integration (Hoerup, 2001). Brennan, Miller and Moniotte (2001), while limiting their study to college level, find that extrinsic factors are not consistently related to technology use and therefore may be more related to intrinsic factors. Lumpe and

Chambers (2001) found that teachers' context and self-efficacy beliefs were significant predictors of teachers' use of technology in classrooms. Chiero (1997) found that increased self-perception of teacher technology expertise increased technology use. Ertmer, Addison, Lane, Ross and Woods (1999) found that these intrinsic, or second-order barriers often interact with other first-order, or extrinsic barriers of time, access, training, and support to limit or enhance teacher use of technology.

Like funding, accountability was mentioned only once in the studies selected. Byrom and Bingham (2001) concluded that the evaluation component of technology implementation efforts was often the weakest element.

Access to resources was another factor identified in current research literature. Sufficient technology infrastructure must be made available for successful technology use (Becker & Ravitz, 1999). This includes access to resources as a function of both teacher training (Doering, Hughes & Huffman, 2003; Mouza, 2003) and classroom use (Butzin, 2001). It is interesting to note that access in these studies was typically mentioned in the discussion and was not a major finding of most of these studies. One exception was a study of urban university students by Chisholm and Carey (2002). Their study found that minority students own computers at a lower rate than majority students. Access was one of the conditions Saye (1998) notes for teachers to admit technology into the classroom.

The body of research into technology integration gives support that technology can be used to transform classrooms and change how teachers teach. However, as noted by Knapp and Glenn (1996) much of this research deals with classrooms in technology rich environments. As Hess (1999) states, regarding research on technology integration, "educational research tends to focus on those schools that are islands of exceptional effectiveness in a sea of chaos" (p. 157). They typically focus on a small number of successful schools that are able to successfully integrate technology that Dede (1998) terms "islands of innovation" (p. 199).

While there is a substantial body of literature dealing with how technology is integrated into classrooms, most seem focused on those islands of innovation. Given the amount of investment in technology in American schools and the increased pressure for accountability, there is surprisingly little research on approaches taken to integrate technology into non-technology rich environments as the result of national or state mandates. The following chapter provides the methodology for such a study.

Chapter 3: Methodology

This study is a backward-mapped, multicase study of four school districts' responses to a state mandate for teachers to integrate technology into their classroom instruction and what factors influence this implementation for low-level, mid-level, and high-end users of technology. This chapter contains four sections. The first section, "Backward Mapping: Case Studies in Reverse," provides support for using a backward-mapped, multicase study approach. The second section, titled "Participants," presents the selection of the districts and sites, or "cases" under study, and the selection of the participants. The "Procedures" section describes the data sources used and data collection procedures. The fourth section, titled "Data Analysis," provides the approach to analyzing the data gathered. Issues of trustworthiness and ethical considerations are also addressed within this latter section.

Backward Mapping: Case Studies in Reverse

It is perhaps best to first establish a perspective from which studies investigating social phenomenon may be viewed. This is especially true when the subject of the study cannot be easily quantified, such as technology integration or policy mandates. Two possible perspectives are through backward mapping and multicase studies.

Backward Mapping

Much of the literature on educational standards is philosophical in nature and does not address the issue of implementation (Bower, 2003). This is also true of literature on policy mandates, especially as they relate to new innovations (London, 1993). Typically, misjudging the ease of policy implementation is a common mistake in planning as abstract policy is moved to concrete implementation (Dyer, 1999). Typical top-down perspectives, referred to as "forward mapping" by Elmore (1980), are important in understanding mandates and their implementation since the policy message and its dissemination are key to its understanding. However, this top-down approach is based on hierarchical control models of implementation that often portray any deviation from policy requirements as a failure that must be checked (Mills, 1998). The bottom-up perspective, or backward mapping, is equally important to such understanding, for it assumes that organizations are different and operate in varying environments. The focus is placed on the local actors and their experiences (Recesso, 1999). For it is with the lived experiences of those implementing policy that sense is made of the interaction of policy definitions, personal knowledge and experience, and local conditions and circumstances (Spillane, Reiser, & Reimer, 2002). Backward mapping then proceeds to policy by starting at the lowest implementation level, the specific actors, and moving toward the intent of the policy. This logic allows investigation of the factors that can lead to a discrepancy between the actual and the desired practice or behavior (Dyer, 1999, Elmore, 1980; Weatherley & Lipsky, 1977). Those issuing policy mandates are then informed by the conditions and actions of the local actors rather than by the intent of their work. In addition to the backward mapping approach, case study methods also offer a design that is well suited for such studies.

The Case Study: A Qualitative Tradition

While backward mapping provides the direction for a study of the implementation and factors affecting a mandate to integrate technology, it does not directly address the research design. The qualitative tradition of research and, more specifically, the multicase study design provide unique features that make it very suitable for studies involving social phenomena. First, qualitative research is concerned primarily with the lived experiences that individuals or groups have gone through (Merriam, 1998). Secondly, the human instrument is the collection device for qualitative data. This allows sensitivity and responsiveness to both the circumstances and context (Merriam, 1998; Rossman & Rallis, 1998).

Participants

This study involved four urban Virginia school districts and the Virginia Department of Education. A total of 50 individuals participated in the study. Of this number, 48 participants were from the four school districts. Two participants were state level administrators. General demographics characteristics of participant sites are provided in Table 1.

Table 1

General Characteristics of Participant School Sites

District	Number of STU	Number of ADM	Number of TEA	Number of TSS
Anderson				
Roosevelt Middle	800	7.5	64.5	3
Madison Elementary	400	2	41.5	1.5
Cheatham				
Rutherford Hayes Middle	500	6	38	1.5
Lincoln Elementary	250	2	22	1.5
Fort Campbell				
Ronald Reagan Middle	500	5	47	1
Andrew Johnson Elementary	250	2	21	1
Grainger				
Van Buren Middle	550	5	28	1
Franklin Pierce Elementary	300	2	16	1

Note: STU = student enrollment at school; ADM = administrative personnel; TEA = teaching positions including teaching assistants; TSS = technology support staff including library media specialists, library assistants, and non-teaching instructional technology specialists.

District Selection

Districts were selected based upon two criteria. These were (1) their urban school district status, meaning non-rural (the Virginia Department of Education does not report suburban school district status, since suburban families attend either a rural or urban school district, depending on location), and (2) their status as a low-resourced school district. The latter was based on the district's composite index of local ability to pay for education (CI), free and reduced lunch eligibility, and poverty percentage data (percent of families in poverty in the city that the district serves). "The poverty index is a composite score used by the Virginia Department of Education to distribute state and federal funds to school divisions. It reflects the numbers of students living in poverty compared to the total school population" (Virginia Department of Education, 2001b, p.6). Data for criteria and selection was obtained from data reports posted on the National Center for Educational Statistics, the Virginia Department of Education's web site, and from State Superintendent's memoranda (National Center for Educational Statistics, 2000; Virginia Department of Education, 2001a; 2002). The composite index of local ability to pay (CI) for urban school districts in Virginia ranges from a low of 0.1886 to a high of 0.8000. The lower the CI the less likely that the district can meet educational needs of its students without external financial support. Of the 18 districts selected for possible inclusion in the study, all had a CI range from 0.22 to 0.68. Based on a comparison of all urban Virginia public school districts, the poverty percent range is from a low of 5.37 to a high of 38.93. The higher the percentage of families in poverty, the less likely they can contribute to the tax base and support education. Of the 18 districts selected for possible inclusion in the study, all had a poverty percentage range greater than 30% (>30.00). The

18 districts with the highest combination of CI and poverty percent were each placed on a folded sheet of paper, placed in a box, shuffled, and four names were "drawn from the hat." Three additional names were drawn in the event access was denied in any of the initial four districts selected. Of the four districts selected their CI ranged from 0.3583 to 0.3901 and their poverty percent range was 31.29 to 33.03. While population and minority were not factors under consideration for selection, it should be noted that the population data in the districts selected ranged from 17,300 to 95,200. The percent of minority (non-Caucasian) in the districts selected ranged from a low of 11.7 to a high of 71.9.

Site Selection

Within each of the four districts selected, two school sites were selected. Sites were selected based on three criteria – grade level, typical representation, and access. One school representing grades K-5 (elementary) and one representing grades 6-8 (middle) was selected from each of the four districts. Secondly, after meeting with the administrative official in charge of instruction (typically this is the district Assistant Superintendent) and explaining the study, schools were selected that were representative or typical of other schools in the district with regard to technical access and integration of technology into instruction. Finally, the principals in the schools identified had to be willing to grant access, to be a participant, and to assist in additional participant selection for the study.

Participant Selection

Since this study looked at factors influencing the implementation of a mandate to integrate technology into classroom instruction, classroom teachers were the primary target group for participation. However, since teachers do not act alone in implementing such a mandate, school site and district administration officials in charge of ensuring that the mandate was carried out were also included. An initial meeting was held with the assistant/associate superintendent to discuss the purpose of the study and criteria for participant selection. At the district level, individuals involved in the oversight of mandate implementation were identified and selected by the district's assistant or associate superintendent of instruction. This typically involved the assistant/associate superintendent of instruction and the district technology director. In larger districts, it also involved technology-training specialists that were responsible for instructing and supporting teachers' integration of technology. Due to differences in district organizational structures it was difficult to define and identify the exact number and role of district staff to include prior to initial meetings with district administrative staff. For example, some district personnel serve dual roles. In one instance the personnel director also served as the technology director for the district. While in another district technology training was the responsibility of multiple technology trainers, while the hardware and software support was the function of the technology director. Selection then, at the district level, was based on the role or function relative to the mandate and technology's integration and not on the position title. The assistant/associate superintendent at the district level identified both the district-level participants and the school site principals for participation. At the school level, the principal, as the school-level administrator responsible for the instructional and technical aspects of the school site, was included as a participant. Once access was granted to the school site, initial meetings were held with the elementary and the middle school principal to discuss the study and selection criteria. Each principal was asked to identify three classroom teachers in their school that represented a low-end, mid-level, and high-end user of technology respectively. These selections were made irrespective of their area of specialization since both middle and elementary teachers may teach across grade levels and subject area disciplines. Additionally, if the school had a site-level technology coordinator that was not one of the three classroom teachers, they were also selected to participate.

In addition to the school district personnel selected, two state-level participants were selected. Identification of these participants was made based on two criteria. First, they had to have participated in the development of the mandate standards. Secondly, they had to have the assigned responsibility for the implementation of the mandate at the state level.

Procedures

This section describes research procedures for the study. Data sources and collection procedures are included.

Data Sources and Collection Procedures

During the four-month period of March 10 to June 10, 2002, two weeks were spent intensively studying one elementary and one middle school in each of four urban school districts in Virginia. Approval for the study was granted through the Internal Review Board (IRB) at Virginia Tech (see Appendix H). During this study multiple data sources were collected. Data sources included interviews with state, school district, and school site staff, classroom observations, field notes, and written documents.

Interviews. Interviews were conducted using standardized, semi-structured, open-ended interview questions (see Appendix I). Interviews generated approximately 3,500 typed pages of data. Length of interviews ranged from forty minutes to two hours. Interviews varied in length due to participant schedules. For example, teachers who scheduled interviews during their planning period tended to be shorter than those who scheduled interviews after school. Questions for the interview were developed and written out in advance. While the questions were written in the order they were asked, participants were encouraged to provide additional information or clarify a response to questions asked. The actual interviews were more informal, relaxed, and conversational in tone and the interview questions served primarily as a guide. Additional questions were asked when the participant discussed unfamiliar terms or programs in order to clarify meanings. For example one participant repeatedly used the term “AR.” When asked what was meant by the term, she indicated that it was an acronym she used for the computer program *Accelerated Reader*. In some instances participants discussed issues that were not central to the study. However, these discussions were allowed and explored further in order to better understand the thinking of the participant and the settings in which they worked.

Prior to the start of each interview, the purpose of the study was reviewed with the participant. Initial demographic questions were asked at the outset of each interview, including their age, number of years in education, number of years at their current location, and official title. Each participant’s interview was audiotaped and later transcribed for analysis.

Interview settings. All interviews were scheduled at convenient times for the participants. This meant that interviews for classroom teachers were held in their respective classrooms or computer labs before school, after school, or during planning periods. All participants were asked at the outset of the interview if they were willing to be audio taped during the interview. The interview began with a general conversation about their classroom arrangement, students, and other more personal comments in order to make the participant more relaxed during the interview and establish a conversational tone. For example, one teacher wore a coach's whistle. A comment about that they must be a coach led into a brief conversation about sports at the school. A tape recorder was placed in front or to the side of the participant being interviewed. Rapport was established with the classroom participants through multiple follow-up observations of classroom instruction. Throughout this process, the intent was to remain as a neutral observer, however, on several occasions I volunteered to assist classroom participants in preparing computers for classroom use when they were exceptionally pressed for time. This included starting, or restarting computer systems, logging into student user accounts, and starting software applications for students.

Interviews for all school-site principals and district-level participants were conducted in the same manner as the classroom interviews. The only exception was that they took place in their offices rather than in the classrooms. Meetings were held with state level participants to discuss the particulars of the study. However, due to scheduling problems, the distance involved in making multiple trips, and the fact that these participants did not involve classroom observations, face-to-face interviews were not held. The two state-level interviews were conducted via speakerphone connected to the audiotape recorder.

Interview field-testing. Before this study began, interview questions were tested with a set of educators, including an elementary and middle classroom teacher and a technology trainer not involved in the study to ensure that the content and the language of interview questions were appropriate, understandable, and addressed the questions of the study. Based on the responses, questions were added or reworded for clarity.

Interview schedule. Classroom interviews were conducted before any classroom observations took place. Interviews were conducted within two weeks of the classroom observations. In one case a participant came in on a scheduled vacation day in order to have the interview. In all cases, the arrangements for the interviews of classroom teachers or site technologists were made with each principal. Initially, a meeting with each participant was planned to explain the purpose of the study, taping, observations, and informed consent forms as well as answer any questions. However, each of the principals indicated that, in order to save teacher time, they wished to convey information to the participants instead of holding separate meetings with each individual participant. The principal was provided sufficient copies of the informed consent form and a self-addressed, stamped return envelope. Each participant was given a copy of his or her signed informed consent form for his or her records. The same process was used for state, district, and school-based administrative participants. However, with the exception of state-level participants and district assistant/associate superintendents, administrative participants combined the initial meeting with the interview and informed consent was provided via mail before the meeting/interview was scheduled.

Audio taping and transcription. All participant interviews were audiotaped. Since responses to interview questions were often lengthy, it was not possible to accurately reduce responses to writing initially. Additionally, it was important to record the verbatim narrative in order to provide answers to some of the research questions. While the intent was to place the tape recorder out of the way to increase the conversational feel of the interview; due to noise levels in classroom settings, it was necessary to place the record either directly in front of or directly to the side of the participant. All audiotapes were transcribed as soon as possible after the interview session. Upon completion of transcription of the audio taped interviews, printed copies of the transcription were mailed back to the participant for review and verification that the transcription was as close to the actual conversation as possible. One audiotaped interview was damaged due to a malfunctioning recording unit, thus only the first half of the interview was recovered, transcribed and submitted for review and verification. Of the transcribed interviews only three were returned with edits. In two instances, minor grammatical changes were made and in one instance, the actual name of the participant was corrected for spelling. A fourth participant returned the transcript with a note indicating that she “certainly laughed a lot” during the interview.

Interviews with district administrative participants were conducted at their convenience. Three sets of district-level interviews took place before school-level interviews could be scheduled. While interviews with state department administrative participants took place last, in keeping with the backward mapping process. One issue that presented itself was that of my own interview as an “actor” in the study. In order to remain as objective as possible, I was interviewed by a co-worker, who was not a participant in the study. They were given instructions to interview me as though they were conducting the research and I, in turn, would provide as objective and honest answers to their questions as possible. The interview was audio taped and was informal and conversational in tone. The interviewer reviewed the informed consent form with me obtained my signature in keeping with the interview process of all other participants. Also my interview was transcribed verbatim from the audiotape.

Classroom observations. In order to better understand how teachers integrated technology into their classroom environment, classroom observations were conducted. Three classroom sessions were observed with each of the teacher participants. Observations were not consecutive, but took place, as class scheduling would allow. For example, while one teacher was on lunch duty or other non-instructional activity, observation of another teacher would be conducted. Classroom observation units ranged from 40 minutes to 2 hours for block classes. During classroom observations, notes about the observations were kept. These notes included classroom layout, use of technical terminology by teachers, interaction between teachers and students relative to their technology use, types of technology available for use in the classroom, number and type of computer hardware available for student and teacher use, types of applications available to students (e.g., word processing, database, spreadsheet, etc.) and types of applications used during instruction. Recording these observations assisted with the analysis by providing detail about teachers' use of and integration of technology that would not be reflected during interviews. In most instances the observation was from an out-of-the-way location within the classroom and arrival at each observation was timed so that interference with classroom process was minimal. Early arrival also provided an opportunity to observe the types and varieties of technology available to the students and teacher. However, in three cases, the classroom teacher indicated that movement within the classroom was encouraged in order to “show off” what students were doing with the technology.

Field notes. A spiral notebook was used to record classroom observations. Class beginning times, ending times, teacher name, class grade level, and subject was recorded. Class layout, any observable computer technology, and student seating arrangement were noted. Class instruction and student interaction with teacher and computer technologies, when available, were noted rapidly in chronological fashion. Teacher interactions about, and with, computer technology were also noted. These interactions included such items as appropriate or inappropriate definition of software and hardware terms, technical difficulties encountered, and approaches to integration, when available.

In addition to notes about the observations, personal reflections were added to the field notes at the end of the day. This provided a guide for additional follow-up questions and assisted in helping make sense of the data collected.

Written documents. In addition to interviews, observations, and field notes, other written documents were important to this study. Teachers were asked to provide two to three written samples of their lesson plans in order to analyze them for inclusion of technology integration practices. District and school technology personnel were asked to provide a copy of the district-level and school-level technology planning documents respectively. Finally, samples of professional development schedules, checklists, portfolios, and certificates used in assisting with or verifying that certified personnel are meeting or will meet the technology mandate were requested from each of the districts.

However, not all documents were available. For example many teachers indicated that they did not keep “formal” written lesson plans. One district was in the process of rewriting their technology plan and, for whatever reason, could not produce their prior plan. The copy of the plan for this district was provided through the courtesy of the Virginia Department of Education. Documents made available were reviewed and incorporated into the districts’ case studies.

Data Analysis

Data analysis procedures are presented in this section. Additionally, issues of trustworthiness and ethics are discussed.

This investigation used a case study approach focusing on multiple cases that met the selection criteria. Both within case and cross-case inductive analysis was conducted and a backward mapping flow was followed, moving from local implementers to state-level decision-makers. Steps in this approach, as outlined by Rossman and Rallis (1998), are (1) organizing the data, (2) data familiarization, (3) category and theme generation, (4) data coding, (5) searching for alternative explanations, and (6) presenting the data. As part of the analysis a constant comparative method was used (Merriam, 1998).

Organization of the data is vital to studies involving case studies because it “creates a more complete record, and stimulates analytic thinking” (Rossman & Rallis, 1998, p. 177). Organization was accomplished through the labeling of each interview tape by district, name of participant, data of interview, and the starting and ending times of the interview. Separate tapes were used for each interview. Where interviews lasted longer than time limits of the tape, multiple tapes were used and duplicate labels were made for subsequent tapes. Additionally, multiple tapes were labeled “tape 1 of n,” where n represents the total number of tapes in the set, to ensure proper order in transcription. All field notes and classroom observation notes were kept in spiral-bound notebooks. One notebook was dedicated to each district.

Raw data from audiotaped interviews were transcribed into computer files. Each transcribed file followed the same set format so that all would be uniform for analysis. In addition, handwritten field notes and classroom observation notes were transcribed into computer files. The computer files were organized by level as well as by district or case. Backup copies of transcribed files were kept in a locked safe in case audiotapes were needed to verify any data transcribed.

In order to become familiar with the transcribed data, hard copy transcripts were compared to its audiotape to check for accuracy prior to analysis. Any discrepancy was noted and the electronic transcription was corrected and resaved to both disk and hard drive. Hard copy transcriptions were then reread twice more. The purpose of the first reading was for general review and to attempt to understand the interview away from the interview and transcription setting. The second reading was for the purpose of identifying broad themes, categories, and concepts that emerged from the data.

Category and theme generation was accomplished during the last full reading of the transcripts by looking for “recurring ideas, themes, perspectives, and descriptions” (Rossman & Rallis, 1998, P. 179). From this a rough concept map was created and major ideas and relationships were identified. These ideas and relationships formed the basis of the data coding.

An initial data-coding scheme came from the concept map. A data-coding table was developed and the printed transcripts were then reread. Pertinent passages of the written transcript were marked with the appropriate code from the table. A coded interview transcript sample is provided in Appendix J. This process was repeated for each of the transcripts. After the initially coding process, the codes were revised with new categories being added or other categories being collapsed. A revised data-coding table was developed and the coding process was repeated for each transcript.

Throughout the coding, analysis, and writing process, the search for alternative explanations was considered in order to “search for other plausible explanations” (Rossman & Rallis, 1998; p. 181) for the developing cases. This questioning resulted in adding or dropping data from consideration when it was not “useful in illuminating the questions being explored” and assisted in preventing making “broad assertions that imply Truth” (Rossman & Rallis, p. 182).

The data are presented through a series of descriptive case studies or “portraits” (Rossman & Rallis, 1998; p. 202) of four school districts (see Appendices B through E). Through these descriptive case studies, themes are presented that dominate the interviews, class observations, and notes. These themes form the basis of a comparative analysis between and within the cases.

Trustworthiness and Ethical Considerations

Rossman and Rallis (1998) establish two interrelated criteria for judging the trustworthiness of a qualitative study. The first criteria asked the question “does the study conform to standards for acceptable and competent practice?” and secondly, “has it been ethically conducted?” (p. 43). For a study to be judged competent is must be reliable, valid, generalizable, and objective. For it to be ethical it must not “exploit other people” for personal advantage (p. 48). The ethics of a study are based on the criteria of privacy and confidentiality, participant consent, trust, recognition of local politics. Given these factors, trustworthiness and ethical considerations were addressed in this study.

Validity and reliability. Merriam (1998) offers a number of techniques in which validity and reliability may be incorporated into a study. Of these techniques repeated observation, triangulation, and member checking were used in this study. Each teacher in the study was observed for a minimum of three class periods at the middle school level or three hours at the elementary level. At the elementary level teachers were observed for three hours, since class periods are not scheduled in fixed periods like their middle school counterparts.

Classroom observations were repeated multiple times with each teacher to ensure that salient features, situations, and issues were not overlooked and were reinforced. For example, in one case, observation of a computer software failure for one student could have been the result of student use rather than a technical failure. However, repeated failures of the same computer over multiple observations and different students helped verify that it was not a human operator problem, but a technical one.

Triangulation of multiple data sources, such as observations, field notes, and interview transcripts provided a means to verify data from more than one source. For example, triangulation assisted in the study when programmatic features were indicated as important by one-participant and these features were reflected both in the classroom observations and in interviews of others.

Particpant checking was used throughout the study to check for understanding. During the interviews and following classroom observations questions were asked of participants to clarify understanding by asking such questions as “You said this earlier, do you mean that…?" or "Do I understand you to mean that…?" This was also used to verify information across participants. For example, in one instance, two participants identified the number of computer labs differently. By asking both for clarification, it was determined both were correct, but each was viewing the setting from their own historical perspective.

Transferability. Transferability is not a goal of interpretive research (Erickson, 1986). "The search is not for abstract universals arrived at by statistical generalizations from a sample to a population, but for concrete universals arrived at by studying a specific case in great detail and then comparing it with other cases studied in equally great detail" (p. 130). The widest range of data sources were taken into consideration and included in this study. In addition, purposeful sampling was used to assist others in making a decision about whether transferability is possible (e.g., teachers who are integrating computer technology into their classroom instruction).

Objectivity. One major concern of this study was objectivity. As an actor within one of the districts studied, I have first-hand knowledge about the issues and questions of this study. On multiple occasions consideration has been given to removing my district, and, in doing so, myself from the study. However, in doing so, I believe that it would eliminate another necessary perspective and reduce the richness of the experience. Triangulation through multiple sources, and peer review has assisted in making this study more objective. Additionally, I have attempted to deal with the issue of objectivity through use of an objective voice, rather than from a personal "I" perspective. When interviewing myself as an "actor" in this study, I enlisted the assistance of a co-worker, who was not a participant in the study, to role-play the "researcher" and present interview questions. I attempted to be as open and honest in my responses, drawing on my decade of experience as a technology director. Despite this, in the writing, it was unavoidable to use both an emic (or insider) and an etic (or outsider) perspective.

Privacy and confidentiality. Due to the brief, intense nature of this study, the issue of privacy and confidentiality was of utmost concern. While it is impossible to guarantee that districts, schools, participants, and specialized program will not be identifiable, every attempt was made to protect privacy and confidentiality. Pseudonyms were used in place of actual names of school districts, school sites, and participants. In addition, pseudonyms were provided in cases where the names of specialized programs would uniquely identify the specific district. All personal titles, such as “Dr.,” “Mrs.” were dropped from participant names and all are referred to as “Mr.,” or “Ms.” throughout each of the cases. Materials with identifiable information were kept to a minimum and locked in a safe or kept in password protected computer files.

Participant consent. All participants were provided an informed consent form with a description of the study and its purpose before any interviews or classroom observations were scheduled. Since data collection sources were different for administrator and teacher participants, a separate informed consent form was developed for each group. A sample of the administrator informed consent form is provided in Appendix K and a sample of the teacher form is provided in Appendix L. Participants were asked if they had any questions about the informed consent form or the study at the outset of working with the participant. Each participant was provided a copy of his or her informed consent form. The original copy of the form was kept in the safe with the participant’s audiotaped interview.

Trust. Since the length of the time spent with each district was limited, but intense, trust was an important factor from the outset. Several techniques were used to try to avoid what Rossman and Rallis (1998), call the “one-night-stand” nature of the qualitative study and the image “that you seduce the participants into disclosing their worldviews then abandon them when you have gotten what you want: data” (p.51). These techniques included up-front disclosure and personal sharing. All participants’ informed consent forms included copies of the generic questions to review and reflect on before interviews were conducted. While I had trepidations about providing the questions in advance, I believe that providing them the ability to give reflective thought about the general questions in advance outweighed the possibility that they would construct “correct” or “pat” answers to questions asked. In addition, field notes and notes about classroom observations (see Appendix M) were not hidden from the participants. Only one teacher asked about class observation notes. The teacher requested to see notes about her classroom observation. After looking at the notes she asked “your classroom layout is sure pretty detailed, do you have to do that for every observation?” One principal asked about the format of the notes, which lead to his relating his own work on a qualitative research project. Before classroom observations occurred, participants were told about the format of the notes and what would not be included. One participant indicated that she was nervous about having people come into her classroom given the “messiness of her classroom” and stated that she was relieved to know that my study did not concern classroom organization. At the initial meeting, I also shared my personal background and interests as well in an effort to “exchange information” rather than be there only to collect data.

Recognition of local politics. Every attempt was made to work through the politics of local school divisions. Recognizing that the "gatekeepers – those in positions of power in organizations – can support or squash a project" (Rossman & Rallis, 1998, p. 54), requests for access into the districts was made from the top-down (superintendent to principal to teacher). This assisted in building credibility and trustworthiness at increasingly lower levels on the districts' organizational hierarchies. Knowing that a study, and its related access, is endorsed or authorized at upper organizational levels increases the changes that access will be easier at the school and classroom levels. This process became both useful and enlightening. For example, in one district access was exceptionally difficult despite district endorsement. On three occasions, principals approved access and scheduled time to conduct the study, and then reneged, citing lack of time, or stating that they did not use technology to an extent that they felt worth observing. Each time I returned to the district level officials and arranged for another school. Despite my personal experience in the K-12 setting, as a novice researcher, I was naïve to the veracity what Rossman and Rallis (1998) term "micropolitics" or "the undercurrents of power that shape organizational life and social interactions" (p. 53). While such midcourse corrections were necessary due to the micropolitics of the district, I do not believe that this negatively impacted this study but assisted in better understanding the social milieu of the district in which the study was conducted.

Chapter 4: State-Level Perspectives and District-Level Implementation

This section provides an overview of the Virginia state *Technology Standards for Instructional Personnel* (*TSIP*) mandate, relative its integration standard, from the perspective of state-level personnel in charge of its implementation. Their definitions of mandates, *TSIP*, and technology integration, as well as perspectives on factors inhibiting and enhancing integration in the classroom, are included. This section concludes with a comparative summary of four districts' *TSIP* implementation efforts that are addressed in Appendix B through Appendix E. Within this summary, their definitions of mandates, the *TSIP*, and technology integration are compared. Other comparisons made include factors that inhibit and enhance integration, approaches to integration, leadership and planning, and means for accountability for meeting the *TSIP*.

State Context

The state of Virginia operates 132 school districts or divisions. These divisions are comprised of approximately 94,236 teachers and administrators who operate 1,842 schools, including elementary, middle, high, special, and alternative schools. These schools serve approximately 1,176,557 students in grades Pre-K through twelve. Of this number 61% are white, 27% black, 6% Hispanic, 5% Asian, and 1% representing other races. Overall, within the state 31.30% of these students are on free and reduced lunch, ranging from a low of 4.58% to a high of 70.2%.

The Virginia Department of Education is part of the executive branch of the government of the Commonwealth of Virginia. It is composed of a State Board of Education, which is the main authorizing body and a State Superintendent for Public Instruction that oversees the eight divisions that make up the department. The eight divisions are (1) assessment and reporting, (2) educational accountability, (3) finance, (4) instruction, (5) policy and communication, (6) special education and student services, (7) teacher education and professional licensure, and (8) technology. The latter two divisions, working in collaboration, were primarily responsible for developing the *TSIP*. Two advisory boards, one representing each division drafted the final documents. These boards were the Virginia Educational Technology Advisory Committee (VTAC) and the Advisory Board on Teacher Education and Licensure (ABTEL). VTAC, composed of representatives from state, business, and regional superintendents' study groups, provides advice to the State Board of Education through the State Superintendent for Public Instruction. ABTEL is composed of nineteen members representing state, K-12 public schools, and higher education. Like, VTAC, their role is to advise the State Board of Education in matters regarding regulations, procedures, policies, and examinations for professional teacher licensure.

The State Board of Education authorized the Administrative Process Act (APA) to begin development of the *Technology Standards for Instructional Personnel* in July 1996. The *TSIP* was written as a component of the planned revision of the *Licensure Regulations for School Personnel* developed through ABTEL. On January 8, 1998, the State Board of Education authorized and approved the revised licensure regulations, including the *TSIP*. These changes in licensure were announced to school division superintendents through a Superintendent's Memo Number 2, dated April 17, 1998 (see Appendix N). This document is also available through the Virginia Department of Education's web site (http://www.pen.k12.va.us). As part of the guidelines of the *TSIP*, school divisions were required to incorporate the standards as part of their technology plans and develop strategies to meet these standards by December 1998. In addition, districts were required to develop in-service training programs and testing instruments to determine the level on which instructional personnel were meeting these entry-level requirements. The timeline for implementation of the *TSIP* was prior to the 2002-2003 school year.

Participant and Data Collection Sources

Two individuals participated in this study at the state level. Both were administrators for the Division of Technology within the Department of Education. They both have a combined 73 years of experience in education. Participant demographics are provided in Table 2.

Table 2

Participant Demographics for the Virginia Department of Education

Name	Position	Sex	Race	Age	YIE	YIP
Ruben Hoffer	Asst. Sup. Tech.	M	White	56	33	5
Sabrina Brown	Dir. Ed. Tech.	F	Black	62	44	4

Note: YIE = years in education; YIP = years in current position; Asst. Sup. Tech. = Assistant Superintendent of Technology; Dir. Ed. Tech. = Director of Educational Technology.

The two state-level administrative staff members, Ruben Hoffer and Sabrina Brown, are in charge of overseeing the statewide implementation of the *TSIP*. Ruben is in charge of the overall administration, in terms of instructional technology in the state.

Sabrina reports to Ruben and is in charge of all statewide software and technology training.

Participants' data were collected from initial meetings and follow-up phone interviews of both participants. Additional data were collected using the Virginia Department of Education web site, state planning documents, and Superintendent's memoranda.

Definition of Terms

Both of the participants at the state level were asked to define three terms relative to the Virginia state mandate for integrating technology into the classroom. These terms were mandates, Technology Standards for Instructional Personnel (*TSIP*), and technology integration.

Definition of mandates. In defining mandates, Ruben defines them in terms of regulatory process. In response, he describes what happens.

> What happens on the state level is a lot of things are developed as guidelines, and generally guidelines can pretty much come out of this office or out of the Superintendent's office. If there are regulatory-type things, usually those end up having to be either approved by the Board or approved by some legislative process or state code or something that is passed by the General Assembly. For example, the Technology Standards for Instructional Personnel, the Student SOL Standards, those were all approved by the Board or were, well they were all approved by the Board and may have originally emanated from General Assembly Legislation that required the Department to take a look at those things and then present them to the Board.

Sabrina simply defines mandates as "something that the state requires of all school divisions." She also sees mandates as a means "to make sure that there's a level playing field. That all school divisions, then are starting from some identical basis, some foundation so that we can have some consistency of delivery of educational services locally to our children."

Definition of the Technology Standards for Instructional Personnel (TSIP).

With the definition of the *TSIP*, Ruben defines it as "mandated guidelines" in order to "set a standard or set something so that everyone is able to, you know, able to try to achieve the same sort of goals." He believes that the *TSIP* provides "a framework for making sure that teachers have a degree of technological literacy."

Sabrina defines the *TSIP* as a "set of expectations for performance." With regard to technology she believes that it "means that we have set an expectation for the integration of technology into the classroom."

Definition of Technology Integration

Both Ruben and Sabrina agree that technology integration is using technology to improve student learning. Ruben's definition reflects a more evolutionary perspective of "business re-engineering," while Sabrina's supports current practice.

Ruben, when responding to defining integration, states, that it is much like "business re-engineering for technology." He clarifies this to mean "taking a look at business practices and things that were going" and once done, "taking technology and saying okay, what can we do with our technology that makes things better." For Ruben "better" includes looking at technology "as an individual teacher, as a school district administrator" and asking how can technology "make my teaching more productive, to make my teaching reach more kids, to make it more engaging for kids, to give them simulated experience."

Sabrina simply defines integration as "the appropriate use of technology tools." The purpose of integration for her is to "increase, improve, support, and academic achievement."

Factors in Integration

Like definitions, participants were asked to identify factors affecting integration from their perspectives. These factors include both those factors that inhibit and enhance the integration of technology across the state.

Inhibiting factors. In terms of personnel and support, Ruben sees hardware support as a potentially inhibiting factor. "There is nothing worse than that, and this happens, of course, all the time, you'll be somewhere and technology won't work properly."

Fear and support is also an inhibiting for Ruben. In talking about fear and resistance, he admits, "we've been aware for quite some time, particularly because of the technology standards for students were created first, but also because it's pretty widely known that young kids embrace technology pretty quickly and get involved in doing a whole lot of technological issues before teachers."

Both Ruben and Sabrina see training as potentially inhibiting factors. Ruben sees teachers as evolving to a higher level of mastery of technology and is now ready for the next step. He discusses K-12 training by higher education.

> I think it's interesting a lot of times higher ed folks in the past have gone into schools and offered up what I call their bag tricks–I don't mean that in a

> derogatory sense, but there were certain college courses that have been created. They'll come to a school and say here's our menu–you can chose what you like. And, schools really don't in my opinion, in the beginning they did, because they didn't know any better but over time they don't respond well to that. What they want, I'm sure you want and everybody does, you want somebody to come into your school, take a look at where your teachers and your students are and then take them to the next step.

Sabrina echoes this sentiment, “professional development has to be more than showing me how to click here and point there and copy this and print this. It’s got to be with how I teach and being willing to change my methodologies.”

In discussing time as a factor that inhibits integration, Ruben reflects on his prior teaching positions. “I think oftentimes teachers are really busy. I know when I was teaching before I became a principal, I had an eight-course load in a nine-course day, and I just didn’t have time.” He sees time in terms of “time to reflect” and time for teachers “to be together to talk about ideas and ways that instruction can be improved.”

Sabrina talks about teachers fear and resistance to technology as “dramatic change,” and “traumatic change.” However, she believes that “the professional development has to deal with that.”

As Sabrina sees time as “the biggest piece” inhibiting integration and feels that with technology “there just isn’t enough hours in the day. It’s finding time for it.” This is true “even if you have the good leadership” because “you still got to find the time.”

Enhancing factors. Both Ruben and Sabrina see access to resources as generally enhancing to technology integration across the state. Ruben says that "the availability of tools" really assists with integration. He also believes that the *TSIP* is "really pretty good because it afforded the opportunity with technology going everywhere from dial-up modems" to those that "have computers everywhere" to "meet the standards without having to be intimidated by it." Sabrina feels that teachers and students across the state have access to resources. She believes that people have begun to rely on computers and says, "the digital divide is closing." However, she admits, "I think disparity will always be an issue."

Like access to resources, both see training as an enhancing factor for integration. Ruben believes that training is potentially enhancing, however, it should be "training that is focused on integration." In addition, training should be offered on an ongoing basis for teachers "to keep their skills up." Sabrina feels that "what has worked best" for some school districts has been to "work with a local college and turn it entirely over to them." For others it may be a "training model" or "summer" or "after-school activities."

In terms of funding, Sabrina thinks, "the most enhancing factor has been that we've had a consistent stream of financial support to help schools acquire and support professional development activities." The funding streams include 25% for professional development from No Child Left Behind. Additionally, "one of the things that we have done is to restrict for the past five years the Technology Literacy Challenge fund grants strictly for professional development." She adds, "We will be doing the same thing through the Ed Tech program under No Child Left Behind."

Integration and Classroom Use of Technology

Both Ruben and Sabrina view classroom integration of technology from the perspective of being seamless and student-centered.

Ruben believes in “experiential learning.” However, he feels that it “is much more present in the elementary and middle school” and then “drops a little bit in high school,” then becomes “almost oppressive in college-level courses.” However, “by the time you get to graduate school it turns out to be a little more like the elementary school experience where people really construct their own learning.”

Sabrina, like Ruben, also believes that integration of technology should be “seamless.” She feels that in an integrated classroom, “there would be continuous use of technology to support instruction,” and “the curriculum would have it imbedded throughout it.” In talking about how she sees this occurring, Sabrina feels that it is probably not.

> Unfortunately I think maybe that's one of the problems is that in order to use it and use it effectively teachers have to change their teaching practices. It's no longer you stand and you lecture. If you're going to use technology, then as a teacher you have to be willing to look at project-base learning. You have to be looking at collaboration and group work and you have to be willing to set a classroom environment that supports that.

Leadership and Planning

The Virginia Department of Education provides a copy of the *TSIP* standards on their web site (at http://www.pen.k12.va.us/VDOE/Compliance/TeacherED/tech.html). They also provide the schools with a copy of their guidance and planning document

(Virginia Department of Education, 1998). Their planning document is comprised of twelve sections. The first section provides and introduction and overview of the standards and provides suggested sources for technology funding and training opportunities. Funding opportunities cited include *Technology Literacy Challenge Grants*, state technology funds, and grants through the Commonwealth's *Standards of Learning Training Initiative* for 1998-2000. Training opportunities listed include the *National Teacher Training Institute* (*NTTI*) provided through local public television stations, state technology consortia, and university sponsored training, and Virginia Department of Education workshops. Section two provides a program description of the *NTTI* and section three lists the Directors of Instruction at Virginia's Public Television Stations. Section for provides a list of statewide technology consortia. Sections five through eight provide sample planning, training, and assessment documents used in Dinwiddie, Poquoson, Gloucester, and Powhatan Counties respectively. Section nine provides a Department of Education Technology Specialist listing. Section ten is a discussion on application of technology to the *TSIP*. This section focuses on how to use various technologies as tools. Section eleven provides pre-service and in-service recommendations from the *Virginia Technology Advisory Committee* (*VTAC*). This section notes the need for on-going support and access to technology. The document concludes with a report on the *TSIP* in Arlington County Schools. *Other* than these planning and guidance documents noted and State Superintendent's memoranda (also available online at http://www.pen.k12.va.us/VDOE/suptsmemos/), leadership and planning for the *TSIP* rest primarily with the local school divisions.

From Ruben’s perspective, leadership is more about meeting the regulatory aspects of mandates and distinguishes between “hard mandates” that specify exactly what must be done and how to do it and “soft mandates” like the *TSIP* that specify what must be done, but doesn’t convey how to do it. He thinks, “the flexibility of having localities determine how teachers would meet those standards was pretty important and so in that case it was a mandate to meet the standard, but it wasn’t conveyed about how to do that.” While “regulatory documents do make sure that you have to do something, but at the same time it is not often communicated and kind of difficult to communicate in writing that there’s a lot of flexibility.”

Sabrina believes that “leadership is essential to implementation of the *TSIP*s.” While teachers may “become skilled” in technology, this does not mean that they will automatically use them in the classroom. She thinks “there’s got to be some expectation” on the part of the leadership “that teachers use those skills in the classroom” and believes that this has become “the greatest piece to those *TSIP*s not being accomplished.” Good communication is also a function of leadership from Sabrina’s perspective.

> I don't know how it's being communicated to teachers because primarily we communicate at this level to the leadership in the school divisions, and it is from there that it needs to go on – and, I'm not – that might be where some of the breakdown is occurring. But, again, it's going back to leadership.

Accountability

Accountability of meeting the *TSIP* is left up to the individual school divisions who report back to the licensure division. While this level of accountability is not rigorous, Ruben sees this as acceptable.

> I guess there's a breadth of the way folks are doing it but from one way or another I guess in many cases it depends on how important the leadership in the division feels that technology is. Frankly, in some cases divisions are just saying look we have to implement these and turn a computer around and call up a website and you've met the literacy standard. So, some people aren't taking them terribly seriously. And, frankly, that's kind of okay.

He recognizes the tremendous pressure" schools are under to "meet the SOLs and to give performance accountability." However, Ruben does see the *TSIP* as "an evolving process" that will change to "accommodate the changes that we see happening."

Unlike Ruben, Sabrina, while noting some flexibility for special conditions, sees accountability for the *TSIP* as less flexible.

> Basically, if you have a mandate, everybody has to meet it. Then what would be the conditions under which they would not? Now, I can say that with respect to state mandates knowing the varying environments of our school divisions we take that into account and whereas we take that into account we will make certain provisions for school divisions that may not be able to meet them but they're not released from them entirely–from meeting the mandate entirely.

Summary of State-Level Perspectives

While the state has mandated the *TSIP* as part of its regulatory process through the Licensure Division of the Department of Education, it is a “soft mandate.” As such, it provides instructions to the local school divisions in terms of what is expected of them, but not how to carry it out. The *TSIP* are linked to teacher professional recertification, and responsibility for accountability rests with the local divisions. Both participants at the state level have the responsibility for implementing the *TSIP* across the state. However, this involvement is primarily an informational and assisting role, providing communications to the local school division superintendents and disseminating information about the *TSIP*, training, and future plans to the districts through the division superintendent’s and VTAC. While both participants view technology integration in terms of using technology seamlessly to move the classroom from a teacher-centered one to one that is more student-centered and experiential, they agree that this is a future goal. Both see the *TSIP* as an initial step toward this vision.

District-Level Implementation of the *TSIP*

Four case studies were conducted to investigate the ways districts approach implementation of the *TSIP*, with regard to its technology integration standard. Of the fifty participants (n=50) in the study, two represent state level officials. Forty-eight (n=48) participants from the four case studies (see Appendix B through Appendix E) represent both district administrative and support staff, school-based administrative staff, and classroom teachers at both the elementary and middle school level. Case studies were organized into seven sections – district context, participants, definition of terms, factors inhibiting integration of technology, factors enhancing integration of technology, integration and classroom use of technology, leadership and planning, and accountability. This section provides a cross-case comparison of these four districts in terms of site and participant demographics, as well as the seven sections mentioned.

District Site Demographics

Of the four districts studied, all were urban, or non-rural, inner city school districts in Virginia (the Virginia Department of Education does not report suburban school district status, since suburban families attend either a rural or urban school district, depending on location). Each district was considered as a low-resourced school district based on their composite index of local ability to pay for education (CI), free and reduced lunch eligibility, and poverty percentage data. The districts under study had a CI range from 0.3583 to 0.3901 and their poverty percent range was 31.29 to 33.03. The higher the percentage of families in poverty, the less likely they can contribute to the tax base and support education. The population range for the four districts was 17,500 to 95,200 at the time of the study. District demographics are provided in Table 3.

Table 3

Comparative District Demographics Across the Four School Divisions Studied

		Ethnicity					
Name	Approx. Pop.	W	B	H	A	O	FRL
Anderson City	65,000	66.6	29.7	1.8	1.3	0.6	
District	9,000	45.7	50.8	1.0	1.3	1.2	44.2
Middle	800	47.5	51.1	0.1	0.4	0.9	33.4
Elementary	400	37.3	58.0	0.7	0.9	3.1	48.0
Cheatham City	95,200	69.4	26.7	1.5	1.2	1.2	
District	13,500	70.3	23.8	3.2	2.6	0.1	59.7
Middle	500	65.2	32.1	1.6	1.0	0.1	45.3
Elementary	250	77.7	18.8	1.2	1.2	1.1	43.0
Fort Campbell City	48,400	53.9	44.1	1.3	0.6	0.1	
District	7,700	28.1	67.5	1.9	0.4	2.1	59.7
Middle	500	25.5	70.3	3.8	0.2	0.2	64.0
Elementary	250	31.5	61.9	4.7	1.6	0.3	63.0
Grainger City	17,500	93.6	5.6	0.0	0.4	0.4	
District	2,400	88.3	9.6	1.3	0.8	0.0	42.3
Middle	550	88.7	8.8	1.8	0.7	0.0	41.7
Elementary	300	90.9	7.3	0.7	1.1	0.0	67.0

Note: Approx. Pop. = approximate population at time of study; W = white; B = black; H = hispanic; A = asian; O = other races; FRL = percent eligible for free and reduced lunch.

District Participant Demographics

Participants in the four districts included for study comprise 35 female and 13 male participants. Participant demographics are provided in Table 4.

Table 4

Participant Demographics Across the Four School Divisions Studied

	Total Number			Mean		
Name	Participants	Males	Females	Age	YIE	YIP
Anderson City	11	3	8	46	20	9
Cheatham City	12	3	9	44	19	6
Fort Campbell City	15	3	12	48	22	6
Grainger City	10	4	6	46	21	6

Note: YIE = years in education; YIP = years in current position. The mean age of participants in Fort Campbell City does not reflect one participant who refused to provide her age.

A total of 72 classroom observations were conducted. Participant observations are provided in Table 5. Of this number 26 observations were conducted in computer lab settings and 46 were in traditional classroom settings.

Table 5

Participant Observations Across the Four School Divisions Studied

	Total Number of Observations	
Name	Classrooms	Computer Labs
Anderson City		
Middle School	8	1
Elementary School	2	7
Cheatham City		
Middle School	9	0
Elementary	6	3
Fort Campbell City		
Middle School	3	6
Elementary School	9	0
Grainger City		
Middle School	5	4
Elementary School	3	5

Note: Middle school observations are given by periods and elementary are given by total number of hours.

Definition of Terms

All participants in the study were asked to define three terms related to the mandate under study. These terms were (1) mandates, (2) Technology Standards for Instructional Personnel, and (3) technology integration.

Definition of mandates. When defining the term mandates, participants in three of the four districts identified it as a "requirement to do." However, participants in all four districts recognized mandates as guidelines that are flexible. Definitions were grouped into six broad categories shown in Table 6. Beyond these definitions, there was a broad range of responses regarding the purpose of mandates including, insuring educational equity and consistency across the state, assisting in educational improvement or quality, keeping teachers up-to-date on current practices, and preparing students for the workforce of the 21st century.

Table 6

Participant Definitions of Mandates Across the Four School Divisions Studied

	District			
Definition Category	ACPS	CCPS	FCPS	GCPS
Something that is required to do	X	X	X	
State policy or law	X	X	X	
Minimum standards of classroom performance	X	X		X
Set of rules and procedures			X	
Set of impositions or restrictions on practice	X	X		X
Flexible guidelines	X	X	X	X

Note: ACPS = Anderson City Public Schools; CCPS = Cheatham City Public Schools; FCPS = Fort Campbell City Public Schools; GCPS = Grainger City Public Schools.

Definition of Technology Standards for Instructional Personnel (TSIP).

When defining the *TSIP*, participants in all four districts defined it in terms of familiar artifacts, such as their district's technology portfolio, checklist, or assessment instrument. Only participants in Grainger defined it in terms of a licensure requirement. Participant definitions were grouped by category and are presented in Table 7. Purposes identified for the *TSIP* by participants include providing tools to enhance current instructional practice, assisting with making instruction more efficient, and providing opportunities for teachers to learn application software in order to train students.

Table 7

Participant Definitions of *TSIP* Across the Four School Divisions Studied

	District			
Definition Category	ACPS	CCPS	FCPS	GCPS
Artifacts (technology portfolios, checklists, etc.)	X	X	X	X
Minimum performance standards or competencies		X	X	X
Licensure requirement				X
Guide for compliance			X	
Skills for teachers to know	X		X	
Skills for teachers to pass on to students	X		X	X

Note: ACPS = Anderson City Public Schools; CCPS = Cheatham City Public Schools; FCPS = Fort Campbell City Public Schools; GCPS = Grainger City Public Schools.

Definition of integration. Participants defined integration, across all four districts, as an extension or enhancement of their current teaching practice. While participants in three of the four districts saw integration as seamless or not teaching technology in isolation, a participant in Grainger simply defined it as having computers in the classroom. Their definitions were grouped by category and are presented in Table 8.

Table 8

Participant Definitions of Integration Across the Four School Divisions Studied

	District			
Definition Category	ACPS	CCPS	FCPS	GCPS
Extending or enhancing current teaching practice	X	X	X	X
Changing current teaching practice	X			
Using technology for productivity (teacher)	X		X	
Using technology for productivity (student)	X	X	X	
Having computers in the classroom				X
Not teaching technology in isolation	X	X	X	
Seamless use of technology		X	X	X

Note: ACPS = Anderson City Public Schools; CCPS = Cheatham City Public Schools; FCPS = Fort Campbell City Public Schools; GCPS = Grainger City Public Schools.

Factors Inhibiting Integration

Six factors that inhibit integration were identified from the literature and participant interviews. These factors were (1) personnel and support; (2) training; (3) time; (4) funding; (5) access to resources; and (6) fear and resistance. Of the 49 district participants interviewed, 31 (63%) indicated that time was the most inhibiting factor. Access to resources was second to time with 26 participants (53%) indicating that this was a factor, followed by fear and resistance (33%), training (31%), funding (24%), and personnel and support (22%).

While the numbers of participants varied from district to district, it is interesting to note that the number of inhibiting factors were reported with a frequency approximately twice the number of enhancing factors as shown in Table 9.

Table 9

Frequency of Identification of Factors Inhibiting Technology Integration Across the Four School Divisions Studied by Division

		Number of Factors	
Division Name	Participants	Inhibiting	Enhancing
Anderson City	11	29	14
Cheatham City	12	29	12
Fort Campbell City	15	34	20
Grainger City	10	19	10

Note. Some factors are duplicated in the inhibiting and enhancing columns since some participants found a single factor to be both enhancing and inhibiting.

Inhibiting factors were also analyzed by position level. Position level included administrative and support personnel, middle school personnel, and elementary school personnel. Reporting frequencies across all levels were relatively level with inhibiting factors being reported in 34 instances by administrative and support personnel, 40 instances by middle school personnel, and 37 instances by elementary personnel. A summary of the frequency of inhibiting factors reported by position level is provided in Table 10.

Table 10

Participants Identification of Factors Inhibiting Technology Integration Across the Four School Divisions Studied by Position Level

Name	PS	TR	TI	FU	AR	FR
Anderson City						
Administration and Support	1	2	2	2	1	0
Middle School	2	2	3	2	4	0
Elementary	1	1	4	1	1	0
Cheatham City						
Administration and Support	2	0	2	0	3	1
Middle School	0	0	5	0	4	2
Elementary	0	2	2	1	4	1
Fort Campbell City						
Administration and Support	2	0	2	3	1	3
Middle School	0	2	4	0	3	2

Elementary	1	2	3	0	4	2
Grainger City						
Administration and Support	2	1	1	2	0	1
Middle School	0	2	1	1	0	1
Elementary	0	1	2	0	1	3

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance.

When looking at inhibiting factors between the high-level, mid-level, and low-level technology users as identified by their principals, the number of inhibiting factors are reported with greater frequency for mid-level technology users than the other two groups. High-level technology users reported inhibiting conditions 13 times across all six factors studied and low-level technology users reported 12 times across the six factors. However, mid-level users reported inhibiting conditions 26 times across all six factors. This variance in reporting of inhibiting and enhancing factors supports Ertmer's (1999) contention that mid-level users tend to struggle more with technology than low-level or high-level technology users. High-level users are more facile with computer technology and its use and integration than mid- and low-level users. Low-level users of computer technology tend to disregard it as important and only minimally use computer technology when required. It is the mid-level user that tends to recognize the importance of technology and its use, but have difficulty knowing how to access and integrate it in their day-to-day teaching practice. A summary of frequency of inhibiting factors is presented in Table 11.

Table 11

Participants Identification of Factors Inhibiting Technology Integration Across the Four School Divisions Studied by Technology Skill Level

Name	PS	TR	TI	FU	AR	FR
Anderson City						
Administration and Support	2	3	5	5	4	0
High-Level Technology User	0	1	1	0	0	0
Mid-Level Technology User	1	1	2	0	1	0
Low-Level Technology User	1	1	2	0	1	0
Cheatham City						
Administration and Support	2	1	4	0	5	1
High-Level Technology User	0	1	1	0	1	1
Mid-Level Technology User	0	0	3	1	3	2
Low-Level Technology User	0	0	1	0	2	0
Fort Campbell City						
Administration and Support	3	1	4	3	4	6
High-Level Technology User	0	1	2	0	2	1
Mid-Level Technology User	0	2	2	0	1	0
Low-Level Technology User	0	0	2	0	1	0
Grainger City						
Administration and Support	2	2	3	2	0	2
High-Level Technology User	0	0	0	0	0	1

Mid-Level Technology User	0	2	0	0	0	0
Low-Level Technology User	0	1	0	0	0	0

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance.

Factors Enhancing Integration

Six factors that enhance integration were identified from the literature and participant interviews. These factors were (1) personnel and support; (2) training; (3) time; (4) funding; (5) access to resources; and (6) fear and resistance. Of the 48 district participants interviewed, 24 (50%) indicated that training was the most enhancing factor. Access to resources was second to training with 13 participants (27%) indicating that this was a factor, followed by personnel and support (21%), and funding (4%). Fear and resistance and time were reported as least as equally enhancing (2%). It should be noted here that fear and resistance was reported as enhancing by only one participant. This was based on their belief that fear coupled with the “force” of the *TSIP* would drive away from the profession those who refused to use technology in classroom instruction.

Enhancing factors were also analyzed by position level. Position level included administrative and support personnel, middle school personnel, and elementary school personnel. Reporting frequencies across all levels were relatively level with enhancing factors being reported in 19 instances by administrative and support personnel, 18 instances by middle school personnel, and 19 instances by elementary personnel. A summary of the frequency inhibiting factors reported by position level is provided in Table 12.

Table 12

Participants Identification of Factors Enhancing Technology Integration Across the Four School Divisions Studied by Position Level

Name	PS	TR	TI	FU	AR	FR
Anderson City						
Administration and Support	1	0	0	0	1	0
Middle School	2	2	0	0	2	0
Elementary	2	2	0	1	1	0
Cheatham City						
Administration and Support	0	3	0	0	0	0
Middle School	2	1	0	0	2	0
Elementary	1	2	0	0	1	0
Fort Campbell City						
Administration and Support	0	3	1	0	2	0
Middle School	0	3	0	0	1	0
Elementary	1	2	0	1	0	1
Grainger City						
Administration and Support	1	1	0	0	1	0
Middle School	0	2	0	0	1	0
Elementary	0	3	0	0	1	0

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance.

When looking at enhancing factors between the high-level, mid-level, and low-level technology users as identified by their principals, the number of enhancing factors are reported with greater frequency for mid-level technology users than the other two groups. High-level technology users reported enhancing conditions 8 times across all six factors studied and low-level technology users reported 9 times across the six factors. However, mid-level users reported enhancing conditions 11 times across all six factors. A summary of the frequency of inhibiting factors is presented in Table 13.

Table 13

Participants Identification of Factors Enhancing Technology Integration Across the Four School Divisions Studied by Technology Skill Level

Name	PS	TR	TI	FU	AR	FR
Anderson City						
Administration and Support	3	2	0	1	1	0
High-Level Technology User	0	1	0	0	1	0
Mid-Level Technology User	2	1	0	0	0	0
Low-Level Technology User	2	1	0	0	0	0
Cheatham City						
Administration and Support	2	3	0	0	0	0
High-Level Technology User	0	2	0	0	0	0
Mid-Level Technology User	1	1	0	0	1	0

Low-Level Technology User	0	0	0	0	2	0
Fort Campbell City						
Administration and Support	0	5	1	0	2	1
High-Level Technology User	0	1	0	1	0	0
Mid-Level Technology User	1	1	0	0	1	0
Low-Level Technology User	0	1	0	0	0	0
Grainger City						
Administration and Support	1	1	0	0	3	0
High-Level Technology User	0	2	0	0	0	0
Mid-Level Technology User	0	2	0	0	0	0
Low-Level Technology User	0	1	0	0	0	0

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance.

Integration and Classroom Use of Technology

Integration was a function of the approach taken by the districts to provide access to computer resource. Computer resource allocations by district by level are provided in Table 14. While all four districts provided some form of computer lab, numbers of computers varied from as few as six computers to as many as twenty-five per lab. While all teachers observed had at least one computer for their personal management and productivity, in five of the eight schools observed, student computers were not available in the classroom.

Table 14

Allocation of Computer Resources in Elementary and Middle Schools in the Four Districts Studied

	Total Number			
Name	CL	RCPL	SC	TC
Anderson City				
Middle	3	25	0	1
Elementary	3	18-25	0	1
Cheatham City				
Middle	4	20-25	2	1
Elementary	1	6	1-4	1
Fort Campbell City				
Middle	3	22-25	4-5	1
Elementary	1	20	0	1
Grainger City				
Middle	3	25	0	1
Elementary	2	17-25	0-4	1

Note: CL = number of computer labs available to students; RCPL = range of number of computers per lab; SC = number of student computers per classroom; TC = number of teacher computers per classroom.

Classroom observations of approaches to integration of computer technology were grouped into seven approaches across three categories based on access (integration using labs or integration using classroom computers, and tradition or non-computer use). A summary of the observations is provided in Table 15. Of the 72 classroom observations, in 33 (44%) the teacher used traditional, teacher-centered, lecture and seatwork to instruct students. Drill and practice, including use of instructional learning systems, using the computer lab was observed in 12 (16%). Other observations show 10 (13%) using lab computers to develop student products, such as presentations, 4 (5%) using computer labs for teacher presentations, and 4 (5%) using computer labs for student research or Internet access. Classroom computers were used in 6 (8%) of the observations for drill and practice and in 3 (4%) for teacher presentation of materials.

Table 15

Integration Approaches Used in Observations of Elementary and Middle Schools in the Four Districts Studied

	ACPS		CCPS		FCCPS		GCPS	
Approach	ES	MS	ES	MS	ES	MS	ES	MS
Traditional Classroom								
Lecture/Seatwork	2	8	3	9	9	0	0	2
Classroom Computer								
Drill & Practice	0	0	3	0	0	3	0	0
Teacher Presentation	0	0	0	0	0	3	0	0

Computer Lab								
Teaching Technology	0	1	2	0	0	0	0	0
Drill & Practice	4	0	0	0	0	0	6	2
Research/Internet	1	0	0	0	0	0	0	3
Produce Product	1	0	1	0	0	3	3	2
Teacher Presentation	1	0	0	3	0	0	0	0

Note: ACPS = Anderson City Public Schools; CCPS = Cheatham City Public Schools; FCPS = Fort Campbell City Public Schools; GCPS = Grainger City Public Schools; ES = elementary school observation; MS = middle school observation.

Leadership and Planning

In terms of leadership and planning for the *TSIP*, each of the four school divisions have personnel in place who are responsible for the implementation of the standards and technology integration into instruction. Each division makes use of one or more school-based staff. These individuals, while called by different names (e.g., instructional technology specialists, site-technology contacts, or technology facilitators), all have served in providing "front-line" assistance with the *TSIP* and integration of technology in their respective schools. However, remuneration for this position varies by division. Anderson uses full-time, paid personnel in their secondary and half time personnel at the elementary level. Cheatham provides a stipend of $900 a year to "volunteers" appointed by the school principals, while Fort Campbell has "volunteers" appointed by principal without any stipend. Grainger provides a stipend to designated individuals at 2% of their annual salary. In all cases, except at Anderson's secondary level, these individuals serve in the capacities of technology support and classroom teacher.

Each division has made attempts at some form of tracking the progress of staff as they move toward meeting the *TSIP* standards. This generally takes the form of a checklist, portfolio, assessment sheet or means of assessing progress of teachers meeting the standards. These are all product-based assessments. While Grainger has made use of college course work to "check-off" approximately 99% of their teachers, Fort Campbell and Anderson use a mix of in-service training and college course work in technology. The leadership in Cheatham makes use of their in-house technology training staff to prepare teachers to meet the *TSIP* standards.

Each district leader interviewed has as part of his or her responsibility, in some form, the integration of technology. However, the leadership in these districts have chosen to address technology and its integration in different ways.

Anderson has a technology plan that it revises yearly as budget and political considerations change. At the time of this study, they had a budget and plan in place to continually refresh their technology. The technology leadership has worked to develop their network "from the outside in" and provides Internet access to its schools as well as to the community.

Cheatham has a comprehensive ten-year technology plan. Despite this the leadership has not been able to secure an annual computer replacement budget, but has used capital bond funds to complete its school networks while maintaining multiple generations of computers in the schools observed.

The Fort Campbell leadership is working under a five-year technology plan that provides for networks and Internet access to their schools. While they do not have a recurring funding stream for technology replacement, they have included the recommendation and planning in their technology plan. The technology staff has worked to develop what it believes is a comprehensive technology notebook and checklist for its teachers. At the time of the study, the teachers in Fort Campbell had been informed only three months before about the *TSIP* and their requirements.

Grainger is a school division under change. It has received new technology leadership within the past two years. Grainger has a much smaller technology staff than the other school studied due to its size. Technology planning documents were not available, but were “being revised.” They have worked to provide network and Internet access to all of their schools and are in the process of trying to add or replace computers as funds become available. They do not have a recurring funding source for the purchase of new computer equipment.

Accountability

All four districts approach accountability for meeting the *TSIP* and integrating technology into the classroom in a similar fashion. All use a form of technology checklist, portfolio, or notebook. Additionally, each district utilizes their instructional technology specialist (ITS) to assist in the verification or “check-off” on the standards. Beyond this, districts approach accountability differently.

Anderson makes use of lab schedules to verify that teachers are using the equipment and resources available. In addition they have made observations of teacher use of technology part of the “classroom” evaluations conducted by the school principal.

However, these observations are scheduled and made in the computer lab and not in the teacher's classroom.

Cheatham provides a double verification on its technology assessment checklist by requiring that one site-based person, typically the school ITS, and one district office technology trainer sign off that the teacher has completed a given *TSIP* standard. Like Anderson, Cheatham has made use of technology in the classroom a part of the standard classroom observation instrument use by principals in the district.

Accountability in Fort Campbell is accomplished through the sign-off of their checklist by the principal and the school ITS. Once signed off the checklist is sent to the district personnel office. Interviews note that beyond this there is little evidence of follow-up on evaluations and that verification is basically "on your honor."

Grainger's accountability is primarily through the school ITS. Once signed by the ITS their checklist is sent to the district personnel office for filing.

Summary of District-Level Implementation

As a "soft mandate," the state provided minimal guidance in terms of fulfilling the *TSIP* standards. Thus, the "make it so" of the mandate became a "'make it so' as you see fit" in terms of district compliance. This potentially allows for a wide variance in district response. In spite of this, districts were relatively similar in their response to the *TSIP* and their approaches to integration of computers into the classroom.

When defining terms, there is variance in participants' definitions of mandates, integration, and the *TSIP* standards. In spite of these variances, there seemed to be a general "ball park" understanding of what these terms meant.

All district participants identified factors in the initial eight categories established in the review of the literature when identifying enhancing and inhibiting factors. While inhibiting factors outnumbered the enhancing factors, teacher-participants identified by their principals as mid-level users of technology (MLU) had a higher frequency of reporting both inhibiting and enhancing factors than did high-level and low-level users across all four districts. Of all of the eight factors, time was the most frequently mentioned as inhibiting to technology integration and training was most enhancing.

Integration of computers into the traditional classroom proved to be challenging, since teacher participants did not have ready access to sufficient numbers of computers except through scheduled lab times. While variations in terms of numbers and locations of computers exist, district access to computers is typically divided between classroom and computer labs. Computer labs were the primary means by which teachers in the study used computers with their students. Teachers in the districts studied tended to continue to rely more heavily on traditional classroom practices and less on using computer technology to support instruction.

Technology leadership and planning in each of the districts in this study is through a central administrative technology staff that supports technology efforts in their respective districts. The number and roles of these staff vary by district. The technology leaders in each district is responsible for development of a technology plan that recognizes the importance of the *TSIP* standards and provides a means by which these standards may be met. An “instructional technology specialist” or “ITS” supports the central staff at the individual school sites. These ITS provide assistance to teachers in each of the districts. Differences in time, pay and position of the ITS did vary by district and level. Some ITS were full-time classroom teachers and received an additional salary stipend to serve in the ITS capacity. Others worked as "volunteers" designated by their principals. Still others, such as those in Anderson, were full-time and the middle school and half time at the elementary. In spite of these differences, in every district studied, the ITS served as a technical support for teachers' use of technology.

Accountability is another function of the ITS in the four districts. The ITS are the primary point of contact to check-off teachers meeting the *TSIP* standards. Each of the four districts used some form of "checklist" to track and verify that their teachers were meeting the TSIP standards.

Summary

In spite of the "soft" nature of the *Technology Standards for Instructional Personnel*, the four districts in this study have responded in very similar ways. Each has communicated the requirements to their respective professional teaching staff. This has been accomplished through utilization of the ITS, checklists, portfolios, and other means. While capacity is still an issue in these schools and districts, administrative and support staff work to maintain equipment, expand on existing resources, and provide the best access possible given constraints on funding and time. While teacher beliefs about technology and its value in education is still debated, the staff in these districts continue to strive to modify and adjust for existing conditions while meeting the requirements of the mandate.

Chapter 5: Conclusions and Future Research

This section provides a summary and conclusion regarding how four low-resourced urban school districts in Virginia are implementing the Technology *Standards for Instructional Personnel* (*TSIP*) mandate, relative to its integration standard. This is done through participant definitions of mandates, *TSIP*, and technology integration as well as through their perspectives on factors inhibiting and enhancing integration in the classroom. This section concludes with suggestions for future research and the limitations of this study.

Definition of Terms

Communication about mandates is vital in their successful implementation (American Association of Colleges for Teacher Education, 1973; Hill, 2001; Kannapel, Aagaard, Coe, & Reeves, 2000). As such agreement on and definition of terms have implications for the implementation of mandates as well, for mandate enactors may define key terms in unique and varied ways, which, in turn, directs and shapes the way mandates are carried out.

Definition of Mandate.

Participants in each of the four districts defined mandates in terms of a “requirement to do.” Beyond this, differences emerge in their definitions. Participants range from defining mandates in terms of policy from the administrative perspective, to imposition and restrictions from the perspective of those users such as Denise Styron, a participant identified as a low-level technology user, in Cheatham.

Definition of Technology Standards for Instructional Personnel (TSIP)

When defining the *TSIP*, participants in each of the four districts pointed to artifacts such as their technology checklist or portfolio as a definition. While administrators, such as Lawrence Steinbeck in Grainger, define it in terms of compliance and licensure, mid-level users, such as Sarah London in Anderson, define them typically as skills or competencies to be learned and passed along to students.

Definition of Integration

Integration is a term that is more ambiguous than that of *TSIP* or mandates. Perhaps because it is the only one of the three terms that teachers and administrators cannot physically put their hands-on since an example, for mandates, like the *TSIP*, may be viewed in some paper or electronic format, whereas integration is more abstract. Definitions across the participants of each of the four districts seem to move along a spectrum from simply having computers in the classroom, as Laura Tey defines in Grainger, to enhancing existing teaching practice, to changing teaching practices all together.

Definitions of the terms mandates, *TSIP*, and integration by participants in this study, support this contention from the literature (Hill, 2001; Pedersen, & Liu, 2003; Pierson, 2001) that teachers define terms through their own perspectives and the meanings they construct from these perspectives. As such, the leadership in these districts defines these terms from a more idealistic or quasi-legal/compliance perspective. While participants identified as high- and mid-level users of technology define them from a practice or skills orientation. Those participants identified as low-level users, tend to be more likely to define terms in terms of their beliefs and attitudes toward technology and see them as “just one more thing to do” or inhibiting to their views of classroom instruction. These perspectives also support Pierson’s (2001) finding that the ways teachers use technology determines their personal definitions.

Factors Effecting Integration

Implementation of any mandate requires that the implementers have the capacity to carry out its intent. This includes human, social, and financial capital, including personnel, materials, knowledge, and money (Fairman & Firestone, 2001; Firestone, 1989). The factors identified as both inhibiting and enhancing to technology integration by the participants, in the four districts studied, varied from district to district.

Inhibiting Factors

Inhibiting factors for participants across all four districts identified inhibiting factors in six categories – personnel and support, time, training, funding, access to resources, and fear and resistence. Frequency of reporting of inhibiting factors across the position levels of administration and support, elementary, and middle school staff were relative equal. However, of the participants identified as low-, mid-, and high-level users of technology across the four districts, the mid-level users identified more inhibiting factors than those of the high- and mid-level users.

Enhancing Factors

Like the inhibiting factors, enhancing factors for participants across all four districts fell within the six categories identified. Also, like the inhibiting factors, frequency of reporting of enhancing factors across the position levels of administration and support, elementary, and middle school staff were relative equal. Of the participants identified as low-, mid-, and high-level users of technology across the four districts, the mid-level users identified more enhancing factors than those of the high- and low-level users.

The factors identified by the participants in this study are supported through the research regarding the factors that inhibit and enhance the integration of technology in schools such as leadership, time, training, support, funding, and access to resources, (Adams, 1985; Beacham, 1994; Burnett, 1994; Burniske and Monke, 2001; Byrom & Bingham, 2001; Cafolla & Knee, 1995; Cohen, 1987; Cuban, 1986; David, 1994; Dewert, 1999; Dickard, 2002; Duffield, 1997; Ely 1995; Ertmer, 1999; Finkel, 1993; Fuhrman, 2001; Harrington-Lueker, 1999; Hoerup, 2001; Hope, 1997; Kearsley & Lynch, 1994; Leggett & Persichitte, 1998; Lumley & Bailey, 1993; McCarthy, 1993; O'Donnell, 1996; Pachon, Macias, & Bagasao, 2000; Sheingold & Hadley, 1990; Shelton & Jones, 1996; Swan, 1995; Tyack & Cuban, 2000; Ward, 1997; Virginia Department of Education, 1993). While some districts, such as Anderson, are better off in terms of resources and staffing for technology support, access to resources, training, and fear and resistance remain significant barriers to fulfilling the vision offered by Ruben Hoffer and Sabrina Brown at the state level. However, there are examples within the participants of this study that lend support to research that indicate teacher second-order barriers, such as beliefs about teaching and technology, may interact with first-order barriers (Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Wood, 1999). One example from the case studies is that of Selena Streiber, a low-level technology user, who, although admitted to being able to retire within three years, has obtained a laptop, *AverKey* ®, and has found the personnel and support to connect it to her classroom television in order to make classroom presentation come alive and now “lives better off” because of it.

One interesting finding was the relative bell curve effect from the difference in identification of both inhibiting and enhancing factors between the low-, mid-, and high-end technology using participants. This may offer support to Ertmer’s (1999) suggestion that teachers who operate at higher and lower levels of technology use may weigh these factors differently due to their “perceptions of the criticality” of these factors. Thus, for mid-level users who are struggling with integration, the criticality is higher than for those high-end users who have greater skill or those low-end users who may be waiting around for the mandate to be washed away with the tides of polical discourse or wait until sufficient resources are made available.

Leadership and Planning

Leadership and planning is essential in implementation of mandates and the willingness of district staff to implement the *TSIP* is tied to the leadership of the district and its culture and beliefs. Within the four districts studied the initial assumption was that the leadership and organizational structure would be much the same from one district to the next, however, this was not the case. While some districts, such as Fort Campbell have relatively complex organizational structures, and as such larger numbers of central office staff, others, such as Grainger, operate out of a single building and staff serve multiple roles. For example in Grainger, the technology director serves as network troubleshooter, trainer, and administrator of the technology budget, while in Fort Campbell the director over technology defers all decisions, save the most critical, to a number of trainers, technicians, helpdesk staff, and technical administrators. While Fort

Campbell is moving away from site-based management and technology is controlled largely from the district administration, technology is influenced significantly in Cheatham due to its site-based focus. The attitude of the staff is also visible noticeable in two school districts. The participants in Anderson are generally positive about technology, in spite of the inhibiting factors, however Grainger is, by its participants' own admission, a district of low expectations, and as such, the catalyst for change is not apparent. This supports the research on technology integration and expectations (Dexter, Anderson, & Becker, 1999; Fuhrman, 2001).

Accountability

Although a factor noted in the research on factors inhibiting or enhancing technology integration, accountability was not identified as a factor by the participants directly. Instead they discussed accountability as a process by which the *TSIP* standards were "checked off" for them through the school ITS, principal, central office technology staff member, or some combination of these. Accountability for the *TSIP* varied from district to district. As it might be predicted, the districts with higher expectations for their staff also had greater accountability. One factor of interest was the participants' belief that, as Paige in Anderson said, when you're signed off "you're done." The state participants voice that the *TSIP* are not likely to go away tomorrow and will probably be continually revised and updated. While this may be assumed, there was no evidence during the interviews that this has been communicated to the districts in a way that would lead them to believe that additional iterations of the standards are likely to appear on the horizon. This may lead them to feel that once they have a process to manage the *TSIP* they can, as Hodas (1993) phrases it, "repurpose" (p.8) it to accommodate internal needs.

Conclusions: State Mandated, Locally Enacted

Mandates are typically responses of governmental bodies to a perceived need or crisis (National Commission of Excellence in Education, 1983). The primary purpose of mandates then are to elicit some response that will lead to some change or reform by the individuals or organizations that are the target of the mandate (Warren, 1990). However, critics such as Sarason (1993, 1996, 1997, 2003) have noted past failures of mandates in educational reform. In terms of district and school capacity, he points out "money is not the panacea we like to believe it is" (1993, p. 183). For "one of the most significant things we have learned is that it is inevitable that the gulf between what they espouse and what they do will be virtually unbridgeable" (1997, p. 167). From his perspective local actors will do as Hodas (1993) and Kelly (1999) suggest and change or repurpose a given mandate to conform to their existing practice. Given this perspective the *TSIP*, as a mandate, and may deteriorate into little else than just one more list to be checked off by classroom teachers. At first glance, the *TSIP* appears to have followed the typical pattern of most mandates, however when looking more closely at the four districts studied this may not be the case.

While generalization to other school districts in Virginia, or for that matter other states implementing or contemplating such a mandate as the *TSIP*, is not possible in such a small sample, within these four districts, technology integration is not happening within the classroom. While districts, such as Anderson, are focused on training through a lab-centric approach, others, such as Cheatham, are struggling to complete network installations and keep multiple generations of computers up and running, and such as Grainger, are struggling with a culture of low expectations and technical phobia.

However, in light of the "soft" nature of the *TSIP*, it must be concluded that the four districts studied, in fact, have met the initial intent of the mandate to integrate technology into the classroom from the state perspective. Initially, this may seem to be a negative conclusion to this study, however that is far from the case. While the TSIP is not powerful enough in statutory authority or accountability, it has served four important purposes within these four districts.

First, it has made district and school administrators, support staff, and classroom teachers begin a dialogue about technology and its use in classroom instruction. As Chandler noted the intent of combining the *TSIP* with teacher evaluation "is for the principal and the teacher to then be able to talk about the effectiveness of it. 'Did it work the way you had hoped it would?' 'How could you change it?' Those sort of questions." Another source of this dialogue about technology comes from the ITS. As Allie states, our ITS is very supportive and will come in and sit down with teachers and help them develop lesson plans."

Second, it has provided an impetus for districts to use funds to purchase computers and other technology resources that before may have been earmarked for other programs. As Ebony Rathman finds, "in the area of technology it requires us to take a look at how we spend money in which areas so that we have moneys designated for technology." Each of the districts studied made use of one or more of the funding sources recommended by the Virginia Department of Education including grants, partnerships, and *Technology Literacy Challenge Grants*. Additionally, they used magnet funds and Title I funds to support technology efforts. While some of these funds are targeted funds that must be spent for technology, the districts also indicated that they were applying local, non-targeted funds to increase their technology investment and were committed to supporting technology and its integration into the classroom.

Third, it has provided impetus for districts to begin to look at and monitor, if not evaluate, teachers' use of technology for instruction. As Jeremy Chandler states,

> If it's tied to teacher evaluation – I think the key is not so much tied to SOLs as much as it is tied to teacher evaluation. If you're evaluated on whether or not you've done what you need to do in the checklist, that's more of a motivator than the SOLs.

Within each of the four districts technology had become either part of the regular teacher evaluation or it was being planned for inclusion in the next revision of their evaluation instrument. At the time of this study checklists were the primary means of accountability for these districts. However it should be kept in mind that it is still too early in the overall implementation of the *TSIP* to conclude that checklists will be the only means of accountability. The checklists have served to focus attention on the *TSIP* and provide a means to monitor teacher progress in the initial stages of implementation. Additionally, they allow teachers to visually see objectives, tasks, and behaviors required to satisfy the *TSIP* within their respective districts.

Finally, due to the *TSIP* being linked to licensure, it has given teachers a sense of urgency about technology that was missing before and is making them reflect on, and in some instances, begin to collaborate with others about technology and its place in the classroom. As Samantha Faulkner said, “I got all those accomplished in one year because I felt the pressure.”

When reflecting on this study there are implications and practical applications for state-level policy makers, district and school administrators, and teachers.

For state-level policy makers, the districts studied provide a rich resource of current information for understanding how districts respond to soft mandates, which in turn, may be beneficial to the development of future mandates that may enter the policy pipeline. Each of the four districts studied are struggling with the *TSIP* and their implementation. Capacity issues still abound. While low-level technology users may use capacity as simply one more excuse for not doing the next thing asked of them, it does not mitigate, the capacity issues faced by these districts and those individuals who are trying to carry out the requirements of the *TSIP* or integrate computer technologies into classroom instruction. These low-resourced urban schools are doing remarkably well given these capacity issues. This is especially true for those mid-level technology users who are challenged by factors such as lack of resources, lack of access, and lack of needed support. If technology integration into the classroom is to be achieved these capacity issues must be addressed. Increased state-level funding for technology is vital to addressing these capacity issues.

District and school-based administrative personnel may use information from this study as a means to review and revise their budgetary requirements and revisit funding strategies. Technology directors may also use this study in conjunction with development of revised technology planning documents. It also has implications for allocation and use of personnel for technology support at the site and district-level.

Finally, those low-level technology users may never take up the mantle of modern technologies for the sake of their students. High-level technology users have already adopted such technologies and view them as some would a close friend. It is the mid-level technology user that may gain the most from this study. It is the mid-level user that is on the cusp of discovery about newer technologies and adoption or rejection of such. While this study presents the problems of capacity, it also provides examples of individuals who have struggled and found their way to discovery and use of computer technologies to enhance their classrooms and their teaching practice. If teachers reading this study must take only one thing away with them, it is that they can integrate technology. They do not have to be expert technology users to successfully integrate technology into their instruction, even if it may not be within the confines of their traditional classrooms.

Considerations for Future Research

While this study has confirmed, or reconfirmed, many of the findings in other studies, there are several areas for possible future research. While this study is a beginning at looking at how school districts integrate technology under a state mandate, it should be expanded and continued in order to learn how legally enacted “hard” mandates, rules, and regulations affect instructional technology in institutional settings. This research was limited only to four middle and four elementary schools in four districts. Such research needs to be extended to all grade levels and to other types of schools, both urban, rural, private, etc.

In conducting the case studies, it was noted as a curiosity that the districts that housed their central offices located in or near municipal buildings had greater technology capacity. One area of research may be the investigation of the proximity of school district administrative offices to the municipal government and their affect on access to technology and diffusion of technology innovations in schools.

Another interesting observation noted was the large number of Title I labs in use within these districts. What role does Title I play in technology integration beyond providing a funding source for computer hardware and software?

During interviews, the Magnet school concept was referred to repeatedly in terms of their role in technology integration. What is the role of magnet schools in terms of their impact on the digital divide? Does it strengthen or weaken the divide and, if so, in what ways?

The role of the ITS in the schools also provided some cognitive dissonance when listening to interviews, particularly in Anderson. While some participants saw the reduction of the ITS at the elementary level as inhibiting, due to reduced support, others felt that it forced teachers to begin to rely on their own, newly acquired technical skills. In what ways can the role of instructional technology specialists enhance technology integration? In what ways can it be an inhibiting factor? What is too much versus too little help? And how does this help change with level of technical expertise?

Another area of interest was the role the principal played in the school in terms of expectations about the use and integration of technology and the relationship to the role of the ITS. What interactions exist between the ITS, the site principal, and the culture of expectations for technology integration?

Another curiosity that may prove fruitful for research is that of the definition of the term “computer lab.” During observations teachers identified everything from four computers to a classroom of twenty-six computers as a “lab.” In what ways does this impact funding for technology through reporting to state and federal officials regarding the number of labs?

While coded as a curiosity, home access was not a factor in this study, however it did provide another point of interest. Three of the four districts studied had not conducted official studies of home connectivity. One district, Fort Campbell, had just completed a survey at the time of this study. One problem noted was the numbers of Nintendo® games, cell phones, stereos, DVD players, etc. reported to school officials as "computers." While technically, these may be computers in a sense; this type of reporting may be used to later fund technology and home access. In what ways can this type of increasingly ubiquitous technology be accounted for and in what ways does it affect school funding and other types of community connectivity projects?

Another area of potential research is that of the role of site-based management in technology integration. What role does site-based management have in assisting or inhibiting technology integration and its standardization across a district?

I believe that this research is important for policymakers as well as school administrators and planners, for it provides a small glimpse of how school districts, or at least those in the study, react to mandates that deal with technology and its integration. While this study was limited to the computer as technology, it has implications for other types of innovations as well. Finally, I hope it provides some support for those teachers that believe that mandates are inflexible things that must be, at best dealt with expediently with the least amount of effort, and, at worst, subverted or repurposed for use with traditional teaching practices out of fear and resistance.

Limitations

The limitations of this study should be noted. There were four limitations regarding this study of districts' efforts to implement a mandate to integrate technology into the classroom.

First, this study was small, including only four districts and eight schools. To make the study more informative, I attempted to do as Merriam (1998) suggests and provide rich descriptions of each district's response to the mandate and teachers attempts to integrate technology into their instruction.

Second, the study was limited to those schools and individuals willing to provide access. During my work with the schools access to schools in one district provided a challenge.

Third, I was a participant in this research and was involved with the implementation process during the entire observation period. In an effort to maintain trustworthiness of the study, I used triangulation to support the results. Participants were informed about the research process, how the study was conducted, and how the data was collected. Participants reviewed all interviews for accuracy and completeness. Throughout the study, I tried to remain aware of legal and ethical considerations and involve the participants in the process as much as possible.

A final limitation was time. While the scope of this study was just the one elementary and one middle school within their respective school districts, more time would have provided potentially valuable information. The observation of the implementation of the mandate from the beginning to end would have provided opportunities to observe the entire process and allow a more in-depth understanding of the individual teacher's understanding of computer integration into the classroom.

Afterthoughts

As a novice researcher, I realize that this study has not been error free. However, I have learned much as I have progressed. While hindsight is always much clearer than foresight, I would certainly proceed with greater diligence if I were to embark on this project again. As an afterthought, several points come to mind.

First, I initially believed that access would be much easier since I was an "actor." I have learned that being an "actor" does not automatically provide entry into another district's "stage." It requires much pre-planning, great persistence and willingness to make accommodations and mid-course corrections when necessary.

Second, I have always viewed the research process as largely a solitary effort and as such have not asked for assistance or help readily. Through this experience, I realize that research is a team effort. It requires the assistance and support of many people and the willingness on the part of the researcher to both ask for help and advice when needed and to accept it graciously when given.

Finally, as a technologist, I was dedicated to the idea of using the computer to do most of my organizing and analysis of research data. In doing so, I spent too much time doing and then redoing work. Only when I took the advice of a much more knowledgeable researcher did the study begin to take shape. While computer technology has its place, next time around, I'll do it the old fashion way – using the technologies of paper and pencil.

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APPENDIX A

TECHNOLOGY STANDARDS FOR INSTRUCTIONAL PERSONNEL (TSIP)

8VAC 20-25-10 et seq.

TECHNOLOGY STANDARDS FOR INSTRUCTIONAL PERSONNEL

Statutory Authority: 22.1-16 of the Code of Virginia

Effective Date: March 4, 1998

8VAC 20-25-10. Definitions.

The following words and terms, when used in this regulation, shall have the following meaning unless the context clearly indicates otherwise:

Demonstrated proficiency means a demonstrated level of competence of the technology standards as determined by school administrators.

Electronic technologies means electronic devices and systems to access and exchange information.

Instructional personnel means all school personnel required to hold a license issued by the Virginia Board of Education for instructional purposes.

Productivity tools means computer software tools to enhance student learning and job performance.

8 VAC 20-25-20. Administration of technology standards.

A. School divisions and institutions of higher education shall incorporate the technology standards for instructional personnel into their division-wide technology plans and approved teacher education programs, respectively, by December, 1998.

B. School divisions and institutions of higher education shall develop implementation plans for pre-service and in-service training for instructional personnel. The implementation plan shall provide the requirements for demonstrated proficiency of the technology standards.

C. Waivers shall be considered on a case-by-case basis of the 18-hour professional studies cap placed on teacher preparation programs for institutions requesting additional instruction in educational technology.

D. School divisions shall ensure that newly-hired instructional personnel from out of state demonstrate proficiency in the technology standards during the three-year probation period of employment.

E. Course work in technology shall satisfy the content requirement for licensure renewal for license holders who do not have a master's degree.

F. School divisions shall incorporate the technology standards into their local technology plans and develop strategies to implement the standards by December, 1998.

G. Institutions of higher education shall incorporate technology standards in their approved program requirements and assess students' demonstrated proficiency of the standards by December 1998.

8 VAC 20-25-30. Technology standards.

A. Instructional personnel shall be able to demonstrate effective use of a computer system and utilize computer software.

B. Instructional personnel shall be able to apply knowledge; of terms associated with educational computing and technology.

C. Instructional personnel shall be able to apply computer productivity tools for professional use.

D. Instructional personnel shall be able to use electronic technologies to access and exchange information.

E. Instructional personnel shall be able to identify, locate, evaluate, and use appropriate instructional hardware and software to support Virginia's Standards of Learning and other instructional objectives.

F. Instructional personnel shall be able to use educational technologies for data collection, information management, problem solving, decision making, communications, and presentation within the curriculum.

G. Instructional personnel shall be able to plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings.

H. Instructional personnel shall demonstrate knowledge of ethical and legal issues relating to the use of technology.

Appendix B: A Case Study of Anderson City Public Schools

Appendix B presents a case study of Anderson City Public Schools and their attempts to integrate technology into classroom instruction as part of a Virginia state mandate. The case study is organized into seven categories – district context, participants, definition of terms, factors inhibiting integration of technology, factors enhancing integration of technology, integration and classroom use of technology, leadership and planning, and accountability. A discussion and conclusions section, at the end of Appendix B, provides a within-case analysis.

District Context

The context of Anderson City is presented through the perspective of the city, school district administration, middle school, and elementary school.

Anderson City

Anderson City is an urban center of approximately 65,000 people. Of this number 66.6% are Caucasian, 29.7% are African American, 1.3% are Asian, 1.8% are Hispanic, 0.6% are other races. It is an industrial city that has in recent years been witness to a growing number of high-tech businesses moving into the area.

District Administration

The school administrative offices of Anderson City Public Schools are contained in one, modern, two-story office building. It is located in the central business district of the city, adjacent to other government office buildings. The administrative offices serve a division of twenty-one schools representing 12 elementary, 5 secondary, and 4 special education or alternative schools. Included in this number are two elementary magnet schools and one middle school magnet. The district has a student population of approximately 9,000. Of this number approximately 45% of these students are eligible for free and reduced lunch.

The district has placed an emphasis on technology. It has been able to garner funds for procurement through partnerships with government and business. They provide full-time, on-site technical support through the use of Instructional Technology Specialists (ITS). However, within the past year, the elementary ITS have been reduced to half-time and are split between serving as the schools ITS and spending 3 forty-five minute periods each day teaching reading using *Compass®* reading software.

A Director of Data Processing is in charge of administrative information systems. However, instructional technology, training, including responsibility for implementation of the technology standards, has been placed under the authority of the Director for Professional Development.

The district has taken a lab-centric approach to computer technology by placing computers in a classroom lab configuration. Two to four computer labs have been placed in each of the schools. Teachers are provided one computer for their classroom use.

Roosevelt Middle School

Roosevelt Middle was built in the mid-60s as a junior high school with a "school-within-a-school" design. It now serves grades six, seven, and eight. The school is under renovation, which will be the fourth one in its history.

The school has an enrollment of approximately 800 students from a racially and economically diverse population. The school is one of extremes with 47.5% of its student's Caucasian, 51.1% African American, 0.1% Hispanic, 0.4% Asian, and 0.9% other races. Family incomes range from less than $25,000 to greater than $100,000 annually. Just over one–third (33.4%) of the students are eligible to receive free or reduced lunch. While the majority of the student body is extremely stable, a small percentage is highly transient.

The administrative staff at Roosevelt consists of one principal, two assistant principals, one full- and one part-time guidance counselor, and three secretaries. The principal and assistant principal are each assigned responsibility for one of the three grade levels. The teaching staff comprises 54 full- and seven part-time teachers, and seven assistant teachers. Support staff includes one full-time library media specialist, a full-time library assistant, and a full-time ITS. There is also a well-organized parent volunteer program at the school.

Roosevelt houses 3 computer labs, with 25 computers in each running *Windows 98*® or better, and each classroom teacher has a computer in their classroom with Internet access. Another lab will be added once their renovation is complete.

Madison Elementary

Madison Elementary School is a three-story structure built in the mid-50s. It has had two wings added since its construction. The school is located on a spacious, well-manicured lot of almost 20-acres in an upper-middle to upper class neighborhood. Its grounds are used as a park outside school hours. The school serves approximately 400 students from Pre-K through fifth grade. Despite the outward appearance, Madison has a highly transient student population. The school is a majority minority school, with forty-eight percent of the students eligible for free or reduced lunch. Of the student population, 37.3% are Caucasian, 58.0% African American, 0.7% Hispanic, 0.9% Asian, and 3.1% other races.

The school staff consists of one principal, a secretary, 25.5 classroom teachers, and 16 resource teachers. There is one full-time library media specialist and one half-time ITS.

The school houses three computer labs, plus a computer for each classroom teacher. The school is also involved in a number of business and community partnerships that provide funds for technology.

Participants and Data Collection Sources

Eleven individuals participated in this case study. They include two at the district level, five at the middle school, and four at the elementary level. Participant demographics are provided in Table 16. They range in age from 27 to 54 years with a mean age of 46. Participant years of experience in education range from 4 to 31 years with a mean of 20 years. Their years in their present positions range from 2 to 29 with a mean of 9 years.

Two district-level administrative-level staff members, Charles Sandburg and Jeremy Chandler, are in charge of instructional technology integration and training in Anderson City. Charles is in charge of classroom instruction within the district and directly supervises Jeremy Chandler. Jeremy serves as the link between administrative data processing and instructional technology. As the Director of Professional Development, he is responsible for all aspects of technology implementation, training, and integration. Jeremy supervises a technology support staff consisting of a network supervisor, an assistant, and three technicians. This staff is responsible for dealing with the network and the servicing of computer hardware and software within the district. Jeremy is also responsible for supervising the district’s ITS staff.

Participants' data were collected from interviews, classroom observations, teacher lesson plans, technology checklists or portfolios, and the district technology plan. Data collection sources are shown in Table 17. Teacher participants identified by their principals as low-, mid-, and high-level users of technology are presented in Table 18. During the study a total of eighteen classroom observations were conducted including 9 at the middle school level and 9 at the elementary level.

Table 16

Participant Demographics for Anderson City Public Schools

Name	Position	Sex	Race	Age	YIE	YIP
Central Administration						
Charles Sandburg	Asst. Sup. C&I	M	White	54	31	12
Jeremy Chandler	Dir. Prof. Dev.	M	White	51	29	8
Roosevelt Middle						
Bennett Warren	Principal	M	White	46	24	4
Samantha Faulkner	Math Teacher	F	White	27	4	4
Allie Tolstoy	English Teacher	F	White	32	5	3
Sarah London	Math Teacher	F	White	51	30	11
Katie Beinhart	ITS	F	White	50	30	11
Madison Elementary						
Alyssa McCullough	Principal	F	White	48	28	2
Paige Stegner	ITS	F	White	47	26	16
Maria Mandino	Grade 1 Teacher	F	White	48	12	10
Erika Tolkien	Title I Teacher	F	White	50	20	2

Note: YIE = years in education; YIP = years in current position; ITS = Instructional Technology Specialist; Asst. Sup. C&I = Assistant Superintendent for Curriculum and Instruction; Dir. Prof. Dev. = Director for Professional Development.

Table 17

Data Collection Sources from Anderson City Public Schools

Name	Int.	Obs.	LP	TC	TP
Central Administration					
Charles Sandburg	X				
Jeremy Chandler	X				X
Roosevelt Middle					
Bennett Warren	X				
Samantha Faulkner	X	X	X		
Allie Tolstoy	X	X	X		
Katie Beinhart	X	X	-	X	
Sarah London	X	X	X		
Madison Elementary					
Alyssa McCullough	X				
Paige Stegner	X	X	-	X	
Maria Mandino	X	X	X		
Erika Tolkien	X	X	-		

Note: Int. = interview; Obs. = classroom observation; LP = class lesson plan; TC = technology checklist or portfolio; TP = district technology plan; Dashes indicate the data was not available.

Table 18

Teacher Level of Technology Expertise as Identified by the School Principal Participants in Anderson City Public Schools

Name	HLU	MLU	LLU
Roosevelt Middle			
Samantha Faulkner	X		
Sarah London		X	
Allie Tolstoy			X
Madison Elementary			
Paige Stegner	X		
Maria Mandino		X	
Erika Tolkien			X

Note: HLU = high-level user of technology; MLU = mid-level user of technology; LLU = low-level user of technology.

Definition of Terms

Participants were asked to provide their definition of three terms relative to the Virginia state mandate for integrating technology into the classroom. These terms were mandates, Technology Standards for Instructional Personnel (*TSIP*), and technology integration. Their definitions are grouped by administrative and support staff (including school principals and ITS) and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Definition of Mandates

When asked to define the term “mandates,” Charles, Jeremy, Bennett, Alyssa and Katie note that it is “something that is required to do.” Alyssa’s definition additionally touched on policy, stating, “mandated by the state is something we need to do and something we have to do as defined by policy that's been noted at the state level.” Bennett, while agreeing that it is a requirement to do something, added that mandates provide equality or consistency across the state.

> They are items that the state has indicated that we have to implement in our academic programs. … I would say its equality across the board so that you’re having the same quality of instruction, going on in a rural area as you would in northern Virginia.

As part of her definition, Katie recognizes that there may be flexibility within mandates. She feels that with mandates “you don't have the opportunity to not do it, but I think you have the flexibility on how you do it.”

The high-level technology using teachers, Samantha and Paige, echo the sentiment that mandates are something that is required. Samantha felt that a mandate is "a standard that we have to make sure that we accomplish in the classroom." While Paige states "I feel that they are minimum standards that the state is imposing upon your school systems and we're supposed to take those minimum standards and make sure they are being implemented."

Mid-level technology users Maria and Sarah both reflect Bennett's comment about equity. Maria sees mandates as giving the state "the authority to require the implementation of certain programs or initiatives" for "consistency across the state." Sarah adds

> I think that when things are mandated its so that there will be some continuity and that there will be some [pause] that teachers across the board will be doing basically the same thing and giving the students the same information.

Like the others, low-level users Allie and Erika see mandates as something that is "required to do." Allie further defines mandates as something that affects the instruction in her "classroom" and as "a way to insure that the students are getting the instruction that they need." Erika takes a more negative tone when adding, "Well, I think sometimes somebody needs a job to do and so they come up with things and you know. As I've said I hope the majority of them really do improve education in Virginia."

Definition of the Technology Standards for Instructional Personnel (TSIP)

Administrative and support staff were split between district administration and site-based staff. Both Charles and Jeremy defined the *TSIP* as a "mandate" concerning skills that "teachers should be able to do in a generic sense" that is open to local interpretation. While school-based administrative and support staff Bennett, Alyssa, and Katie defines the *TSIP* in terms of artifacts. Bennett, pointing to a green ribbon that teachers in his school receive once completing their technology folder or checklist says "It means that, huh, I have to have a ribbon on my ID Badge, okay." While Katie and Alyssa refer to their "technology folder," as a means of definition.

Samantha defines the *TSIP* in terms of skills to pass along to students, saying "that means that those are standards that I have to be competent in before I can teach it to the students." Paige defines the *TSIP*, like Katie and Alyssa, in terms of her technology folder.

Sara and Maria mirror Samantha and Paige's definitions. Sara states "I would think that that would be what I need to [pause] what the teacher would need to know in order to give those skills to the students." Maria simply says, "I'd get my book out," referring to her technology folder.

Allie and Erika both define the *TSIP* in terms of application programs and skills that they must learn and, in turn, teach to their students. Allie says, "they're basic computer programs and things that we need to be able to know well enough to teach it to our students." Erika, referring to her technology folder, states, "these are skills that we have to be able to do or we can't teach our children to do them."

Definition of Integration

Charles and Jeremy both define technology integration as changing the way teachers teach. Charles states, "I think it means using the technology to teach in a different way, to improve student learning and to allow students with different learning styles to be able to learn more effectively." Jeremy, defining integration through the lab-centric nature of the district, adds:

> I do think that for a student the lab experience needs to be something that gives him an opportunity to use what he's learned, learn it better, learn it differently, whichever adverb you want to chose there, so that he's owning it in a way that he hasn't owned it before.

Bennett, Alyssa, and Katie define technology integration as "having technology is the tool" to "enhance the instructional process."

Samantha says "I would define that as bringing technology into the classroom so that the students are exposed to it and also taking them into the labs so that they themselves can interact with it." Paige defines integration as when "technology is not taught in isolation. That you should use technology as a tool, as one tool of many to help students to learn."

Sarah, Like Paige, connects integration to student learning – "I think if you integrate technology that means that you're using it in your teaching of your subject matter." However, Maria defines technology as a tool from her own personal productivity. Maria states "you have to go beyond what's pre-developed or pre-designed and know how to use the computer yourself to make what you need."

Allie believes that technology should not be an add-on but admits that when it comes to integration of technology "it's probably something I don't do very often." She continues "I guess most often most teachers plan their lesson and then figure out how to fit the technology into it. Where it should be a natural part the lesson." While Erika simply defines integration as a "tool to enhance learning."

Factors Inhibiting Integration

Like definitions, participants were asked to identify factors that inhibit the integration of technology from their perspectives. Their responses are presented grouped by administrative and support staff (including school principals and ITS), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

Administrative and support staff found personnel and support, training, time, funding, and access to resources to be inhibiting factors.

Charles believes that “inhibiting factors are personnel.” The lack of personnel to support the district’s growing technology infrastructure as a problem, as he states “the more technology you buy, the more it goes out of numerity and the more technicians you need.” Training is another area of concern for Charles. “We have a turnover of maybe 75 to 100 teachers every year and you’ve got to go back and retrain those teachers in technology.” For Charles, the SOLs often become an excuse for not integrating technology. He says, “the SOLs are actually becoming a negative because [teachers] say ‘I don’t have time to go to the lab. I don’t have time to use technology and still teach the SOLs’.” Despite the “$175,000 to $250,000 in new money each year,” Charles believes that funding, especially relating to the cutback of the elementary ITS to half-time is inhibiting. He states,

> the only thing that I would do different would be economic. I'd have more money, which is generally not possible but ideally more. When our ITS at the

> elementary schools were full-time for several years and we went to half-time with them because we're funding half of their position out of Title I when they're doing remedial reading. I would not have our elementary ITS as doing that.

Jeremy expressed concern about access to resource being uneven within the district. He feels that “Magnet Program grants provide must more access at the site than other schools have” since “if you look at our Magnet schools they’ve got more technology than our other schools do. You’ve got four or five [computers] in a classroom. You’ve got another whole lab.” So “especially at the classroom level, you’ve got more opportunities to integrate.” Another inhibiting factor for Jeremy is time. He expresses this in terms of the reduction of the ITS time at the elementary level and protection of instructional time. Regarding the ITS, Jeremy states, “Well, you eliminate 50 percent of their time and that 30 percent didn't change [he indicates later that the 30% represents the time the ITS use to do troubleshooting and repair]. Then, you're into a real frustration level with the elementary ITS, because they're saying I don't have time to do anything.” He continues “another issue that we struggle with is instructional time and trying to protect it.” Problematic are classes being “pulled out for this and pulled out for that resource.” As it relates to lab time as a resource “if we could get to the point where [the teachers] could have that time and see how technology is affecting that time, I think they’d be willing and ready to go.” Another “struggle” for Jeremy is that of funding. He reflects that “lots of times the state has given a mandate, it does not always appear that they’re giving the financial or personnel resources to make sure that it is carried out.” He sees this as “affecting technology” and the ITS. He notes,

> so far, no one has talked to me about technology specialists. I know Dr. McCormick's commitment is to keep them as they are. But, we're talking about closing an elementary school. We're getting no new money from the state. No new money from locality.

Bennett sees funding and time to train as inhibiting factors. He says that “[state officials] don’t always provide the necessary funding to make [mandates] work.” He points out “we’re supposed to have a ratio of one computer to every five students, if I’m not mistaken. Well, I’m not sure that they’re providing us with all the folks that we need to make it happen.” However, he sees, “the time commitment” as “probably the biggest problem” with training. “It’s difficult to get your competencies covered when the only time that you’re allotted to do that is after school or during staff period.” He notes that historically training of teachers has involved “pounding them” in August workshops and moving on to focus on something else next year. The result is “the teacher takes the information, she walks into her classroom or his classroom, puts it up on the shelf and it stays there…its never implemented.”

For Alyssa “the time element is a biggy.” Time for her is time for teachers “to get out of the classroom” in order to “see others doing things with the programs” and time for conference attendance. Access to resources also proves to be “a little bit of a scheduling nightmare” when it comes to software licenses and lab time. An example is the use of *Compass*® reading software. Alyssa explains,

> we for instance, with *Compass*®, we only have X number of licenses for *Compass*®. So, a teacher who has *Compass*® lab for an hour has to switch out

after a half an hour because you see we can only have X number of computers in *Compass®* at one time.

Funding, as it relates to staff development, is another inhibiting factor for Alyssa. She feels that they "have very limited money for staff development." And explains that the school has a partnership with a local McDonald's to raise funds.

I know this sounds like a joke, but we work once a month at McDonald's. The staff members will get a $100 each month and I put it into a staff development pool. So, that's how we make some of the money that we have for staff development. There's very limited staff development money from the division.

For Katie, access to resources, personnel and support, and time are inhibiting factors. One area of concern is that of aging technology. Katie expresses this concern saying,

well I would hope that we don't loose as the technology gets older which is what we are dealing with at school right now, our machines came in, in 97, so these machines are about worn out and the printers. I am moving printers out ten at a time where the sprockets have just worn out. It's frustrating now for the teachers. I want to do this but my machine won't do it

For Katie, the move to a half-time ITS position at the elementary level is cause for concern. She believes that teachers there are "struggling with trying to maintain the level of technology activity that they had" before the ITS became half-time. Katie sees "that the biggest challenge is time for her" and says, "that's been my frustration." For "when I really wanted to focus on 'we know the how to, let's get into using it, the true integration instructional end of it,' there hasn't been the time." She points to the fact that technology is not seen as truly embedded into the day-to-day of the school. “The technology is not needed for the day-to-day. It’s what we would like to see done. It’s what we’d like to make it be – an integral necessity for the teaching day-to-day process.”

High-Level Technology Users (HLU)

High-level technology users, Samantha Faulkner and Paige Stegner differ on inhibiting factors. While Paige, as the ITS, identifies time and training as factors, Samantha, as a classroom teacher, does not identify any inhibiting factors.

As a classroom teacher who teaches both math and computer classes Samantha has greater access than most in the school. However, she does speak to the level of access to the computer labs in the school. She states,

> Assuming that you do not take any of the computer classes, you will go into the lab with every single one of your content classes, with your math, with your science, with the social studies and with the science. But all of your content classes you'll get in there. In a nine-month period you'll probably be in the lab between two to four, five, or especially with the English, maybe even six times within that nine-month period.

Paige sees time and training as two factors that influence integration of technology. The one thing she “would like to change would to be full-time again” as an ITS. Since “now that my time is so scheduled, we don’t have as many opportunities” for demonstrating technology integration. She feels that “going into labs with [the teachers] and actually demonstrating this integration of technology is probably the best training that you can have.” However, she “did an enormous amount until [her] job was changed.” Regarding time, Paige says, “time is the problem. I mean you don’t want to add staff development days, because you don't want to add any more days to the school year." For training "you've got like 8:00 to 8:30 and teachers have to go to their classrooms. How in the world do you do that? Get a lesson in, in thirty minutes?"

Mid-Level Technology Users (MLU)

Mid-level technology users Sarah London and Maria Mandino, like their high-level counterparts, differ on inhibiting factors. Sarah sees access to resources as inhibiting, while Maria believes that personnel and support, and time are inhibiting factors.

Sarah sees access to resources as a "catch-22 situation." Since both have their disadvantages. She states,

> it's hard to we only have one computer in here so whenever we use computers you know we have to go to the lab and the lab has to be scheduled. And, we have a lot of teachers at this school. And, so, if you get into the computer lab once a month, you're doing pretty good.

Sarah feels that often, with large classes "there's not a computer for each child" in the lab setting. Additionally, she notes that in the middle of the lesson "something goes wacky" with the computer and it can't be easily fixed.

Maria sees the move to a half-time ITS at the elementary level as "a mistake, a huge mistake. Because technology is constantly changing and I don't think that there's a way that she can do her job the way she did it before and teach too." Maria feels that "new people this year are nowhere near as far along as I was when she started with us." She believes that the reduction in the ITS time "coupled with the lack of time is going to be a real problem" when integrating technology. However, when discussing time, Maria sees this as inhibiting for others, not for herself. “A lot of people resent that time after school or time before school or using their planning time to do [training].” However, “it hasn’t bothered me as much as it’s bothered some people, because I feel like it is something that I’m using.” Although, “some people say ‘I don’t want to go in that lab for two hours. That’s time out of my classroom. I’m loosing instructional time.’ Not if you use it with what you are doing.”

Low-Level Technology Users (LLU)

Low-level technology users Allie Tolstoy and Erika Tolkien both see time as inhibiting. In addition, Allie sees training and access to resources as inhibiting.

Allie sees support by the school ITS as limiting for her. She says that beyond the work where “the instructional technology specialist will sit down and help plan a lesson” she has received “very little” assistance. This support extends to assistance with equipment. She mentions that her “printer hasn’t worked for months” and that the school’s “printers are so old that they would stop printing” in the middle of a project. She is also frustrated that her computers are “out of warranty.” She says, her students will be working “in the middle of something and [the computer] performs an illegal operation and shuts down.” This frustration extends to training and access to the computer labs.

> A lot of times you go and you sit through an in-service and they show you all this stuff and you're thinking how am I going to use that. And, if I do ever get to use it, where am I? How am I going to fight with these other teachers to sign up for time to do this? So, I think it needs to be something that is that I can see that I can use.

With lab time Allie also feels that “it’s very frustrating to have forty-four minutes in computer lab” because of the “wide range of students who are familiar with the technology and students who are not.” She adds, “there are a lot of teachers that don’t get computer lab time. I happen to teach English, so I get one – at least one a month. But it’s hard to integrate when you have one a month.” Allie believes that “teachers don’t like to give up time for anything” and “because we feel so rushed, you tend to fall back on what’s familiar.”

For Erika, time is the major inhibiting factor. She states, “I feel like sometimes we’re pushed to the limit with what we’re expected to do.” She expresses her frustration with lack of time to integrate technology into classroom instruction as an either or proposition,

> If you're going to decide whether or not you're going to work on math or technology, then there's not a whole lot of choice there. Now you can do math through technology but you're not necessarily learning technology when you do that.

Additionally she feels that “finding time to teach [technology] is almost impossible. That’s not a high priority with most teachers.”

Factors Enhancing Integration

Participants were also asked to identify factors that enhance their integration of technology from their perspectives. Responses are presented grouped by administrative and support staff (including school principals and ITS), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

Charles sees access to resources as positively impacting integration. He is proud of the district's 145 partnerships and of the Internet connectivity the district has developed through a partnership with the municipal government and Intelos.

> We have a 50-mile fiber network in the city that we jointly funded with the city that connects all our schools, city government, police, fire, community centers are all connected with the fiber and they all come into one access point. And, so, we have an equivalent of a T-3 line that comes into that access point, so everybody accesses the internet from all of our sites over one T-3 line.

This access also includes "18 sites in the community that we can provide a free Internet access." The district has also taken the older "Pentium ones that are still viable computers" from the high schools and moved them into the community centers as they are replaced.

Jeremy is proud of the ITS staff and identifies them as positively influencing factors with regard to technology integration. He sees the ITS as both the "first line of troubleshooting assistance" representing about "thirty percent of their time" and trainers of "teachers in the labs" through "modeling" and "demonstrating so that gradually the teachers feel more comfortable coming in the lab without the ITS." Jeremy links the ITS with the charge of "uniform" training across the district. He notes that they have not brought in "outside people to try to work as consultants" but "train a group of trainers within the division."

Bennett identifies personnel and support as positively influencing. He defines this in terms of the ITS. Bennett feels that the "technology specialist" is "very thorough" when training new staff and works to get new teachers "caught up so that they're on the same level with the rest of the teachers." The ITS also "makes herself available in the labs after school or before school because the teachers need help." If "something goes wrong and they panic, well, she's available to help them. And the teachers use her as a resource for planning the activities in the labs as well."

Alyssa McCullough sees personnel and support, training, and funding as positive factors. She feels that they "have been very fortunate" to have the ITS in each building. Alyssa says this despite the reduction of the ITS to a half-time position at her school. From her perspective,

> the bright side would be that people have learned how to change cartridges and how to get things back on line out of necessity whereas it's very easy for me to say "Paige can you come help me?" In my own personal case I find myself trying to figure something out for myself, which is a good thing actually as opposed to leaning on Paige. You know the opposite the negative side of it is Paige always feels like she's always doing two jobs and I'm fortunate in that I work with Paige because she can do two jobs.

Alyssa says that "she learns by doing" and has implemented flexible technology training for teachers in her building. She has both required training sessions and "optional ones after school." Alyssa also has impromptu training sessions.

> If it's a short in-service or something we've learned it's kind of like oh, come in let's see. Everybody come on quick, quick. I'll set it up a few days ahead of time or a week or so ahead of time and we'll just go into the lab and do a little stand up meeting and say this is something new.

Money has also been a positively influencing factor for Alyssa. She has been able to garner grant funds from Eisenhower, Title I funds, and partnerships. Through Title I funds they were able to "put in another lab." As Alyssa says, "I find money in the darnedest places.

Katie, as a full-time ITS at the middle school level sees training as a positively influencing factor for integration. In describing her role, she moves teachers toward technological self-sufficiency.

> It's not let me take the kids to the lab an I'll go get a cup of coffee. And you just take over. So they've had to be more self-sufficient. And, you know, we'll help them get through the activity and we'll run through it or I'll be in there to help the kids to make sure things are moving smoothly the first period and then they'll be okay for the rest of the day–that kind of thing. So, they have been more actively involved. And, they'll be. Now when we go check to see. You've got the lab. Were you aware you have the lab today? Oh, yeah, and I've got my activity. Well, do you need help getting anything in your folder? Do you need help getting links ready? Oh no, I've got it all done. Worksheets ready and run off! So, they're taking more of an active role instead of it being a pushing role.

High-Level Technology Users (HLU)

High-level technology users Samantha Faulkner and Paige Stegner differ as to positive factors. They find access to resources and training positive respectively.

Samantha believes that access to resources is a positive factor in technology integration. She points out that the school has "a set of wireless keyboards" to use with the computer classes. "I can stand at the back of the room and show them what I want them to do." She also points to a "big screen monitor hooked up to the main teaching computer" at the front of the lab. "It shows on the big screen monitor so everyone can see and not only can I show them what I want them to do but by standing in the back I can see exactly if they're doing it correctly."

Paige believes that training, while more limited now, has been a positive factor. Pulling out a teacher's technology folder and pointing to a list of classes attended, Paige says, "these are the workshops that I have conducted solely at Madison. This does not include the school division's opportunities." There are "just enormous amounts of opportunities that teachers have to attend after hours." Paige also mentions the technology camps that are training sessions "offered weekly." The "goal is to develop lessons that integrate technology and thereby help students use technology and SOL mastery of content."

Mid-Level Technology Users (MLU)

Both Sarah London and Maria Mandino agree regarding positive factors. Both feel that personnel and support, and training positively influence integration of technology.

When talking about personnel and support, Sarah sees the school's ITS as their primary source of support. Sarah says, "at this school, we have a very good technology person. She is within thirty minutes if you have a problem." She "is always in the lab to help you when you take a class." When discussing technology training, Sarah points to the pace of training.

> Here at Roosevelt, because it wasn't real fast paced, it was slow enough so that you know that you could learn it, and you could practice it, and you would know

> it before you went to the next thing. It wasn't real rush, rush, rush, get it done, get it done! It was we had a lot of time that we could practice what we learned.

Maria also believes that “in the area of technology, we have incredible support” referring to the ITS on staff. She explains,

> she will actually take everything we do and writes up step-by-step instructions for us. She offers workshops constantly so that if you miss it one time you get another time. With somebody like me I could go to her and say that I have this idea or this thought that I could maybe make such and such. Can I do that? She'd say, let me think about it and then she'd help me figure out a way to make whatever I wanted to make.

Maria also links training to the ITS. “Well I think one of the things that has made our program so successful is the fact that we have had someone who could come in and help you teach your class.

Low-Level Technology Users (LLU)

Low-level technology users, Allie Tolstoy and Erika Tolkien differ in their identification of positive factors influencing technology integration. While Allie looks at the supportive role of the ITS, Erika sees access to resources as positive.

Allie sees the support she has received from the ITS as positively assisting her in integration of technology. She uses phrases as “very helpful” and “very supportive” to describe the ITS staff member. And describes her role as being “pretty much close to perfect.” Allie continues her description by saying,

> Now she assists when we go to the computer labs. She will help develop lesson plans with you and help you come up with ideas and help you come up with ideas

for using the technology. She also helps in the classroom when you need to use technology.

For Erika, access to resources is an influencing factor. As she says, "I teach in the Title I learning lab. Everything I do is done with computers."

Integration and Classroom Use of Technology

In spite the influencing factors, teachers in Anderson are still required to integrate technology into their instruction. For teachers at both middle and elementary this is generally done in the computer lab, not in the traditional classroom.

Middle School

At the middle school level, teachers' integration of technology is largely determined by their lab time. Observations of classes at this level reflected this.

During classroom observations, Samantha Faulkner's time was split between a "traditional" math classroom with only one teacher computer and a computer laboratory with 25 computers. During math class students use pre-made SOL practice worksheets to practice angles, fractions, and interpretation of graphs. With the exception of several student calculators, no computer technology was observed. Sample lesson plans reflect the lack of computer technology use. However, during the observation of her computer applications students spent the most of the class period working on the computer. Students were provided a step-by-step procedure for creating web pages. Samantha used her time helping individual students with specific questions about their web projects.

Sarah London's classes observed were "traditional" math lessons in which the teacher presented the material and had students work problems at their seats. Topics covered included construction of tree diagrams, order of operations, and reading box and whiskers charts. Lesson plans reflect this workbook orientation. No computer integration was observed. However, Sarah did share a lesson plan in which her lab time was used having students experiment with tessellations using *PC Paintbrush*®.

Like Sarah, observations of Allie's classroom did not reveal any use of computer technology. Allie covered development of an explanatory composition to each of the three English classes observed. The overhead projector was the primary technology used to introduce the concept to students. One lesson plan provided did show that Sarah intended to use her lab time to have students write their final composition using the word processor. Included in the lesson plan was step-by-step instructions for students to log onto the computer and use word processing functions such as inserting a picture, spell checking the document, as well as saving and printing documents.

Elementary School

Like the middle schools in Anderson, the lab centric-nature of their technology is also found at the elementary school level. This is reflected in classroom observations and lesson plans.

Paige, as the school ITS, spends the majority of her day in the Title I reading lab. As such she uses the *Compass*® reading program to determine what students will cover. She has no "formal" lesson plans, but uses the program's diagnostic system to guide students through the program's various levels. During observations her role was to bring students into the lab, make sure they were logged into the system, and kept on task during the class periods. With the exception of asking students to be quiet, when they started to sing to music while listening over their headphones, little student-teacher interaction took place.

During the observations, Maria Mandino's second grade class was learning about consonant e sounds. Maria, unlike the other teachers observed, moves her class from questions, to songs, to writing, to coloring in the classroom and then moves to the computer lab. Once in the lab, she instructed students on the various programs they would be using. During lab time, she moves students from one program (*Bell the Cat*) to another (Compass®) to another (Quia). Her lesson plans reflect this interweaving of technology and movement. The range of materials includes books, charts, transparencies, Internet sites, audiotapes, records, instructional computer programs, and application programs (such as *Microsoft PowerPoint*® and *Microsoft Word*®).

Erika Tolkien's fifth grade class completed background reading on a project on famous Americans. She uses the computer lab to have students use Internet to find sites with information about the individual they chose. Erika mentions several times that they are going to use *Microsoft PowerPoint*® to create a slide presentation about their famous American. She uses a large television, connected to the teacher computer to demonstrate how to cut and paste pictures from a website into a *Microsoft PowerPoint*® slide. Her lesson plans provide step-by-step procedures for students and repeatedly indicate, "students will click…" or "students will type…" in a numbered sequence of steps. Lesson plans also targeted specific SOL technology and curriculum area objectives.

Leadership and Planning

The ITS predate the *TSIP* and have evolved as computer labs have been put in place. Anderson has enjoyed the benefits of advance knowledge about the standards. Since Katie Beinhart was "involved in setting it up." As Jeremy puts it,

> Katie knew the standards were coming long before they did because she was in at the state level, as you may well have been, also in developing them and getting feedback and keeping us apprised as to where the state board was in this process and all this kind of thing.

Armed with this knowledge, technology leadership and planning turned toward development of their networking and Internet access. Charles describes the approach they have taken as "outside in" or moving from the wide-area network, to local area networks, to equipment and software. While Alyssa and Warren both feel that Charles Sandburg is the ""driving force" behind technology in the district, Charles gives credit to Jeremy for the ITS and the work that they do, including development and revision of the district's technology plan.

The district's technology plan is revised annually and directs much of what happens with technology during the year. The plan is composed of mission and vision statements, current status, needs assessment, goals and objectives, budget, evaluation, and training. The plan supports technology as "a means to an end, not an end unto itself." The plan lists the technology standards and makes the ITS responsible for training of teachers to meet the standard. Also noted in the plan is the need for more computers for the district to meet a 5-to-1 student-to-computer ratio as well as a need for these computers to be placed both in classrooms and in additional computer labs.

Through the leadership of the ITS, checklist has been developed which is referred to interchangeably as the technology "notebook," "portfolio," or "checklist." Integration is assessed through checking off nine items across three categories. These are as follows:

- Plan and implement lessons that utilize technology to facilitate instruction:
    - Student projects,
    - Small group instruction,
    - Individual instruction,
    - Whole class instruction;
- Use technology effectively in various educational settings:
    - Computer lab,
    - Computers in classroom clusters,
    - Single computer in classroom,
    - Multimedia station; and
- Effectively utilize the automated library media center:
    - Access instructional materials.

The complete checklist for Anderson City Public Schools is provided in Appendix O.

Accountability

Accountability for teachers in Anderson completing the *TSIP* standards, including the integration of technology, is handled through the division-wide checklist or technology booklet. The checklist is recognized as the de facto standard across the district.

District Administration

At the district level, Charles Sandburg notes that the checklist is “a division-wide notebook” and that “every school” and “every teacher has one.” Charles sees the checklist as something that “the teacher can demonstrate” and that “going through the activity doesn’t allow you to check off those things” since “once you’ve been taught, you've got to demonstrate it." It is "tied to teacher evaluation." The "principals have to do the same thing. They have to demonstrate it as well." For teachers this demonstration usually comes in the form of lab sessions observed by the principal. In turn, principals demonstrate computer skills to the school ITS.

Jeremy sees this demonstration as "still sort of an exercise. It's not an automatic application." He points out that the demonstrations "could be as contrived as you want it to be," but feels that "the intent is good." Jeremy states that "the intent is for the principal and the teacher to then be able to talk about the effectiveness of [technology].

Middle School

At the middle school level, Warren Bennett is proud that his school boasts 100% of his teachers completing the technology checklist. He attributes this to the fact that "the teachers know it's important because we tie it in with their final evaluations." However, he admits, "teachers won't always willingly come up with activities and go to the computer lab." He has addressed this by having "set times" in which teachers must go to the lab with their classes.

As the school's ITS, Katie agrees, "the principal has definitely helped by requiring that everybody be in the lab. There's a set calendar. Everybody's scheduled." However, she sees the technology assessment as "a checklist basically. It's a product-based checklist that you will create this product by doing these things and at the end of having the product you can check off those 10 or 15 items that went into building that product."

Sarah feels that "its not a big hairy deal" when discussing the checklist. While not expressly stating it as an enhancing factor, Sarah sees the scheduling of the labs as a positive factor in promoting teacher use of technology. "One thing that promotes all the teachers in this school to use technology is that we have a schedule and we're supposed to use it."

Samantha sees the checklist in terms of products. She states that the standards "just basically involve things in *Word*®, and *Excel*®, and *PowerPoint*®." Samantha "felt pressure" to complete the standards "in one year" because she "taught the computer classes" but notes that this feeling is true for other teachers because the ITS "pushes them to finish."

Elementary School

The "push" noted at the middle school is also felt at the elementary school. Alyssa McCullough says, "my personal opinion is that there would be perhaps some people who would not reach out and grasp a solid knowledge of technology if they weren't pushed just a little bit." She feels that "it makes my job easier" because "it is the expectation." For Alyssa the checklist is a means of monitoring teacher progress with technology. As she states, "well, in my years of education I've found that things that are monitored seem to be things that get done."

When asked what happens after the checklist is complete, Paige says, "you're done" and then spells out "DONE." However, she hastens to point out that integration is an "ongoing process that never ends." She sees the checklist as "the principal's responsibility to make sure everything is checked off and signed off." However, she also adds "but with so many, they rely upon us a lot."

For Maria Mandino, "the expectations are high" for technology and its use. "We had to actually demonstrate the competencies at the time." This meant that "we actually had to go into [the principal's] office or she would come into our room and watch us do whatever it was we were suppose to do." Sometimes "we had to have proof. Printed proof of what you had done so far." She believes that "from an accountability standpoint it has drastically changed what we do and how we do it" and that "the paper trail that it requires has been incredible."

Erika sees the accountability for the standards as "a no-choice situation. We do them." She feels that "they affect everything we do because with our education and our technology mandates they have to be met by a certain time or we can't get re-certified."

Discussion and Analysis

The following section presents a discussion and analysis of Anderson City Public Schools. Definition of terms, influencing factors, inhibiting factors, integration and classroom use of technology, leadership and planning, and accountability are discussed.

Definition of Terms

In defining the terms mandates, *TSIP*, and technology integration, participants provided a range of responses. While their definitions did not vary greatly, as they moved from general to more specific terms, the nuance of meaning changed. These variances in meaning did not seem to depend on skill level or position. One explanation for the subtle differences may be the various perceptions, beliefs, and experiences that the individuals held about technology and about their experiences with past mandates such as the SOLs.

Definition of mandates.

When defining the term “mandates,” most of the participants associate it with something that they have to do or are required to do. However, beyond this are individual nuances that may indicate policy connections and a belief that mandates provide a level of equality or continuity across the state. While others see mandates as something that is flexible and defined by the locality.

Definition of Technology Standards for Instructional Personnel (TSIP).

The *TSIP* are defined generally as those technology skills that teachers need to know to help students. These skills were defined both in terms of basic skills needed to operate a computer and being able to use a variety of application programs. Some of the participants defined *TSIP* solely on the basis of artifacts such as ribbons, badges, or checklists.

Definition of integration.

In terms of technology integration, most of the participants identified it as using technology as a tool to enhance or help teach core content material. Others see integration in terms of changing teacher behavior. Still others see it as exposing students to technology or not teaching technology in isolation from other subject areas.

Inhibiting Factors

Participants were asked to identify factors that were inhibiting to technology integration. These factors were arbitrarily classified into five broad categories. These categories were (1) personnel and support, (2) training, (3) time, (4) funding, and (5) access to resources. Of the inhibiting factors, time was reported most often (82%), followed by access to resources (55%), and training (46%). Both funding, and personnel and support were reported least often (36% each). These factors can be seen in Table 19 and Table 20. These factors are consistent with the findings from the research on integration. The reporting of time and access to resources as most inhibiting may reflect the lab-centric approach to technology within the district and the scheduling of lab time.

Table 19

Factors Identified as Inhibiting or Enhancing Integration of Technology by Location

Name	PS	TR	TI	FU	AR
Central Administration					
Charles Sandburg	I	I	I	I	E
Jeremy Chandler	E	I	I	I	I
Roosevelt Middle					
Bennett Warren	E	I	I	I	I
Samantha Faulkner					E
Allie Tolstoy	I	I	I		I/E
Sarah London	E	E			I
Katie Beinhart	I	E	I	I	I
Madison Elementary					
Alyssa McCullough	E	E	I	I/E	I
Paige Stegner		I/E	I		
Maria Mandino	I/E		I		
Erika Tolkien			I		E

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; I = inhibiting factor; E = enhancing factor.

Table 20

Factors Identified as Inhibiting or Enhancing Integration of Technology by Level

Name	PS	TR	TI	FU	AR
Administration and Support					
Charles Sandburg	I	I	I	I	E
Jeremy Chandler	E	I	I	I	I
Bennett Warren	E	I	I	I	I
Alyssa McCullough	E	E	I	I/E	I
Katie Beinhart	I	E	I	I	I
High-Level Technology User					
Samantha Faulkner					E
Paige Stegner		I/E	I		
Mid-Level Technology User					
Maria Mandino	I/E		I		
Sarah London	E	E			I
Low-Level Technology User					
Allie Tolstoy	I	I	I		I/E
Erika Tolkien			I		E

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; I = inhibiting factor; E = enhancing factor.

Enhancing Factors

Participants were asked to identify factors that were enhancing to the integration of technology. Like inhibiting factors, these were arbitrarily classified into the five broad categories of (1) personnel and support, (2) training, (3) time, (4) funding, and (5) access to resources. Of the enhancing factors, personnel and support was reported most often (55%), followed by training (36%), and access to resources (27%). Funding was reported least often (>1% each) and time was not reported as enhancing by participants. These factors can be seen in Table 6 and Table 7. It is likely that the reporting of training, and personnel and support as being the most enhancing factors was a reflection of the work of the ITS and their “hand-holding” approach to training teachers about technology and its integration into instruction.

Integration and Classroom Use of Technology

Integration was largely presented as support to instruction through instructional learning systems such as *Compass*® and technology applications classes where technology was the focus. This was probably not due to the teachers’ inability or unwillingness to integrate technology but a function of their limited access to computer technology. Because of the district’s lab-centric approach to technology integration, participants were unable to demonstrate technology integration within their individual classrooms and, as such, their level of integration was not able to be determined.

Leadership and Planning

Technology within Anderson is directed largely through a top-down approach in which central administrative officials oversee the ITS staff. The ITS staff, in turn, train in the use of, assist with, and model technology use and integration for the classroom teacher. This has been seen as an enhancing factor for most of the participants. However, as Alyssa points out, the reduction of the ITS at the elementary position has been positive in the sense that it has forced teachers to become more self-reliant. This may indicate that the teachers have come to rely too readily on the ITS staff for technology integration.

Accountability

Accountability in Anderson has been achieved through a series of checklists or "technology folders" that the ITS and/or the school principal sign off once teachers can demonstrate that they have met the specific item. The integration standard is achieved, according to the checklist, when teachers can be checked off on nine competencies. While this provides some level of accountability, it may be left up to the ITS to determine how these are met since terms such as "facilitate," "implement," and "effectively" are not defined within the checklist. It is likely that the accountability within Anderson comes from the overall expectation that something will be done to ensure some level of technical competency on the part of teachers. Use of the ITS coupled with tying the checklist to teacher evaluation seems to have elevated the level of concern on the part of the participants and, no doubt, others on staff at these schools.

Appendix C: A Case Study of Fort Campbell City Public Schools

Appendix C presents a case study of Fort Campbell City Public Schools and their attempts to integrate technology into classroom instruction as part of a Virginia state mandate. The case study is organized into seven categories – district context, participants, definition of terms, factors inhibiting integration of technology, factors enhancing integration of technology, integration and classroom use of technology, leadership and planning, and accountability. A discussion and conclusions section, at the end of Appendix C, provides a within-case analysis.

District Context

The context of Fort Campbell City is presented through the perspective of the city, school district administration, middle school, and elementary school.

Fort Campbell City

Fort Campbell is an urban center of approximately 48,400 people. Of this number 53.9% are Caucasian, 1.3% are Hispanic, 44.1% are African American, 0.6% are Asian, 0.1% represent other races. The city is proud of its two and one-half century heritage as both an agricultural and industrial center. Founded on the growth and processing of cotton and tobacco products, the city has evolved into an industrial production center focusing largely on textiles. In recent years the city has begun to experience an exodus of some of its textile-based manufacturing plants. In response, the city administration has tried, with relative success, to draw high-technology firms into several newly developed industrial parks.

District Administration

The school administrative offices of Fort Campbell City Public Schools are located in a large, four-story office building, located in the downtown area of the central business district. The building contains most of the municipal government offices, including the jail, courtrooms, mayor’s office, and school administrative offices. The school administrative offices serve a division of sixteen schools representing 10 elementary schools, 3 middle schools, 1 high school, and 2 special education or alternative school. Included in this number are five elementary magnet schools and one middle school magnet. The district has a student population of approximately 7,700. Of this number approximately 59.7% of these students are eligible for free and reduced lunch.

The district has placed emphasis on technology. It has been able to garner funds for purchase of equipment through federal magnet grants and through Title I programs. An Assistant Superintendent of Business and Technology oversees the technology operations for the district. However, he is not a “hands on” supervisor but prefers to delegate all day-to-day issues to the Manager of Information Systems. The central technology department is composed of eighteen individuals including the one manager, six network technicians or analysts, two technology specialists assigned to the high school, four programmers, and three trainers, and two persons assigned to the technical help desk and sub-finder system (a computer program used to find substitute teachers). The technology team has had poor experience with purchasing off-brand PC. Many of these older systems still in the district work poorly or are waiting to be picked up by the technology staff for discarding. Although they still have some older systems they have now standardized on Dell and Gateway computer systems division-wide.

The district has been operating under a five-year technology plan. At the time of the study, the plan was being revised since objectives of the original plan were already met.

Ronald Reagan Middle School

Ronald Reagan Middle is a single story mid-60s brick structure. It serves as a magnet school with a focus on the environment.

The school has an enrollment of approximately 500 students. As a magnet school, the student body is predominately majority minority, with 25.5% Caucasian, 70.3% African American, 3.8% Hispanic, 0.2 Asian, and 0.2% other races. Sixty-four percent of the students are eligible to receive free and reduced lunch.

The administrative staff at Ronald Reagan consists of one principal, one assistant principal, one full-time guidance counselor, and two secretaries. The teaching staff comprises 40 full-time teachers, and seven assistant teachers. Support staff includes one full-time library media specialist.

Ronald Reagan houses 3 computer labs, with 22 to 25 computers in each running *Windows 98*® and each classroom teacher has a computer in their classroom with Internet access. In addition, each classroom has a bank of four to five computers for student use. Another smaller lab of about 18 computers is just off the library media center.

Andrew Johnson Elementary

Andrew Johnson Elementary School is a single story brick structure built in the mid-60s. The school serves approximately 250 students in grades Pre-K through fifth.

Over the past few years the school has experienced problems with attendance and poor test scores. The school principal, determined to increase test scores, has been working with the University of Virginia to address some of these problems through a "focused initiative on reading." The school is a majority minority school. Of the 250 students 31.5% are Caucasian, 61.9% African American, 4.7% Hispanic, 1.6 Asian, and 0.3% other races. Sixty-three percent of their students are eligible for free and reduced lunch.

The school staff consists of one principal, a secretary, and 21 classroom teachers. There is eleven support staff, including a guidance counselor and a full-time library media specialist. The library media specialist also serves as the school's ITS.

The school does not have any classrooms outfitted as dedicated computer labs. The school does have a single mobile computer lab on a cart. Teachers have one classroom computer for their administrative use.

Participants and Data Collection Sources

Fifteen individuals participated in this case study. They include five at the district level, four at the middle school, and six at the elementary level. The numbers at the district level reflect the complexities of the organizational structure relative to technology in the district. The number at the elementary level was increased from the planned four to six participants at the principal's request. Participant demographics are provided in Table 21. They range in age from 30 to 61 years with a mean age of 48 (not counting one participant who refused to provide her age). Participant years of experience in education range from 6 to 33 years with a mean of 22 years. Their years in their present positions range from 1 to 16 with a mean of 6 years.

Fort Campbell has a Manager of Information Systems Technology, Darius Price, who has computer hardware as his primary responsibility. A full-time instructional technology specialist and one full-time computer technology specialist assist him. Their primary responsibility is the computer training of teachers and staff. They also work with school-based "facilitators" or instructional technology specialists (ITS) who are responsible for signing off on those teacher and staff members who meet the *TSIP* standards. The ITS are part of a central technology committee that has been formed within the past year to assist in directing and planning for the district's technology. One "technically savvy" teacher has been selected from each of the schools to serve on this committee, which meets monthly to discuss technical issues relative to the district.

Participants' data were collected from interviews, classroom observations, teacher lesson plans, technology checklists or portfolios, and the district technology plan. Data collection sources are shown in Table 22. Teacher participants identified by their principals as low-, mid-, and high-level users of technology are presented in Table 23.

A total of eighteen classroom observations were conducted including nine at the middle school level and nine at the elementary level.

Table 21

Participant Demographics for Fort Campbell City Public Schools

Name	Position	Sex	Race	Age	YIE	YIP
Central Administration						
Georgia Elliott	Asst. Sup. C&I	F	White	48	27	3
Ebony Rathman	Dir. HR	F	Black	-	33	5
Darius Price	Dir. IST	M	Black	33	6	2
Erin Shute	ITS	F	White	52	29	3
Victoria Hemingway	ICS	F	White	55	33	5
Ronald Reagan Middle						
Joan Kennedy	Principal	F	White	50	26	4
Selena Streiber	Social Studies Teacher	F	Black	51	27	13
Max Pasternak	Math Teacher	M	Black	61	19	4
Catlin Rutherford	Computer Teacher/ITS	F	White	30	6	3
Andrew Johnson Elementary						
Seth Merton	Principal	M	White	51	29	6
Megan Canfield	Title I Teacher	F	White	51	28	6
Yasmine Esquivel	Kindergarten Teacher	F	Black	41	19	10
Abby Vidal	5th Grade Teacher	F	White	52	7	1
Whitney Jennings	2nd Grade Teacher	F	White	59	25	16
Sierra Rand	Librarian/ITS	F	White	43	20	6

Note: YIE = years in education; YIP = years in current position; ITS = Instructional Technology Specialist; ICS = Instructional Computer Specialist; Asst. Sup. C&I = Assistant Superintendent for Curriculum and Instruction; Dir. HR = Director for Human Resources.

Table 22

Data Collection Sources from Fort Campbell City Public Schools

Name	Int.	Obs.	LP	TC	TP
Central Administration					
Georgia Elliott	X				
Ebony Rathman	X				
Darius Price	X				X
Erin Shute	X			X	
Victoria Hemingway	X				
Ronald Reagan Middle					
Joan Kennedy	X				
Selena Streiber	X	X			
Max Pasternak	X	X			
Catlin Rutherford	X	X	X		
Andrew Johnson Elementary					
Seth Merton	X				
Megan Canfield	X	X			
Yasmine Esquivel	X	X			
Abby Vidal	X	X			
Whitney Jennings	X	X			
Sierra Rand	X	X			

Note: Int. = interview; Obs. = classroom observation; LP = class lesson plan; TC = technology checklist or portfolio; TP = district technology plan.

Table 23

Teacher Level of Technology Expertise as Identified by the School Principal Participants in Fort Campbell City Public Schools

Name	HLU	MLU	LLU
Ronald Reagan Middle			
Catlin Rutherford	X		
Max Pasternak		X	
Selena Streiber			X
Andrew Johnson Elementary			
Yasmine Esquivel	X		
Megan Canfield		X	
Abby Vidal		X	
Whitney Jennings			X

Note: HLU = high-level user of technology; MLU = mid-level user of technology; LLU = low-level user of technology.

Definition of Terms

Participants were asked to provide their definition of three terms relative to the Virginia state mandate for integrating technology into the classroom. These terms were mandates, Technology Standards for Instructional Personnel (*TSIP*), and technology integration. Their definitions are grouped by administrative and support staff (including school principals and ITS) and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Definition of Mandates

District administrative and support personnel are terse when defining mandates. Ebony defines mandates as “a requirement that the division must meet.” George states that it is “non-negotiable” to “insure consistency across the state.” Consistency is also echoed in Erin and Joan’s definitions. Erin says, “It is something we must do. She adds “for some consistency throughout the state.” Joan states “it is what the state orders us to do” and adds “I think they’re trying to get an even playing field to make sure everything is on an even keel throughout the state.” Sierra also notes that mandates are something that is “required by the state” and feels that the purpose is “to make sure everybody competes in the same boat.” While Darius does not mention consistency, he does feel that mandates are “something that’s going to affect every district or division.” Seth defines mandates as the state’s “rules, procedures in which the state expects localities or schools to enforce” for the purpose of insuring “that teachers have some realm of competency in the use of technology.” Victoria defines mandates through the *TSIP*.

> State mandates I look at them as the 8 technology standards that were given to us broadly and then as a district person we defined how we were going to measure those particular mandates, the eight technology standards.

The high-level technology using teachers, Catlin and Yasmine both state that it is something that the "state requires." However, beyond this definition, they differ. Catlin feels that the purpose of mandates is "to keep things as even as possible, I guess, across the board in all schools." Yasmine feels that the purpose is to insure that teachers are "keeping up with the advances that are coming along."

Mid-level technology users Max, Megan, and Abby, like their high-level counterparts, agree that it is something teachers "have to do." Max explains, "It is to prepare teachers to effectively teach children how to use technology." Megan sees mandates as things that must be done to make students "better learners." Abby reflects the sentiment expressed by Yasmine, "I am sure it is to keep us up to speed with what's out there, new and upcoming."

Like the others, low-level users, Selena and Whitney see mandates as something that "we have to do." However, while Selena agrees with Catlin, Darius, George, and Joan, that mandates are "to keep education, to keep all the schools equal, to make sure that they're trying to do the same thing," Whitney feels negative toward mandates. "I don't think they really serve a purpose. I just think that sometimes they try to find stuff for teachers to do and there's really no purpose behind it. It just sounds good."

Definition of the Technology Standards for Instructional Personnel (TSIP)

Administrative and support staff were split between district administration and site-based staff. Victoria, Joan, Sierra, and Seth all defined the *TSIP* as the district's technology notebook or portfolio. Victoria simply points to the notebook when asked to define the *TSIP*. While Joan pointedly says, “Here, read this.” Sierra indicates that she has a notebook, but that she has only had it less than two months.” Seth says, “I’d give you this portfolio of what the state standards are.” The *TSIP* are defined by Darius as a “flat-level guide” for the purpose of determining “if you’re compliant or not compliant.” Georgia feels that the *TSIP* are competencies for “basic operations for a computer, knowing how to use electronic communication devices, being able to use and function in a word processing program.” Erin defines the *TSIP* as what the teachers “need to know” in order to help students “because the students need to know the technology.” Finally, Ebony defines *TSIP* in terms of licensure – “Well it means that there have been certain standards identified that each license holder must meet.”

High-level technology users, Yasmine and Catlin both define the *TSIP* in terms of their technology notebooks. Yasmine says, “We got those books this year and the requirements were in it.” Like Yasmine, Catlin says, “I’m going to give [new teachers] their notebook when they walk in the door.”

Mid-level technology users Max, Abby, and Megan, offer different definitions of the *TSIP*. Max feels that the *TSIP* are “technology standards” that “you have to demonstrate proficiency in.” Abby believes that “it’s trying to see if I understand computer technology.” The *TSIP* is also defined by the technology notebook by Megan, “I’d hand you the extra portfolio I have right up here [laughs].”

While low-level technology user Selena offers a definition of the *TSIP*, Whitney does not offer a direct definition. Selena indicates that the *TSIP* are “the basic things that you’d need to be able to do in the classroom with the computer. While Whitney refers to the technology notebook, she simply states, I really don't know, because I haven't really had time to look at that book."

Definition of Integration

The administrative and support staff in Fort Campbell generally define integration as using technology as a "tool" to either "enhance delivery of instruction" by teachers or as a "learning tool" by students. Erin equates it with traditional learning tools, "It's simply a tool. Just like the dictionary." Darius relates it with the SOLs, "using technology as a tool to help the kids actually grasp that SOL that they need to learn or create a web page that meets one of those SOL standards." According to Georgia, integration means using technology as part of the regular instruction, "instead of being used when you finish." Ebony says that "full integration" means using technology as an "instructional tool" for her "planning of instruction and my management of my own accountability – grades and what not" and as a "learning tool" for her students. Seth sees integration as exposing students "in a broader way, in a different way a content area using technology." Victoria says, that integration is using technology in a "seamless" way so that "it's not a separate part of the instruction." While Joan sees integration as limited to the "software available" to "enhance what you do" in the classroom; Sierra sees integration as simply "incorporating what you're doing in the classroom."

Although Yasmine responds to the definition of integration with "that's one that I really don't know; she pauses, and then adds that it is probably using "technology in some form" in "your lessons to get your point across." Catlin expands on Yasmine's definition and says that integration is "using some form of technology in what you teach." However, she adds that technology could include "television[s]," the "computers," or the "electric pencil sharpener."

Megan, Abby, and Max all define integration similarly. Megan says that integration is, "using it within the classroom and using it for instruction as much as possible." Abby feels that it is "bringing technology into the classroom" and Max says that it is being able to use technology in "the regular classroom routine." Max provides an example of integration.

> For example, they might get confused with prime and composite numbers and sometimes they would go the Internet to maybe find games with prime and composite numbers, things of that sort.

Low-level technology users Whitney and Selena both define it in terms of subjects taught. Whitney sees integration as "using technology with every single subject that we're teaching." Selena describes integration as "putting technology into science, putting it into math – making it work together."

Factors Inhibiting Integration

Like definitions, participants were asked to identify factors that inhibit the integration of technology from their perspectives. Their responses are presented grouped by administrative and support staff (including school principals and ITS), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

While not all of the Fort Campbell administrative and support staff participants agreed on factors inhibiting integration of technology, they collectively identified six factors as inhibiting. These factors were personnel and support, training, time, funding, access to resources, and fear and resistance of staff to technology.

Ebony felt fear and resistance to technology, time, and personnel and support were inhibiting factors. With regard to time and the *TSIP*, she said, “everyone is extremely taxed with time and available time to learn a new process.” She also believes that “a lot of teachers still are afraid of technology.” Ebony feels that the “biggest impediment” is the “fear that some people still have.” She also sees the lack of support from a full-time, paid, on-site technology person as an issue. “I think what would get us there most quickly would be to have an on-site technology expert” and this person should be able to “go in and work with the teachers” to “model” integration of technology.

Georgia sees fear as a factor “for those who are not proficient in technology.” However, she believes that “one of the major problems that we have in dealing with technology and implementing it and using it in the classroom is the support that teachers have.” This is also a funding issue for her, for she states, “we cannot afford to put a technology specialist in every school” and “probably more funding” could address this issue. Georgia also believes that time is a factor since “there’s too much to be done.” She believes that technology has been seen as a “separate skill set” by teachers.

Darius identifies funding and fear and resistance as factors. He equates money with bandwidth. “Money [laughs] money is bandwidth. Those two things can be really major barriers.” Relative to fear and resistance, Darius sees teachers, especially the “older teachers who didn’t come in with the computer age” as “petrified to death of the computer.” He sees students and teachers as reacting differently to problems encountered with computers.

> An adult sits at a PC and you tell it you've crashed the machine. And, you can just see the panic go over an adult. And the go Oh My God I've crashed it. Whereas you tell a kid they crashed it and they're like okay so how do I fix it. How do we get it back up?

Factors for Erin Shute are access to resources and funding. When asked about inhibiting factors she says, “Money. That’s it.” However, she later discusses teacher access and scheduling of the mobile labs at the elementary level.

> One or two is nice but it's like everything else you know a teacher will use it more if she has it in her classroom and doesn't have to check it out of the library every morning when she wants to use it and has to have it back by 10:00 cause another teacher has to have it and she wants to use it until 10:15.

Victoria believes that fear and resistance to computers is a factor that is driven by teachers being the focus in the traditional classroom.

> This is very difficult because especially teachers who are my age who have not been raised with technology and may not have embraced it are very intimidated by it. First, because in the classroom in the past the classroom teacher is the person who knows is the fountain of knowledge. And, this image, until it changes as being more a facilitator and resource person, until we see ourselves in that role, they're intimidated. They feel insecure.

Victoria also sees “the time factor during the day” as an issue. See feels that “until there’s a good understanding of how to integrate all this into the curriculum to be more efficient with it I think that’s a factor to being used.”

Joan thinks fear and resistance, access to resources, and time are inhibiting. Regarding fear and resistance, Joan feels that “as far as teachers in your regular classroom using technology in an integrated way, no you’re not going to see that.” She indicated that some of the teachers had “reacted quite vehemently” to the *TSIP*. Some older teachers said, “I’m going to retire, I don’t need to do this.” With regard to time, Joan says, “having time is really important and that’s something we all seem to lack. The technology is here.” For Joan access to resources is sometimes a competitive endeavor for teachers. She says that teachers will tell her, “I mean, if you’re going to make me do this, then make it available so that I’m not competing for computer time.”

Seth feels that access to resources is inhibiting, however he sees this, not in terms of scheduling equipment, but in terms of it functioning properly. “Equipment has been a little bit of a problem. Technology. The telephone lines are going down.” He and his teachers are also frustrated with the server at the school. “I have teachers complain because they go in and the server is down.” He adds, “We don’t do a good job in purchasing software that’s compatible with our server.” In terms of fear and resistance, Seth relates how some his teachers respond to checking their e-mail daily.

> I told them you're responsible at least before you leave school to pull your email up and look to see the messages to see if they've come. To be honest with you, I have some teachers who will order and pay for another teacher's meal from *The Italian Garden* if they'll come in at the end of the day and pull up their email for them to just make sure that they've been able to read it. And, I know of teachers that do that.

Fear is also probably “the biggest thing” inhibiting integration of technology for Sierra. She believes that “in the area of technology, I don’t think that if it wasn’t state mandated any of us or some of them would ever do it.” Sierra feels that the reason teachers do not want to use technology is “just change. They don’t want to change the way they do anything.” Training is also an issue for Sierra. However, it is not the training offered but the timing of the training.

> We were just kind of handed the notebook and, you know, said when you need help that she'd help you and that if we wanted some classes offered. But, the thing was that they waited until the month of June to offer them and as teachers nobody wants to do anything the month of June. And, they're offering some really good classes but they're all the month of June. You want to offer them to me you offer them in September.

Sierra also has concerns about access to resources. These concerns largely deal with the access and use of the single mobile computer lab in the school. “Well for one thing, the thing’s too heavy to move. It takes two people to get it down and out the door and down the hall.” Sierra feels it was a “waste of money” because “it only holds a charge for two hours” and “it takes me twenty to thirty minutes to get them all up and logged in for them to use it.” She admits, “It’s been used less than ten times this year.”

High-Level Technology Users (HLU)

High-level technology users Catlin Rutherford and Yasmine Esquivel agree that time and access to resources are inhibiting. However, in addition, Catlin adds time as a factor.

Catlin Rutherford identifies time, access to resources, and training as inhibiting factors. Catlin sees time as a factor relative to the SOLs and access.

> Time. We don't have enough time in the day to cover all the SOLs the state says we have to cover for the kids and try to figure out how to make sure that twenty kids get on four computers in a 45-minute block.

For her, access to computers is the "biggest thing" and she feels that the district would be well served by giving "the child, each child, access to a computer in a room, instead of just four computers that twenty-two kids have to share." Relative to training, Catlin thinks that some training should be made mandatory for teachers and says, "Right now there's not one thing that's being required of them to go through."

Yasmine thinks that time and access to resources are factors. She mentally divides "traditional" teaching and teaching with the technology. While she believes "with all [her] heart that it's a useful tool. It's just finding the time with all the other things that are going on with the book part." When talking about access to resources, she comments that, "That's the thing. Because we don't have a lab here." However, later she talks about the school's portable lab.

> It's a portable lab. Even if you come in early and get it set up, you spend so much time making sure that everybody gets where they need to be and by the time you get the whole thing up it's a lot of time has been used and somebody might say 'Oh, bite your tongue' wasted.

Mid-Level Technology Users (MLU)

Both mid-level technology users Max Pasternak and Abby Vidal think training and time are inhibiting. However, Megan Canfield thinks that access to resources, and fear and resistance are factors.

Max feels that “lack of time is the biggest problem” and thinks, “some may feel kind of threatened by it.” He also equates centralized training as potentially threatening and wants more in school training sessions using the more technically literate teachers in the school to conduct the training. “I think if they would teach and have more in-service, in school trainings, in school training, using those teachers, it would be a lot more relaxing and they could learn a lot better. Won't feel threatened by the computers.”

Abby identifies “time” as a factor. However she attributes it to her “scheduling” and says, “sometimes it’s not convenient to be on the computers.” In terms of training, Abby feels that she “was lucky enough to be one of the twelve chosen” to attend a centralized workshop on *Microsoft Excel®* offered in the spring. However, she feels that it is “difficult just to watch someone on the computer.” She would prefer weekly training sessions with someone who could “just walk through it” with the teachers.

Megan believes that fear and resistance “may have some retire” and says that there are “some classes that don’t use computers at all.” She feels that this lack of use by teachers translates into a lack of integration in the classroom so that “the children don’t have the opportunity to use it.” Additionally, Megan points to the “problems” they have had with access and use of the mobile lab. She says, “They have problems getting into the Internet” and although “we’re scrambling to get the things to work. And it’s not working.”

Low-Level Technology Users (LLU)

Low-level technology users Whitney Jennings and Selena Streiber both see time as inhibiting. In addition, Selena sees access to resources as inhibiting.

Whitney sees the state as “mandating one thing after another. We can’t get one thing finished before they put another one on us. I just feel like it’s too much.” She indicates that she has “had some technology training classes, but not recently.” This is due to the fact that she “just really hasn’t had the time.” She has also not used the mobile computer lab because she says, “I just don’t have the time to go in and set that up and work with them.”

Selena also sees that “time is always an important factor. I need time with it.” In addition to time, she feels that lack of resources is inhibiting. “We don’t have a lot of computers in the classroom. So I think that would have to be [pauses] the equipment itself would be a major problem.”

Factors Enhancing Integration

Participants were also asked to identify factors that enhance their integration of technology from their perspectives. Responses are presented grouped by administrative and support staff (including school principals and ITS), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

Ebony sees training as positively impacting integration. He has come to rely on Erin and Victoria to provide needed training. He indicates that the division provides “workshops on each area” of the *TSIP*. “For instance, one workshop might cover six standards, or three, or two, or what not. As we look at each school, we go in and provide training on-site. So that is how we help our teachers and principals get there."

Georgia also feels that training is a positive factor. She feels that this has been especially true with improving the "technology literacy" of teachers. This is exhibited through their "introductory *Word*®, *Excel*®, and *Access*®" classes. She adds, "With the portfolio, we have tried to offer classes along that support the development of skills for teachers."

While Darius says that he is "not really clear" about his "particular role other than to make sure the technology is there and working," he is proud of his network and the access it gives the teachers and students. His staff has installed "T-1 lines back to this location and everything comes back here T-3 and then we go out to Network Virginia via T-3." They have also just completed a survey and found "fifty-three percent" of "kids having Internet access at home." Darius sees this "increasing over time."

Erin believes that training is a positive factor. She points out that there are "at least three options, maybe four" available for teachers in terms of technology training. She lists division-wide in-service offerings, adult basic education courses, school-based in-service opportunities, and courses at the local community college.

Victoria also sees training as positive, providing "several different options." The trainers "try to make it as simple and not overwhelming" as possible and try to make sure that teachers are "getting the basics." One example of their success in training has been through a partnership with the community college offering "technology literacy" courses as "online classes." Victoria notes, "Last year we had over two hundred teachers take online classes."

Training is also a positive factor for Joan. She sees the course in-services through Victoria and Erin as something that "makes it easier" on the school staff. She also thinks that Catlin is very supportive in terms of training and is willing to "sit at the computer with them" to "work them through the system." However, she admits, "I don't think we probably need as much staff development as some other areas might."

Seth believes funding has been a positive factor and states, "that "funding for our school for the last four years has not been a problem." However, unlike the others, he expresses that the *TSIP* mandate itself is a positive factor in assisting with those who have fear or resist technology. "I think the mandates that are coming down will force those individuals who have been reluctant in the past."

Sierra feels that training is positive in terms of offering incentives to teachers. She thinks that this was done to "encourage people to take them." She notes that teachers are allowed to use technology training "as content" for recertification. "So if you took *PowerPoint*®, *Excel*® and *Word*®, or whatever, you'd have your 90 points."

High-Level Technology Users (HLU)

High-level technology users Catlin Rutherford and Yasmine Esquivel differ as to positive factors. They find access to training and funding positive respectively.

Catlin, like Victoria, believes that the online training has been positive in terms of "making sure that they know how to do [technology]." She recalls that her school had between twenty to thirty teachers using the online program. Catlin also encourages teachers, "after they get the basics," to "sit down and play with it in their classrooms during their planning periods."

Yasmine feels that they have “been blessed to have grants and to get a lot of materials and things that we need.” She thinks “that’s made it a little bit better” for teachers and their use of technology.

Mid-Level Technology Users (MLU)

Max does not identify any enhancing factors but remains non-committal. However, when talking about access to resources, Max sees the division as “doing an adequate job.” However, he feels that “we could do better.”

Training is a positive factor for Megan, who says that “she is just getting into it” when talking about her level of technical skills. “I’m learning. I’m learning” is her reply when asked about her role as the ITS for the school. She feels that the “workshops” that were offered in “two parts” over multiple days were helpful in her learning. She is also interested in the $75 that the district offers as a stipend to offset the cost of coursework and in the two-day courses that are being developed by the community college because “they give an hour credit.”

Abby feels that personnel and support are positive for her. During a break between observations Abby meets with the school’s ITS to confer about her portfolio. During the meeting, Abby received clarification about the spreadsheet portion of the portfolio. When finished, Abby comments, “The help that you just saw me with, the technology specialist here. She’ll come by whenever I need her in our planning period and show me how.”

Low-Level Technology Users (LLU)

While low-level technology user Whitney Jennings does not offer any factors as enhancing to technology, Selena Streiber believes that training is a positive factor for her. This was especially true of the online classes offered by the division.

> The division offers classes, free classes at that, so that's good. And, you can also take classes at the community college, and one year at the community college and the division offered a class on computers. Not on computers. Well, like *PowerPoint®* and *Word Perfect®* and all that but you take it on the computer so that you could travel at your own pace.

Although not stated directly, one enhancing factor for her is her ability to acquire access to resources. This issue came out of her being the only teacher in her grade level who had a laptop computer connected to her classroom television. She explains.

> Well, how I got the laptop since I've been waiting for a long time and I have a reputation for not being able to keep a partner. So, when they leave, I get things. And, my partner was in the Virginia Tech program where they were training all the teachers and they were given laptops. So, when he left I just said okay, ‘ I'll take your laptop.’ See that's how I got the laptop. And, I'm the only one to have one in this area, in the 6^{th} grade, and then I [pauses] about that program that's shown on the TV, so I had to find that little box to connect it up. So everybody doesn't use that, so I had to go around to teachers who have it to see who had it in their closet and I found one. And, all I had to say was Ms. Rutherford, I have an *Aver Key®* and I have my laptop and they hooked me up [laughs]. That's why I live better off [laughs].

Integration and Classroom Use of Technology

While both inhibiting and enhancing factors play a part in the integration of technology and its use in classrooms in Fort Campbell, there is a difference in its use at the middle and elementary levels.

Middle School

At the middle school level, teachers' integration of technology is mixed between classroom computer access and lab time. Observations of classes at this level reflect this.

As the writing and publishing center teacher, Catlin Rutherford is assigned to one of the school's computer labs. She covers a wide array of topics in her classes and often responds to teachers' needs within the building. During classroom observations, Catlin Rutherford moved students into her computer lab of approximately 22 computer stations (In addition, seven generic CPUs sit broken on the floor at the back of the classroom). Once at their assigned seats time was spent using either *Cornerstone*® or *Orchard*®, both integrated learning systems. Catlin uses them to teach math lessons. During her classes students work through lessons presented while Catlin moves around the classroom, stopping intermittently to assist a student. Sample lesson plans reflect Catlin's use of computer technology in other areas besides mathematics. They include a social studies lesson, in which students research famous persons using the Internet and then develop a *PowerPoint*® presentation, and English writing lessons using *Word*® and *Publisher*®.

Max Pasternak is a self-described "synergistic" teacher. He now teaches technology in a lab much like that of Catlin Rutherford. Max's classes are elective and often project-based. His students enter and sit at assigned locations at one of 21 computer stations. In two class observations, Max has students work on a project to design a poster that reflects a topic of their choosing. In addition to printing the poster, they are to research the topic on the Internet and create a written report. Max spends each period moving around the room and assisting students with problems, such has how to import images into presentations from their Internet searches. During the third observation, he has students login to Orchard and "play math games." He comments, "Our students do terrible in math." Again, during this observation he moves about the room and tries to assist students as they have questions. When asked about lesson plans, Max says that he does not have "formal" lesson plans.

Selena Streiber's social studies classroom is traditional in most respects, except for the round table in the back of the room containing four computers and a single printer. There is also a small laptop to the front side of the room. A small wire runs from the laptop to the television suspended on the wall. Her classes all focus on the TV, for it is from this position Selena "lectures" to her class. Occasionally pressing a button on the laptop to move through her presentation. Her topic de jure "What is a political party?" is repeated during each observation. While the workstations in the back of the room were unused during the observations, Selena pointed to a number of worksheets she had developed using *Word®* that were stored on these computers for use by students. Like Max, she has no formal lesson plans and doesn't recall ever doing any.

Elementary School

Unlike the middle school observed, Ronald Reagan Elementary has only one mobile lab. All observations were traditional and unremarkable relative to technology. Classroom computer access was limited to teacher computers with none observed being used during the observations. The mobile computer lab remained stored in the library during the duration of this portion of the study.

Leadership and Planning

Leadership in the district, relative to technology, is provided primarily by Information Systems to the schools through Darius, Erin, and Victoria. At the school level, the principal and the designated ITS provide the leadership. During interviews, participants expressed a belief that the leadership or push for technology was coming from various individuals, including the superintendent, building principal, ITS, and fellow teachers. At least two participants expressed concern for the lateness in being informed about the *TSIP* standards. Megan says, “I think that the first time I heard about it was when we went to the technology conference in Roanoke back in December.” When Megan and her fellow teachers “talked with the teachers about what was coming up and what we were going to have to do, then they begin to realize that other school systems already had it.” Yasmine wonders, “if there’s some feedback that fell along the way.” In referring to the district technology portfolio, “we got those books this year.”

The district’s five-year technology plan was being revised at the time of the study. Their existing plan is composed of mission and vision statements, a statement of how technology will be used, current status, needs assessment, goals and objectives, a strategic action plan, evaluation, training, and collaboration. The plan supports technology as a tool “to prepare today’s students for life in the 21st century.” The plan lists the technology standards as one strategy in preparing teachers to have the “base competencies” for technology use. It makes the information systems department responsible for the training of teachers to meet the standard. Also noted in the plan is the need for more computers for the district to meet a 6-to-1 student-to-computer ratio as well as a need for tracking teacher competencies and assessing them once complete. As part of the strategic plan section, a recurring line item in the operational budget is included.

Through the leadership of the information systems department and the site-based ITS, a portfolio has been developed which is referred to interchangeably by teachers, administrators, and staff as the technology "notebook," "portfolio," or "checklist." Integration is assessed through checking off 16 selected items from 42 items across the eight *TSIP* standards. These are as follows:

- Operate a computer system and utilize software [complete both]:
    - Printout two documents created with different software,
    - Printout information from a CD-ROM,
    - Other (with approval of your site ITS);
- Apply knowledge of terms associated with educational computing and technology [required]:
    - Complete a technology vocabulary quiz with a score of 80% or better;
- Apply productivity tools for professional use [complete three]:
    - Complete two professional word processing documents, at least one with a graphic,
    - Computer-generated grade or class report on a student or class,
    - Computer-generated test or activity, not word processed,
    - Printout of student database or other professional information,
    - Printout of spreadsheet used to record class or professional information,

  - Computer-generated crossword, word search, or other puzzle or game, not word processed,
  - URL and a printout of a web page created by you,
  - Evidence that you have used technology to produce a bulletin board, learning center, or other learning game,
  - Printout of a digital camera or scanned image,
  - Other (with approval of your site ITS);
- Use electronic information to access and exchange information [complete two]:
  - Lesson plan that incorporates students' active use of the World Wide Web,
  - Evidence of your class's participation in a web project,
  - Printout of an e-mail correspondence,
  - Bibliography of a curriculum topic that you created,
  - Write-up of the search strategy you used to access specific information to or from the web,
  - Printout of a thread or an e-mail conversation from a professional listserv,
  - Printout of a web-based lesson plan OR pages that you used to conduct research related to your discipline,
  - Other (with approval of your site ITS);
- Identify, locate, evaluate, and use appropriate instructional technology-based resources (hardware and software) to support SOL and other instructional objectives [complete two]:
  - Lesson plan that incorporates student use of instructional software,
  - Lesson plan that incorporates use of video by teacher or student,

- Lesson plan that incorporates use of a presentation device,
- Three reviews of instructional software programs and/or web sites,
- [Media Specialists/Librarians only] Assist teachers with the selection and use of all of the above,
- Other (with approval of your site ITS);

- Use educational technologies for data collection, information management, problem solving, decision-making, communications, and presentations within the curriculum [complete three]:
  - Copy of a desktop publication,
  - Copy of a database from a class assignment,
  - Copy of a spreadsheet from a class assignment,
  - Printout of a multi-media presentation,
  - URL and a printout of your class's web page,
  - Copy of a management plan developed by you to assure frequent and equitable use of classroom computers or other technologies by your students,
  - Copy of a student or class generated computer-produced piece of art or musical composition,
  - Other (with approval of your site ITS);
- Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings [complete one]:
  - Lesson plan that utilizes the computer in your classroom,
  - Lesson plan that utilizes the computer lab,

  - Lesson plan that utilizes augmentative communication devices and other software appropriate for special needs students,
  - Other (with approval of your site ITS);
- Demonstrate knowledge of ethical and legal issues relating to the use of technology [required]:
  - Signed copy of Fort Campbell Public Schools Acceptable Use Agreement, and
  - URL and printout of web-based information regarding copyright infringement.

The complete checklist for Fort Campbell City Public Schools is provided in Appendix P.

Accountability

Accountability for teachers in Fort Campbell completing the *TSIP* standards, including the integration of technology, is handled through the division-wide portfolio or technology notebook. The portfolio and related checklist is recognized as the de facto standard across the district.

District Administration

At the district level, Ebony Rathman places accountability largely with the principals. She says, “Our principals are taking a great part of the responsibility and they know it’s linked to licensure.” She also believes that “people have to understand that their licensure renewal is attached to it so that’s one reason we wanted them to go ahead and get started on this early.”

Unlike Ebony, Georgia, places much of the accountability with the site-based ITS for signing off on the *TSIP* standards. “We have a technology team, a division-wide technology team committee that has representatives from every school. That person is usually the one that signs off on the teacher's portfolio."

Darius does not comment on accountability, but says that they have "tried to align what the state has sent down." He indicates that the district has made "modifications as we need to."

Erin places accountability with the site ITS, but comments that "It's not something that we're watching over your shoulder or whatever. You're basically on your honor." Erin discusses the "plan" for accountability.

> As far as assuring the teacher has the standards? We do have a plan and this is it. This is a book, and each school has a facilitator, and you become a facilitator by having me or Victoria or our Assistant Superintendent of Business and Technology certifying you as a facilitator. Then, that facilitator obviously facilitates the school in all the teachers meeting the standards. So, they have a book.

Victoria sees accountability in terms of the check-off process. She notes that the "sign-off sheet" in the portfolio is sent to "HR to turn in for recertification." The teacher will "keep the notebook for any questions" and the ITS will turn in a list of those "checked off" at the "end of the school year."

Middle School

At the middle school level, Joan Kennedy, when asked if technology is a factor in teacher evaluation, responds "Not for here." While she "encourages" the use of technology she says, "as far as a check, I really don't do that."

As the school's ITS, Catlin takes on the major responsibility of signing off on the teachers' notebooks. She tries to "make sure that they meet the standards" since "I have to check behind them."

Max feels that there is "no standard behind the standard." He thinks that standards are "different for different schools." He believes that "everybody should do the same thing" since it "makes it more valid."

Selena does not comment on accountability except to say, "up to this point, I think this classroom has had only one working computer." To this point she has "looked at" the standards but hasn't done anything with them. She states, "I'm going to retire in four years."

Elementary School

The "push" at the elementary level has not been there, according to Seth Merton. "It's not from the superintendent" because "this is just not his cup of tea." He also believes that "it hasn't been from the instructional office to be honest." Seth feels that "there's not been a sense of urgency from the central office to be very candid with you, building principals and the teachers just haven't see the urgency."

Megan and the teachers at her school only recently received the *TSIP* standards. She recalls, "I think we started them here about maybe in November or December, and I may have gotten my portfolio maybe in January."

Yasmine points out that the school has "one teacher that's certified" or signed off on the standards. She says, "she's our school sign-off person. We have to report or take the materials to her, and she signs off on it showing we've completed that portion of the requirements."

Abby and Whitney both have no comments about the level of accountability in the district. For them the standards are too new to them.

Sierra puts words to their sentiment.

> Well, I mean we're at the very beginning of implementing. I mean, you know, our teachers, I dare say that any of them, have done one or two of the technology standards. We're really at the beginning stages. I think a lot of them are really frustrated and don't know what to do with them.

Discussion and Analysis

The following section presents a discussion and analysis of Fort Campbell City Public Schools. Definition of terms, influencing factors, inhibiting factors, integration and classroom use of technology, leadership and planning, and accountability are discussed.

Definition of Terms

In defining the terms mandates, *TSIP*, and technology integration, participants provided a range of responses. While their definitions did not vary greatly, as they moved from general to more specific terms, the nuance of meaning changed. These variances in meaning did not seem to depend on skill level or position. One explanation for the subtle differences may be the various perceptions, beliefs, and experiences that the individuals held about technology and about their experiences with past mandates such as the SOLs.

Definition of mandates.

When defining the term "mandates," most of the participants associate it with something that they have to do or are required to do. However, beyond this are individual nuances. For example some see mandates as a collection of procedures or rules, while others see them as a means of achieving a level of consistency or equality across the state. Still others speak about mandates in terms of what they do to improve education or to create an added burden on the schools.

Definition of Technology Standards for Instructional Personnel (TSIP).

The *TSIP* are defined generally in terms of the division-wide technology notebook or portfolio. While participants differ in terms of their purpose, and suggest they are for compliance, proficiency, and insuring that teachers can operate a computer at a basic level.

Definition of integration.

In terms of technology integration, most of the participants identified it as using technology as an instructional tool or a learning tool. Others see integration in terms of simply using it in some form in the classroom. Still others see it as something that is seamless and not taught apart from any core subject area.

Inhibiting Factors

Participants were asked to identify factors that were inhibiting to technology integration. These factors were arbitrarily classified into six broad categories. These categories were (1) personnel and support, (2) training, (3) time, (4) funding, (5) access to resources, and (6) fear and resistance. Of the inhibiting factors, time was reported most often (67%), followed by access to resources (53%), and fear and resistance (53%). Training (27%) was next. Funding and personnel and support were reported least often (20% each). These factors can be seen in Table 24 and Table 25.

Table 24

Factors Identified as Inhibiting or Enhancing Integration of Technology by Location

Name	PS	TR	TI	FU	AR	FR
Central Administration						
Ebony Rathman	I	E	I			I
Georgia Elliott	I		I/E	I		I
Darius Price				I	E	
Erin Shute		E		I	I	
Victoria Hemingway		E	I		E	I
Ronald Reagan Middle						
Joan Kennedy		E	I		I	I
Catlin Rutherford		I/E	I		I	I
Max Pasternak		I	I		E	
Selena Streiber		E	I		I	
Andrew Johnson Elementary						
Seth Merton					I	I/E
Sierra Rand	I	I/E			I	I
Yasmine Esquivel			I	E	I	
Megan Canfield		E			I	
Abby Vidal	E	I	I			
Whitney Jennings			I			

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance; I = inhibiting factor; E = enhancing factor.

Table 25

Factors Identified as Inhibiting or Enhancing Integration of Technology by Level

Name	PS	TR	TI	FU	AR	FR
Administration and Support						
Ebony Rathman	I	E	I			I
Georgia Elliott	I		I/E	I		I
Darius Price				I	E	
Erin Shute		E		I	I	
Victoria Hemingway		E	I		E	I
Joan Kennedy		E	I		I	I
Seth Merton					I	I/E
Sierra Rand	I	I/E			I	I
High-Level Technology User						
Catlin Rutherford		I/E	I		I	I
Yasmine Esquivel			I	E	I	
Mid-Level Technology User						
Max Pasternak		I	I		E	
Megan Canfield		E			I	
Abby Vidal	E	I	I			

Low-Level Technology User						
Selena Streiber	E	I		I		
Whitney Jennings		I				

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance; I = inhibiting factor; E = enhancing factor.

Enhancing Factors

Participants were asked to identify factors that were enhancing to the integration of technology. Like inhibiting factors, these were arbitrarily classified into the six broad categories of (1) personnel and support, (2) training, (3) time, (4) funding, (5) access to resources, and fear and resistance. Of the enhancing factors, training was reported most often (53%), followed by access to resources (20%). Personnel and support, time, funding, and fear and resistance were all reported with the same frequency (7%). These factors can be seen in Table 24 and Table 25.

Integration and Classroom Use of Technology

At the middle school level, integration was largely presented as support to instruction through instructional learning systems such as *Cornerstone*® and *Orchard*®, and technology applications classes where technology was the focus. Where technology integration was evident at the classroom level, it was primarily as an aid to teacher-centered instruction.

At the elementary level there was no evidence of technology integration. Participants were unable to demonstrate technology integration within their individual classrooms, since access to computers was limited to the teacher computer and one mobile computer lab shared by the entire teaching staff. The one class observed in the library, which had direct access to the portable lab, spent the period watching a video. As such, their level of integration was not able to be determined. However, from interviews, it is very likely that teachers, at least at this one elementary school, are resistant to using technology for a variety of reasons, including problems with equipment, issues of time and logistics of moving and setting up the mobile lab, and lack of training on its use.

Leadership and Planning

Technology within Fort Campbell is directed from the centralized management information systems (MIS) department. Central administrative MIS officials oversee the site-based, volunteer technology facilitators or ITS staff. The ITS staff, in turn, assist with tracking teacher completion of the *TSIP* standards. Due to time and access factors the ITS staff do little to assist teachers in technology use and integration in the classroom. In addition, participants voiced concern over what they felt was a lack of responsiveness and interest in pushing the *TSIP*. The number of participants that had only been informed about and received the *TSIP* standards during the year, rather than four years earlier evidenced this. This may be due to the complexity and size of the district administrative organization.

Accountability

Accountability in Fort Campbell has been achieved through the division-wide technology notebook that the ITS sign off once teachers can demonstrate that they have produce a specific product. The integration standard is achieved, according to the notebook, when teachers can produce a lesson plan showing integration of technology.

While this provides a minimum level of accountability, follow-up is not a priority and further assessments and tracking of teachers' progress have not yet been developed. It is likely that the accountability within Fort Campbell comes from the personal willingness of the individual ITS to make sure, as Megan says, "You've got to do and you've got to show that you are capable of using technology." Development of the division-wide technology notebook and announcement of the *TSIP* requirements, linked to recertification may not have, as Megan puts it "stirred up the hornets nest," but it seems to have elevated the level of concern on the part of the participants. It is likely that the other schools in the district have experienced the same increase in concern over the standards.

Appendix D: A Case Study of Grainger City Public Schools

Appendix D presents a case study of Grainger City Public Schools and their attempts to integrate technology into classroom instruction as part of a Virginia state mandate. The case study is organized into seven categories – district context, participants, definition of terms, factors inhibiting integration of technology, factors enhancing integration of technology, integration and classroom use of technology, leadership and planning, and accountability. A discussion and conclusions section, at the end of Appendix D, provides a within-case analysis.

District Context

The context of Grainger City is presented through the perspective of the city, school district administration, middle school, and elementary school.

Grainger City

Grainger City is an urban center of approximately 17,500 people. Of this number 93.6% are Caucasian, 5.6% are African American, 0.0% Hispanic, 0.4% are Asian, 0.4% are other races. Grainger is an industrial city. However most of its industries are smaller trade and professional operations hiring less than 100 employees. Salaries range from less than $10,000 to approximately $45,000. In recent years the city has experienced a number of business closures and, as a result the schools have been witness to declining enrollments.

District Administration

The school administrative offices of Grainger City Public Schools are located in a wooden three-story structure. It is located in a low- to middle-income residential section of the city. The area seems to be in transition, since some of the adjacent residences have been converted to small shops. The administrative offices serve a small division of only six schools representing 4 elementary, 1 middle school, and 1 high school. The district has a student population of approximately 2,400. Of this number 42.3% are eligible for free and reduced lunch.

Almost 100% (97.7%) of the district's teachers and administrators have met the *TSIP* standards as they define them. The district has historically done well for its size. Originally the district was able to place a bank of five computers in each classroom and install a wide-area network. However, in recent years may of the computers have been redistributed and some no longer function. Additionally, the wide-area network was down for approximately one year. Now the district is in transition with its technology. Within the past two years, the district has moved all of its computers from a Macintosh to a PC-based platform. The former Director of Technology has been moved back to his former position as school librarian and now serves the middle school. A new Director of Technology has been hired, the network has been repaired and upgraded, and computer standardization has been established around Dell computer systems, running *Windows 95®* or *Windows 98®*.

The Director of Technology is in charge of all administrative information systems, instructional technology, technology repair and training, including responsibility for implementation of the technology standards. One secretary and one network/repair technician provide support.

As part of the transition, the district has moved from a classroom mini-computer lab configuration to one that is lab-centric, placing the majority of their computers in two to three computer labs per building. Teachers are provided one computer for their classroom use. Additionally two to four classroom computers are available for teachers that have shown an interest in using them for classroom instruction.

Van Buren Middle School

Van Buren Middle was built around 1910 and opened as a high school. It became a junior high in 1953. It now serves grades six, seven, and eight as a middle school. The school underwent one major renovation in the mid-90s.

The school has an enrollment of approximately 550 students from a primarily white population. The student population is composed of 88.7% are Caucasian, 8.8% African American, 1.8% Hispanic, 0.7% Asian, and 0.0% other races. Of the 550 students 41.7% are eligible for free and reduced lunch.

The administrative staff at Roosevelt consists of one principal, one assistant principal, two full-time guidance counselors, and one secretary. The teaching staff comprises 28 full-time teachers. Support staff includes one full-time library media specialist.

Van Buren houses 3 computer labs, with 25 computers in each running *Windows 95*® or better. Each classroom teacher has a computer in his or her classroom with Internet access.

Franklin Pierce Elementary

Franklin Pierce Elementary School is a two-story brick structure built in the mid-50s. The school is located on the periphery between a residential neighborhood and the main business district. The grounds are small and cramped. The school serves approximately 300 students from Pre-K through fifth grade. The student population is composed of 90.9% Caucasian, 7.3% African American, 0.7% Hispanic, 1.1% Asian, and 0.0% other races. Of the 300 students 67% are eligible for free and reduced lunch.

The school staff consists of one principal, a secretary, 15 classroom teachers, and 1 resource teacher. There is one full-time library media specialist.

The school houses two computer labs, plus a computer for each classroom teacher. Some of the classrooms have two to four additional computers for student use.

Participants and Data Collection Sources

Ten individuals participated in this case study. They include two at the district level, four at the middle school, and four at the elementary level. Participant demographics are provided in Table 26. They range in age from 26 to 61 years with a mean age of 46. Participant years of experience in education range from 2 to 39 years with a mean of 21 years. Their years in their present positions range from 1 to 18 with a mean of 6 years.

Two district-level administrative-level staff members, Miriam Steinbeck and Robert Lawrence, are in charge of instructional technology integration and training in Grainger City. Miriam is in charge of classroom instruction within the district and directly supervises Robert Lawrence. Robert is responsible for all aspects of technology within the district. Robert supervises a small technology support staff consisting of a network technician, and a secretary. This staff is responsible for dealing with the network and the servicing of computer hardware and software within the district. In addition, each school has an instructional technology specialist or coordinator (ITS). This position is voluntary and individuals serving in this capacity receive a stipend equal to two percent of their annual salary. The ITS serve as the front line of troubleshooting at the school site and sign off on teachers' technology standards for their building.

Participants' data were collected from interviews, classroom observations, teacher lesson plans, technology checklists or portfolios. Robert was not able to locate the old technology plan for the district and was in the process of revising the new district technology plan. Data collection sources are shown in Table 27. Teacher participants identified by their principals as low-, mid-, and high-level users of technology are presented in Table 28.

A total of seventeen classroom observations were conducted including 9 at the middle school level and 8 at the elementary level.

Table 26

Participant Demographics for Grainger City Public Schools

Name	Position	Sex	Race	Age	YIE	YIP
Central Administration						
Miriam Steinbeck	Asst. Sup. C&I	F	White	54	32	3
Robert Lawrence	Dir. Technology	M	White	32	2	2
Van Buren Middle						
Emma Murdock	Principal	F	White	59	30	1
Avery Moore	Librarian	M	White	54	31	2
Mariah Patton	Teacher	F	White	26	2	1.5
James Cannell	Technology Teacher	M	White	40	16	11
Franklin Pierce Elementary						
John Pynchon	Principal	M	White	61	39	9
Maya Singer	Grade 3 Teacher	F	White	47	24	18
Laura Tey	Resource Teacher/ITS	F	White	41	18	11
Laurn Adams	Title I Teacher	F	White	41	20	4

Note: YIE = years in education; YIP = years in current position; ITS = Instructional Technology Specialist; Asst. Sup. C&I = Assistant Superintendent for Curriculum and Instruction; Dir. Technology = Director of Technology.

Table 27

Data Collection Sources from Grainger City Public Schools

Name	Int.	Obs.	LP	TC	TP
Central Administration					
Miriam Steinbeck	X				
Robert Lawrence	X				X
Van Buren Middle					
Emma Murdock	X				
Avery Moore	X	X	-		
Mariah Patton	X	X	X		
James Cannell	X	X	X		
Franklin Pierce Elementary					
John Pynchon				X	
Maya Singer	X	X	-		
Laura Tey	X	X	-		
Laurn Adams	X	X	-		

Note: Int. = interview; Obs. = classroom observation; LP = class lesson plan; TC = technology checklist or portfolio; TP = district technology plan; Dashes indicate the data was not available.

Table 28

Teacher Level of Technology Expertise as Identified by the School Principal Participants in Grainger City Public Schools

Name	HLU	MLU	LLU
Van Buren Middle			
Mariah Patton	X		
James Cannell		X	
Avery Moore			X
Franklin Pierce Elementary			
Laurn Adams	X		
Maya Singer		X	
Laura Tey			X

Note: HLU = high-level user of technology; MLU = mid-level user of technology; LLU = low-level user of technology.

Definition of Terms

Participants were asked to provide their definition of three terms relative to the Virginia state mandate for integrating technology into the classroom. These terms were mandates, Technology Standards for Instructional Personnel (*TSIP*), and technology integration. Their definitions are grouped by administrative staff (including school principals) and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Definition of Mandates

Miriam, Robert, Emma, and John agree that mandates are "requirements" or "regulations" from the state. Miriam and Emma both add the element of equalizing services. Miriam says that mandates are "to insure some sort of equality or uniformity of service across the state." Emma thinks "it's for consistency, so we will, I guess you'd say have equality if there is such a thing."

The high-level technology using teachers, Mariah and Laurn, reflect on mandates as something that improves instruction and the schools. Mariah says, "I guess it is what is required by the state for us to teach." Laurn refers to mandates as "guidelines" or "policies that are given to us to help improve our school system."

Mid-level technology users James and Maya define mandates from different perspectives. James sees mandates as "any directive that's been handed down by the state that I must implement in the classroom." Maya defines the term mandate in terms of *TSIP* standards. She states that mandates are standards for "preparing teachers in accordance with what [the state] feels should be met for the 21st Century for the children technology wise and how we address them."

Low-level technology user, Avery, echoes Maya's *TSIP* related definition. They are "standards to get everybody up on board in terms of technology into the curriculum." Laura defines mandates as "required by the state to do" and then adds that it is something "to make us miserable."

Definition of the Technology Standards for Instructional Personnel (TSIP)

The administrative and support staff varied on their definition of *TSIP*. Miriam, cannot locate her copy, but simply refers to the state standards by saying, "I would take you to the net, to the Internet and show you where those are. We have a hard copy around here somewhere I suppose." Robert also does not readily define the *TSIP* but, instead, discusses the ways in which teachers can be checked off on the standards. John and Emma provide still different perspectives on the *TSIP*. John notes they are standards "mandated by the state" as a "tool that you can use to make your teaching more lively or to make it more, in some cases, interesting to the youngsters." Emma believes that they "are minimal skills that you must use to carry out your assignment as a teacher." She adds, "such as being able to use the computer in a way that teaches students how to access information, students how to become smarter on their own, so to speak, be creative."

Avery sees the *TSIP* in terms of his experience taking a series of six classes that he and other teachers attended in order to be certified as having passed the *TSIP* standards. His definition is,

> I would say, okay the School Board passed a document some years back, three or four years back, that told us that we needed to take certain classes or whatever and for the most part myself and all my teachers went through that regimen of classes and received our certificates, meaning that we were certified as being, as meeting the State Department mandates.

James sees the *TSIP* as "a set of guidelines" or "competencies of the material that you must cover in the technology classroom." Mariah defines the *TSIP* as "just the requirements that we have to have – Technology requirements so that we can better explain or better teach the children using those requirements."

Like Avery, Laurn defines the *TSIP* in terms of her experience with classes she has taken to become "certified" on the standards.

> Okay, what I did a couple of years ago. We were told that we would be receiving technology training, and, what that consisted of. We each took a series of courses. We started out very basic with some people who had never even seen a computer actually seen it but not worked on a computer so we started very basic with turning it on, the basic operations. We worked with Excel. We had to become familiar with *Excel*®, *PowerPoint*®, *Word*®, and we did *Hyper Studio*®. I think were the four basic. Then we could go on to learn presentations actually presenting presentations with *PowerPoint*® and how to take a computer apart, how to put it back together. We actually went into class one day and it was completely apart. We were given the cords and the monitor and it was okay, we will begin class when your computer is up and running.

Laura defines the *TSIP* as simply another "state requirement." Finally, Maya sees the *TSIP* as "preparing teachers in accordance with what [the state] feels should be met for the 21st century."

Definition of Integration

The administrative and support staff varied on their definition of integration. Miriam defined integration as using technology as "an instructional tool, period." Robert saw integration as "transparent." He states,

> I think technology integration is really when the use of technology is so transparent that it's not even noticeable. I mean when it's just a part of your everyday life you know it's not a big deal for the kid go back on the computer and search for something that you all were talking about in class or something like that.

Emma defines integration as "applying what you learn through your books, or whatever, applying that using the technology." John defines it as making technology "a tool, to be utilized to make our curriculum more viable, more relevant, more up-to-date."

James begins to define integration as "a research tool and as a learning tool." But, then extends his definition, "I don't think of integrating it into the classroom, but I'm the technology teacher, I'm integrating it into their life." Avery believes that integration is "computers anytime, anywhere, anyplace. Full access to them." However, Mariah doesn't offer a definition, but simply says, "I don't know. I don't feel comfortable answering that question."

Laurn defines integration from the perspective of her grade level. "Integrating technology at this level is actually making it accessible to the students." Laura sees integration at a basic level. She says, "integration means having a computer in the classroom." Maya sees integration as positive access. She states, "I think anytime a child can be exposed to the computer in a positive way would be technology integration."

Factors Inhibiting Integration

Like definitions, participants were asked to identify factors that inhibit the integration of technology from their perspectives. Their responses are presented grouped by administrative and support staff (including school principals), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

Administrative and support staff found personnel and support, training, time, funding, and access to resources to be inhibiting factors.

Miriam identifies personnel and support, time, and funding are inhibiting factors. For Miriam personnel and support issues revolve around the ITS, their skill level, and their lack of access to the staff, especially at the elementary level. “The elementary schools very often that the site coordinator is the librarian. Some of those people are not the most skilled. So that's not worked as well as it should for us.” She adds, “what doesn't work with that is that person's not readily available in the middle of the day when a teacher's having a problem because they're in a classroom with their own children.” Often time has become an issue in the selection of the ITS. As Miriam comments, “When we first named certain people as technology site coordinators sometimes that decision was made by this criteria who in that school has some free time and some computer skills, and then that's the site coordinator.” She says, “It's not resources. I'd say it's probably the allocation of time that's been the hindrance.” This limits the amount of training that can be done. Miriam comments about the small staff size and that “Teachers are stretched. They're time is really quite short. A number of them, I mean, they have any number of other responsibilities.” While funding has not been an issue, Miriam feels that it is now looming as something that could potentially affect technology and its integration within the district.

> It has not been until now a money issue. It has not been a money issue [Closes door, outside conversations in hallway]. We have had the resources for a division of this size. It could be that there are too many things on the to do list for teachers and building administrators and central office administrators. There are too many things out there that have to be done and have to be done now. And, technology is not unfortunately the most significant one.

For Robert Lawrence, influencing factors are funding, personnel and support, fear and resistance, and training. He is faced with little new monies except those he gets from the state and says, “There's not really any hardware accounts provided by the school board.” He continues,

> The honesty of it is that they don't give us any money at all. It all comes from the state so we have we're confined to whatever perimeters they give us. If we get $200,000, then we can only replace or buy new with that amount.

In terms of personnel and support, Robert reflects on the technology issues of the past,

> Our teachers are behind in technology. There was a huge push for those UVA classes and everybody got into them and about that time the school system went through a change in the person who was running the computer network and they were down for a long, long time. When I got here, only about 30 percent of the computers could actually get on the Internet and out of about 100 network printers, only 3 worked in the entire system.

Robert also sees teachers as increasingly frustrated with technology and the ITS staff as insufficient support as he comments, “We don't have a single person who does instructional technology as their job.” Part of Robert’s frustration is with the fear and resistance of the older staff. He says, “We've got an old staff. I would say I believe the statistic was that 70 percent of the staff was like within 3 years of retirement.” He feels that some of the teachers “are scared to try to get in the lab and put something on the screen cause they don't they think maybe they can't get the projector turned on right or whatever you know.” Between interviews, Robert also related a story about one principal that would not allow technology into their school. Robert indicated that this decision was made because the principal believed that computers were “the work of the devil.” Training is another inhibiting area for Robert. Since he is the primary technology trainer, training is “generally done after school.” However, he states that few people show up at training sessions offered. As he puts it,

> If I get five or six people in a training session, that's a pretty large amount of people. So, I don't have a lot of demand for it. I don't have people begging me for stuff or anything like that. It's almost all push.

He attributes this to teachers’ over confidence in their own abilities. Robert states,

> I think the teachers have a false sense of competency from the classes they took from UVA. When I got here, I sat in a couple of those classes. And, I found that teachers were taking the classes. But, in some cases, there was one or two people standing around another person watching them do it and they weren't doing anything while they were still passing the class.

Emma Murdock identifies training and time as inhibiting. She feels that training “is not mandated” and “probably should be.” Emma says, “I would like to see every teacher in my building required to do X amount of hours of staff development in the computer and technology area.” She also links training with time. Technology training classes were offered at “some wonderful computer labs” at the high school. But “3:00, you know, rush over there and stay till 6:00 or whatever and people have families.”

Time is also an issue with John. He notes,

> “It’s a time consuming thing for teachers with everything else that’s going on in their lives in teaching. Plus, most of them have a life outside of school. They just don’t have time to engage in a two or three hour in-service.”

John also sees fear and resistance as an inhibiting factor. He’s “got about five percent, mostly the older teachers, that are not comfortable” with technology. He is not “real sure how to motivate them, because retirement is on the horizon.” While he indicates, “it’s not that they have been strangers to [technology],” he feels that “having it, and implementing it and using it are two different things.”

High-Level Technology Users (HLU)

Both High-level technology users, Mariah Patton and Laurn Adams are unable to identify any inhibiting factors. While, Mariah does feel she doesn’t have time to attend training offered by the district, she blames this on her busy coaching schedule and says, “as far as I am concerned, anything that I’ve had questions about or could have taken is available to me.” Laurn shakes her head at the question, and indicates that she is unable to identify any inhibiting factors.

Mid-Level Technology Users (MLU)

Of the two mid-level technology users, James feels that funding, training, and fear and resistance are inhibiting. Relative to money, he simply states “Money. Funding. Getting the money.” He believes that training is often one-shot deals or insufficient. As he puts it, “the professional development that I’ve seen is ‘here’s the software package’ and ‘you’re going to go to a day in-service’ and ‘this is what you’re going to have to do.’” He also feels that training after school “is just not enough.” In terms of fear and resistance of teachers to technology, James says, “there are teachers “still used to the paper, calculator method” and that they “tend not to be friendly with technology.” He feels “that is where a lot of my problems are at, because they just can’t accept it yet.”

For Maya training, time, and access to resources are factors that influence integration. In reflecting back on her six-hour UVA courses, she wishes that the district “would offer us more classes, because it’s been like two years since I’ve taken computer classes.” She feels that in order to “keep the standards up” the district administrative staff should “make sure that everyone is adequately trained.” While she admits that “Mr. Lawrence will send you an e-mail and say like this afternoon we’re going to do web pages or we’re going to do *FrontPage®*, she feels that “it’s only a three-hour course” and “in three hours you can’t do a whole lot.” Maya believes that the two computer labs in her building create problems of both time and access to resources. She looks forward to the possibility of opening up one lab.

> Hopefully, we're going to have it open all the time, ready, you can go into the computer lab. We haven't ever had that. They're going to combine the two Title teachers into one computer lab, which will leave one open.

However, she admits that it would only open up about thirty minutes a week for her class and says, “thirty minutes a week is not very much out of five days. By the time you leave your classroom, walk to the lab, if another teacher’s running over, you’ve cut into your thirty minutes.”

Low-Level Technology Users (LLU)

Low-level technology users Avery Moore and Laura Tey both agree that fear and resistance is a factor in influencing technology integration. Avery frames the issue in terms of older teachers. “Yes, I think the older people truly are less accepting. They didn't grow up with it. Some of the older teachers, they're going to do only those things that they have to do to survive.”

Laura sees the issue of fear as both a lack of confidence and a mindset of the computer as evil. “I think that their biggest obstacle is that they're afraid and have no confidence in what they can do.” She adds, “So, they have a fear that they’re not, they don’t know enough, you know I need to be trained. I need to be trained. I need to be trained.” The staff has also received a new librarian. In discussing the role of the librarian, Laura talks about the issue of the computer as evil.

> What has helped us tremendously is a new librarian because she is so onboard and she is so into making this stuff work. And, she doesn't sit there and think that computers are all evil and you know the devil's playground and all that crap that I hear all the time from these people [laughs]. Good Southern Baptists–I'm all for them you know [laughs]. Yes, I am not kidding you. It's I mean it is just unbelievable the stuff you hear from some of the older people that just aren't catching on. And, I guess I'm entering that older people stage, but I just don't see myself that way [laughs].

Factors Enhancing Integration

Participants were also asked to identify factors that enhance their integration of technology from their perspectives. Responses are presented grouped by administrative and support staff (including school principals), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

Miriam is proud of the numbers who have passed the technology assessment and of the training the district has offered through UVA. She sees this as a factor that has help integration and use of technology. “We provided an opportunity for all of our teachers to get a technology certification using UVA…We took cohorts of teachers through six courses and at the end of those six courses they could receive a technology certificate.” She also comments that that “Mr. Lawrence’s office arranges a whole series of afternoon in-service sessions or mini-courses for teachers who want to come in to learn one particular skill. He advertises those throughout the district.” In addition, Miriam sees the support Mr. Lawrence offers as making a positive impact on technology.

> Before Mr. Lawrence came on board in this division. We were contracting the services, our network services, were done by private contractors. We ran into all kinds of problems, network went down for almost a year…. That was horrible timing. Then, we hired our own full-time director of technology and it's made huge difference for this division.

Robert Lawrence sees the access to resources as an influencing factor. He is proud of the network, the computers, their recency, and the teachers’ access to them. As he says,

> They've put a lot of money into it. I mean they've got a gigabit WAN and not many do. It's complete fiber optics. Most everything's a 100-megabit switched and I would guess that 75-80 percent of the machines are within two to three

> years old. More than that, probably 90 percent of the machines are within three years.

Robert admits that they "haven't been able to put computers in the elementary because of the SOL." While he says that they have, in general, "five in every classroom." He adds that there are "three to five classrooms per school who don't have any." They have addressed this by "kind of just redistributed them so you might find three or four in a classroom."

Emma, like Robert, sees access to resources as positive. Emma says, "well everybody has one computer, but most of them have five or more computers in their rooms." As she walks through the school Emma points out the number of computer labs available to teachers and students.

> We have several, you know, labs. Computer labs. We have a computer lab up side Ms. Jones' room that no one is assigned there. Teachers sign up for it. They take classes. And, then we have Ms. Jones at that lab [pointing to the entry to the lab] and then we have James Cannell in the big lab downstairs."

Like Emma and Robert, John also sees access to resources as positive. Regarding teacher access to computers, he states, "all of them, at least one, and some of them as many as five. In addition we have the lab." He knows that "the middle school and high school will get first priority on the latest" computers, but is looking forward to additional computers coming from these schools as the "trickle" down. In reflection, he adds "even though they're a couple of years old, they're very useful for us. And youngsters and teachers use it."

High-Level Technology Users (HLU)

High-level technology users Mariah Patton and Laurn Adams both see training as positive factors. However, their perspectives of training differ. Mariah sees training from the perspective of local district training. Mariah, discussing her technology training opportunities states,

> We have the opportunity to take different courses. I, myself, took a Front Page class at the beginning of the year. Any kind of computer program, he, our technology coordinator offers them throughout the year and usually has follow-up courses later on for them.

Laurn relates to technology training through her experience with the UVA classes. In discussing the experience, Laurn recalls,

> We were told that we would be receiving technology training. And, what that consisted of. We each took a series of courses. We started out very basic with some people who had never even seen a computer actually seen it but not worked on a computer so we started very basic with turning it on, the basic operations. We worked with *Excel*®. We had to become familiar with *Excel*®, *PowerPoint*®, *Word*®, and we did *Hyper Studio*®. I think those were the four basic. Then we could go on to learn presentations actually presenting presentations with *PowerPoint*® and how to take a computer apart, how to put it back together. We actually went into class one day and it was completely apart. We were given the cords and the monitor and it was 'okay, we will begin class when your computer is up and running.'

Mid-Level Technology Users (MLU)

Like Mariah and Laurn, both James Cannell and Maya Singer see training as positive. While James believes both the UVA classes and local training are positive, Maya remembers the UVA classes.

James believes that the district has “a very intensive, I guess you could say, series of classes you can take. Teachers can take.” He indicates that the district web site is a place where “teachers can go and sign up for a series” of classes and that the list is “updated daily.” James also remembers the UVA “technology cohorts” and recalls them as covering “basically your Internet, word processing, databases, spreadsheets. Just general computer knowledge.”

Maya chose not to do a technology portfolio offered by the district as an option for meeting the technology standards. Instead she opted to take the UVA classes. “I just thought I’d rather do the classes and be there with the professor and be exposed and talk with other people.” She wishes that the district “would offer something more intense again.”

Low-Level Technology Users (LLU)

Low-level technology users, Avery More and Laura Tey differ in their identification of positive factors influencing technology integration. While Laura sees the training being offered as positive, Avery does not identify any positive factors.

Laura finds the “three-hour classes offered throughout the year” helpful. She says, “There’s been a lot of training offered” through the district. “There’s been three or four classes a month that were offered in the different labs.” Laura sees the portfolio assessment as a better option than the UVA classes. She explains,

> I think the portfolio standards as a minimum you know like it says minimum, are really good and that it requires you actually to do a whole lot more than we ever did in those six classes to get that UVA certificate.

Integration and Classroom Use of Technology

As the influencing factors indicate, Grainger has the resources it needs to integrate technology. Because Grainger's schools have computer labs and classroom computer access teachers have opportunities to integrate technology using both.

Middle School

At the middle school level, teachers' integration of technology is a mixture of traditional instruction (i.e., lecture), classroom computer use, and lab time. Observations of classes at this level reflected this.

During classroom observations, James Cannell presented conceptual information regarding electric wiring of a light bulb. During this he spent the entire class discussing how lights worked and how wiring was connected, using only the chalkboard and a model of a light socket. In another class, students went outside to put paint on wooden model cars they were building. During this class period no computers were used, however, James said that the students using either *PC Paintbrush*® or *PowerPoint*®, initially designed the models, in an earlier class. During the third observation, James moved into the computer lab and had students show their presentation that they had created using *PowerPoint*®. The students had been asked to identify a country they were curious about and to develop a tour of that country. Each student took turns presenting. One student "forgot" to bring his presentation in on disk. Another student had use a Macintosh computer at home to create his presentation and could not get the file to load on the school computer. James Cannel's lesson plans are arranged by grade level in booklets by class. Each lesson is numbered and provides objectives and directions for students as they step through the lesson. Lessons are composed of a combination of *Microsoft Windows*®, *Word*®, *Excel*®, and *PowerPoint*® exercises that are a mix of English literature, history, mathematics, and technology.

While Avery is considered as a classroom teacher by the principal, as the school librarian, he does not have set classes. Students come to the library individually, by groups, or as a class, by arrangement with their subject area teachers. During observations, teachers leave their students with Avery and he covers topics such as organization of the library, use of the electronic card catalog, and research skills. When teaching the use of the card catalog or on-line research skills, Avery utilizes the small bank of six computers. For larger groups, students share the computers two or three to a station. Avery does not keep lesson plans, since he does not have a set number of classes. However, he feels that he has done library work long enough to have it "all in his head."

Mariah Patton is stationed in one of the school's computer labs. She primarily teaches typing and computer skills. During two observations she has students spend the class periods working in their *Twenty-First Century Typing* books. She apologized for not having "anything more exciting to observe." During the third observation Mariah, like James, uses Internet to have students research their favorite countries. Her goal is to have students use the Internet to research countries; use *PowerPoint*® to develop a presentation about the country; and use *Word*® to write their report. She has no "formal" lesson plans with the exception of those provided in the *Twenty-First Century Typing* teachers' manual and several *Microsoft Works*® lessons she has developed to supplement typing exercises.

Elementary School

Teachers at Franklin Pierce Elementary utilize the school's main Title I computer lab for much of their integration. The teacher's observed indicated that the two to four classroom computers provided in the building, where available, are also used for integration of technology into classroom instruction. Each teacher observed at the elementary level indicated that they did not have and are were not required by their principal to have "formal lesson plans."

As the school's Title I teacher, Laurn utilizes a lab of seventeen computers. Students are provided access to several reading and math software programs including *Joseph's Reader*®, *Jump Start Math*®, *ALS*®, and *The Schoolhouse*®. As students enter her classroom they are directed to take their seat and pick up where they have left off. Students use headsets to listen to directions and interact with the software. She repeats this process for subsequent observations.

Maya Singer integrates technology into her classroom using four Dell computers stationed at the back of her room. During observations, students took turns, three at a time, moving from seatwork to working at the computers. Each student was assigned to write a report. They were first asked to write the report on paper and then go to the computer and "write the report and then print it out using *Microsoft Works*® and their *PAWS*® (a typing tutorial program) skills. During observations Maya identified the word processor to be used as *Works*® *and Word*® interchangeably. Maya also instructed students to indent paragraphs using the spacebar rather than using the tab key. She also told one student, when she asked how to center the title line, to “line it up with your eye and then just space over.” Students were also asked to print out their report on the classroom laser printer (HP4050n) and turn it into their teacher.

Laura Tey, the school’s technology coordinator has a classroom crowded with paper and other materials. She is a self-described “pack rat.” The classroom is outfitted with a “lab” of four aging generic computers. She uses a Dell laptop as her personal computer. During each of the class observations, Laura gave students seatwork in workbooks while giving oral tests to individual students, taking turns one after another. During observations, none of the computers were turned on or used. During the last observation, Laura apologizes for having to give the tests, but indicates that the principal has asked her to take students from three other classes and do testing with them. She states, “I have no idea why he asked me to do this knowing you were coming.”

Leadership and Planning

The change in leadership within the district has given the primary planning and implementation of technology to Robert Lawrence. He is assisted by a limited staff and by those chosen, at the school sites, to be technology specialists.

Miriam Steinbeck sees the change in technology leadership in Grainger supportive of technology.

> We've had the resources, of course, not as much as we'd like to have and we never do have, but we have had the resources. We have had the leadership in this division over the last couple of years since we established our own division of technology. That's been key for us.

When asked about the push for technology in the district, Robert responds, first in terms of his view of the superintendent and then the assistant superintendent.

> He's not an impediment to technology. He supports me but he's not a user of it and Steinbeck is not big into using technology in the classroom either. She's accused me of trying to make network engineers out of people and I'd just like them to be able to log in [laughs].

This lack of "push" is also reflected in other staff comments. Avery says, "to my knowledge, or my feeling is there is nobody that's really pushing it." Laura also states "well, we don't have good leadership."

The district is currently revising their technology plan. They are still in transition from the change in the technology leadership from two years earlier. The technology plan was not made available despite multiple requests both by phone, e-mail, and in person to obtain a copy of the plan currently "in force." The plan was later obtained through a request to the Virginia Department of Education.

The Grainger technology-planning document is a three-year plan composed of ten sections including, vision, mission, how technology will be used, current status, needs assessment, goals and objectives, timeline, the TSIP standards, evaluation, and budget. The primary goal of the plan is to use technology to support teacher training for its use. Since the plan was written before the arrival of Robert Lawrence, the plan makes the district technology coordinator, not the technology director, responsible for implementation of the *TSIP*.

Three methods are used to "verify" that teachers have met the *TSIP*. Robert Lawrence discusses these methods.

> The way we actually do it is we have a technology coordinator at each school. The technology coordinator keeps track of the teacher's progress toward the certification and we have three methods to certify. One is a portfolio and we have a list of objectives that teachers have to meet and there's a *PowerPoint*® presentation, an *Excel*® spreadsheet, there's *Word*® documents and there's some calculations involved and letters and junk like that that they have to do. And, the second one is we offered a set of courses through the University of Virginia. It was I want to say it was 45 hours but I'd have to check. And, if they completed that set of courses, then we certified them. There was no testing or anything like that. And, then the third method is their transcript. This usually only applies for a new person coming straight out of college. If their transcript seems to indicate that they've had a pretty good number of technology courses then we kind of just wave a magic wand over them. For transfers we if they were certified when they came in, then we say they're certified. If they were not certified when they come in then they have to start over in our program.

Through the portfolio, technology skills are assessed through teachers being checked off on 21 of 52 items across the eight *TSIP* standards over a three-year period. These are as follows:

YEAR ONE

- Standard 1: Operate a computer system and utilize software [Three of the following]:
    - A disk on which you have saved at least two files,
    - The print-out of two original documents created with different software,

    - A list of at least three trouble-shooting operations you have accomplished and their dates,
    - A printout of information from a CD-ROM,
    - Demonstrate to a technology specialist you ability to set up a computer system;
- Standard 2: Apply knowledge of terms associated with educational computing and technology [One of the following]:
    - Successfully complete the school division "Technology Vocabulary Quiz",
    - Activity or lesson you have developed to teach appropriate technology vocabulary to your students,
    - Printout of a multi-media presentation;
- Standard 3: Apply productivity tools for professional use [Four of the following]:
    - Two professional word processing documents, at least one of which contains a graphic relating to the subject or text,
    - A computer generated grade report on a student or class group,
    - A computer generated test or activity for a class you teach,
    - A printout of a database of student or other professional information,
    - A printout of a spreadsheet used to record class or other professional information,
    - A printout of e-mail correspondence (at least your message and a reply) with a colleague about a professional or curricular issue,
    - A computer generated cross word, word search, or other puzzle or game,

- A printout of web based information you retrieved for professional use,
- The URL and a printout of a web page created by you as a resource for your students and/or their parents,
- Evidence that you have used technology to produce a bulletin board, learning center, or learning games,
- A student activity for a class you teach, created with technology,
- A printout of a digital camera image that you produced for a professional activity;

<u>YEAR TWO</u>

- Standard 4: Use electronic technologies to access and exchange information [Three of the following]:
    - A lesson plan that incorporates students' active use of the World Wide Web,
    - A printout of web based information you retrieved for instructional use,
    - Evidence of your class's participation in a web project,
    - A print-out of e-mail correspondence between you or a member of your class and an adult "expert" at a remote site about a topic of curricular concerns or interest,
    - A printout of an electronically generated list of sources available in your school or an area library on a topic of interest to you and your class,
    - A write-up of the search strategy you used to access specific information from the web or an information database,

    - A printout of a thread or an e-mail conversation from a professional listserv you have joined;
- Standard 5: Identify, locate, evaluate, and use appropriate instructional technology-based resources (hardware and software) to support SOLs and other instructional objectives [Four of the following]:
    - Printout of a digital camera image that you produced for a curriculum related activity,
    - A document that contains a scanned image that you produced for a curriculum related activity,
    - Lesson plan that incorporates student use of computer assisted instructional software,
    - Lesson plan that incorporates laser disk usage by teacher or student in an instructional setting,
    - Lesson plan that incorporates video usage by teacher or student in an instructional setting,
    - Lesson plan that incorporates use of presentation device (not an overhead) by teacher or student in an instructional setting,
    - Review of three instructional software programs,
    - Review of three web sites that relate to you grade level or discipline,
    - Date and usage of camcorder in a professional or instructional setting;
- Standard 6: Use educational technologies for data collection, information management, problem solving, decision making, communications, and presentations within the curriculum [Four of the following]:

- A copy of a student generated word processing document from a class assignment,
- A copy of a student generated database from a class assignment,
- A copy of a student generated spreadsheet from a class assignment,
- A copy of a student generated desktop publication from a class or extra-curricular activity,
- Evidence of your class's participation in a web project,
- A printout of e-mail correspondence between a member of your class and an adult "expert" at a remote site,
- A printout of a multi-media presentation generated by you for a professional or instructional purpose,
- A printout of a multi-media presentation generated by your students
- The URL and a printout of your class's web page,
- Date of usage of a presentation device in a professional or instructional setting (do not include overhead projector),
- A copy of a management plan developed by you to assure frequent and equitable use of classroom computers or other technologies by your students;

YEAR THREE

- Standard 7: Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings [Must do item (A); select one from the remaining choices]:

   - The signature of your principal or designee indicating that they observed a lesson that successfully included student use of technology,
   - A bibliography of resources on a specific curriculum topic that you created using your school's electronic information databases and/or electronic catalog,
   - A lesson plan that utilizes one computer in your classroom,
   - A lesson plan that utilizes the computer lab;
- Standard 8: Demonstrate knowledge of ethical and legal issues relating to the use of technology [Required]:
   - Read a document on computer ethics and copyright guidelines or attend a staff development session that reviews the document; sign and submit a statement that you have read it and agree to abide (Document provided by School Technology Coordinator).

The complete checklist for Grainger City Public Schools is provided in Appendix Q.

Accountability

Accountability for teachers in Grainger completing the *TSIP* standards, including the integration of technology, is handled primarily through a lose check-and-balance system that largely rests with the school ITS. The portfolio and classroom observations are recognized as the primary means of accountability.

District Administration

Miriam admits "In terms of how we hold teachers accountable? We don't do real well there." The process is mainly "you put it on a disk. The technology coordinator signs off on that portfolio. That paperwork comes here to the personnel office, and they don’t go back and check it. They simply say, ‘yes this person has met the technological requirements for recertification.’” They do “keep logs of computer lab usage and that kind of thing,” however; they “don’t really go back and look at those things.”

Robert feels that the main responsibility lies with the school principal. When talking about accountability, he states, “well, I guess accountability is at the individual level, you know, primarily. But the principals are supposed to be tracking this and you know they’re responsible for their own teachers.”

Middle School

At the middle school level, Emma Murdock feels that her school is doing well in terms of technology. When asked about accountability she responds in terms of the state’s role.

> I think the state said hey public education or education in general, public meaning what they're responsible for. We have to do something to better prepare and if you're not going to do it locally, then we're going to help you do it, or we're going to show you. We're going to demand you do it, and we're going to hold you accountable. And, if we're going to put money into it, if we're going to keep paying, then we have to see some results. So, it keeps us on our toes.

Mariah sees the accountability at the local site. She notes, “there’s a technology coordinator, I guess, at each school and that coordinator keeps up with the teachers from that school. So once I complete what I need to finish, I turn it in to her.

James does not comment on accountability relative to the *TSIP*, but instead says that he uses the SOL criteria for seventh and eighth grade. “I use that criteria probably more than any other check sheet, because in my classroom, I know what I have to cover.”

Avery sees accountability as a problem at the state level. He feels "that the state department should have put more teeth into [the *TSIP*]. Avery adds, "anybody with any sense would know that some districts are going to be more, are going to be harder, and put more emphasis and more importance on it than other systems."

Elementary School

At the elementary level, John Pynchon feels that the *TSIP* "adds more paperwork." As part of his evaluation of teachers, John visits classrooms to see if "computers were in evidence or other audiovisual equipment, such as overheads, and other things were in use." However, he admits "as a principal I don't deal directly with that. I deal with my coordinator, Laura, and let her take it from there."

When discussing accountability, both Maya Singer and Laurn Adams see it as the UVA classes or the portfolio. Maya points out "we could do either a portfolio to address the technology skill or we could do like so many classes to achieve what the state expected of us to incorporate into the classroom." Laurn echoes Maya's thoughts,

> You have a choice. You can go through the classes or you can do a portfolio and they are given a list of skills that they have to be able to master and by doing that they are given activities to do on the computer and then the portfolio is then turned over to the technology department and they're accessed that way.

Laura, the technology coordinator, sees accountability as part of necessary follow-up once teachers are "checked off" on the *TSIP*. She feels that the follow-up is not happening.

> I don't think it would be a bad idea to follow up on these teachers. You know everybody got the certificate. Okay. Well, we're all certified but then what?

> There's no follow-up or accountability after that. There's nothing that says other than the 5th grade SOLs. I mean there's nothing that says are the teachers actually doing anything with this.

Laura believes that there is little or no accountability and feels that “once you’re done, you’re done.” In addition, she thinks that the portfolio may be insufficient to insure the standards are being met.

> Those people don't necessarily know how to do any of this stuff in the portfolio. Because the portfolio, I even, I signed off on one and then I found out that the majority of work she'd not done herself…. I was like really impressed with this stuff and then when it came time to do a PTA program and she couldn’t come up with her program for her music class and wanted me to do it. I said you took the class. And she said, ‘well I don’t know how to do that.’

Discussion and Analysis

The following section presents a discussion and analysis of Grainger City Public Schools. Definition of terms, influencing factors, inhibiting factors, integration and classroom use of technology, leadership and planning, and accountability are discussed.

Definition of Terms

Participants provided a range of responses when defining the terms mandates, *TSIP*, and technology integration. Although definitions did not vary greatly, as they moved from general to more specific terms, the nuance of meaning changed. Variances in meaning did not seem dependent upon the individual participant’s skill level or position. Subtle differences in definitions may be due to the various perceptions, beliefs that the individuals held about technology, their experiences with technology, and their experiences with past mandates such as the SOLs.

Definition of mandates.

Most participants in Grainger define "mandates" as something that "must be done." Beyond this definition, participants vary in their understanding of the term. Some associate it with what must be done in the classroom or as part of the curriculum to prepare students for the future. Others see it as a burden placed on the locality or define it simply as a set of guidelines. Still others define mandates as something to improve the schools.

Definition of Technology Standards for Instructional Personnel (TSIP).

Teachers and staff in Grainger define the *TSIP* both in terms of the standards presented by the state "to be checked off" and as events or artifacts. The primary event for Grainger teachers became the six courses they had through UVA two years ago. The primary artifacts were teachers and administrator technology portfolio components, such as the word processing documents, spreadsheets, charts and graphs.

Definition of integration.

In terms of technology integration, most of the participants identified it as using technology as a tool. Others saw integration in terms of student access to technology. Still others saw it as making learning more "alive" or interesting to students.

Inhibiting Factors

Participants were asked to identify factors that were inhibiting to technology integration. These factors were arbitrarily classified into five broad categories. These categories were (1) personnel and support, (2) training, (3) time, (4) funding, and (5) access to resources. Of the inhibiting factors, fear and resistance was reported most often (50%), followed by time and training both reported equally (40%), and funding (30%). Personnel and support (20%), and access to resources (10%) were reported least often. These factors can be seen in Table 29 and Table 30. The resources found while observing the district support the notion that access to resources is least inhibiting to technology integration. While it would seem logical that personnel and support would be ranked high as an inhibiting factor, given the small technology support staff, this is not the case. This may be attributed to the support given to teachers by the ITS at the school sites. However, it is more likely that this is, as Robert Lawrence points out, a “false sense of competency” in the teachers’ own technical knowledge and the high rate of teachers “passing” the UVA courses or being “checked off” on their portfolio for the *TSIP*.

Table 29

Factors Identified as Inhibiting or Enhancing Integration of Technology by Location

Name	PS	TR	TI	FU	AR	FR
Central Administration						
Miriam Steinbeck	I/E	E	I	I		
Robert Lawrence	I	I		I	E	I
Van Buren Middle						
Emma Murdock		I	I		E	
Mariah Patton		E				
James Cannell		I/E		I		I
Avery Moore						
Franklin Pierce Elementary						
John Pynchon			I		E	I
Laurn Adams		E				I
Maya Singer		I/E	I		I	
Laura Tey		E				I

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance; I = inhibiting factor; E = enhancing factor.

Table 30

Factors Identified as Inhibiting or Enhancing Integration of Technology by Level

Name	PS	TR	TI	FU	AR	FR
Administration and Support						
Miriam Steinbeck	I/E	E	I	I		
Robert Lawrence	I	I		I	E	I
Emma Murdock		I	I		E	
John Pynchon			I		E	I
High-Level Technology User						
Mariah Patton		E				
Laurn Adams		E				I
Mid-Level Technology User						
James Cannell		I/E		I		I
Maya Singer		I/E	I		I	
Low-Level Technology User						
Avery Moore						
Laura Tey		E				I

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance; I = inhibiting factor; E = enhancing factor.

Enhancing Factors

Participants were asked to identify factors that were enhancing to the integration of technology. Like inhibiting factors, these were arbitrarily classified into the five broad categories of (1) personnel and support, (2) training, (3) time, (4) funding, and (5) access to resources. Of the enhancing factors, training was reported most often (60%), followed by access to resources (30%), and personnel and support (10%). Funding, time, and fear and resistence were not reported as enhancing by participants (0%). These factors can be seen in Table 29 and Table 30. It is likely that the reporting of training, and personnel and support as being the most enhancing factors was a reflection of the combination of expenditures the district has made toward acquiring computers and the positive experiences Grainger staff report from taking courses offered through UVA two years prior. The reporting of personnel and support, as least enhancing, is likely the result of a small technology support staff that is responsible for all aspects of technology within the district and the lack of time site-based ITS are available to offer support at the schools.

Integration and Classroom Use of Technology

Integration in Grainger is a mix of computer lab and classroom use. The definition of what constituted a "computer lab" varied from a 25-computer classroom configuration to four computers in a classroom. The larger lab configurations were primarily used for running applications, such as *Microsoft Works*®, and instructional programs, such as *Accelerated Reader*®. Students at both elementary and middle school levels also used *PowerPoint*® and *Microsoft Word*® for productivity. Smaller classroom "labs" of three or four computers, when used, were limited in use to student writing and Internet use. Students working in larger labs tended to use self-directed learning applications, such as typing or reading tutorial programs. Students working in smaller classroom configurations seemed to use application programs that required more teacher-directed training and assistance.

Leadership and Planning

Despite the amount of resources that have been placed in the district over the past two years, the leadership still seems to be in a transition mode. While district staff describes technology and its integration as being planned for, there was no evidence of any technology planning documents. Much is done “by memory,” “on the fly,” or as the need arises. Technology within Grainger is directly the responsibility of Robert Lawrence. He is seen as a positive asset making technology available for use. However, he may feel that his “hands are tied” when it comes to making large changes. He seems frustrated with other administrative officials’ lack of understanding of the importance of technology. While he depends on the schools’ ITS staff, he understands that there may be limits on what they can be asked to do.

Accountability

Accountability in Grainger is seen as lacking by both members of the administrative and teaching staffs. There are three methods of assessing the technical skills of individual teachers and administrators, as part of the *TSIP* standards. These include course work through UVA, the district technology portfolio, and college transcripts noting technology-related courses taken (for new teachers). However, there is little evidence to suggest that any follow-up is done to see if these skills have actually been mastered and are being used in classroom instruction. For Grainger, the integration standard is achieved when teachers (or administrators) present a portfolio with “sample” work to the school ITS. While this provides a minimal level of accountability, it is left up to the ITS as the sole person responsible to check off that the standards have been met. Since the ITS staff are volunteers with principal approval, their technical skills may also come into question. Additionally, the expectations to use technology in instruction do not appear to be a focus of the leadership. The leadership may be seen by the teachers and staff as simply not interested in technology, but rather as seeing it as simply one more mandate, one more hurdle over which to jump.

Appendix E: A Case Study of Cheatham City Public Schools

Appendix E presents a case study of Cheatham City Public Schools and their attempts to integrate technology into classroom instruction as part of a Virginia state mandate. The case study is organized into seven categories – district context, participants, definition of terms, factors inhibiting integration of technology, factors enhancing integration of technology, integration and classroom use of technology, leadership and planning, and accountability. A discussion and conclusions section, at the end of Appendix E, provides a within-case analysis.

District Context

The context of Cheatham City is presented through the perspective of the city, school district administration, middle school, and elementary school.

Cheatham City

Cheatham is an urban center of approximately 95,000 people. Of this number 69.4% are Caucasian, 26.7% are African American, 1.5% are Hispanic, 1.2% are Asian, 1.2% represent other races. The city is proud of its two and one-half century heritage as a major transportation hub for the region. In addition to transportation industries, the city has a mix of manufacturing, trade, and service industries. However, the city's workforce is largely blue collar and 15.9% of the population lives at or below poverty. Extremes of annual income range from less than $10,000 to in excess of $500,000. Originally the city had a population in excess of 100,000, however, in recent years, the city has experienced an exodus of manufacturing jobs and a reduction of the numbers of people moving into the area.

District Administration

The school administrative offices of Cheatham City Public Schools are located in three adjoining, two- to four-story brick buildings that once housed an all black high school. It is located between the downtown area central business district and a predominately black residential section of the city. The buildings contain the school administrative offices and a community gym, which has been retained from the old high school to serve as a sports facility for the local residents. The school administrative offices serve a division of 32 schools representing 21 elementary schools, 6 middle schools, 2 high schools, and 4 special or alternative schools. Included in this number are seven elementary magnet, two middle magnet, and one high school magnet. While the administration has tried to reduce the number of schools in the past, community support for "neighborhood schools" had overrode financial considerations. As such, the district is committed to supporting all of its schools and operates on a "site-based management" concept. The district has a student population of approximately 13,500. Of this number approximately 59.7% of these students are eligible free and reduced lunch.

Since the formation of the Office of Technology in 1994, the district has placed emphasis on technology. It has been able to garner funds for purchase of equipment through federal magnet grants, Title I, Technology Literacy Challenge Grants, and a $1.5 million dollar capital bond initiative. Through these funds, the district has completed administrative networks in all of its schools and instructional networks at all but four schools. Additionally, the district has recently completed renovation of four of the six middle schools, including the addition of all new computer systems, including one computer lab per grade level and three computers per classroom. Despite these initiatives, the district does not have a stable funding source for recurring costs of technology, such as replacement. As such, they have not been able to standardize on a specific computer platform. Computers within the district represent a wide range of systems from Apple LCs to Macintosh G3s and Windows-based PCs ranging from *Windows 3.1*® to *Windows 98*®. A Director of Technology oversees the library media services and technology operations for the district. The central technology department is composed of nineteen individuals including the director, a secretary, a technology training coordinator, a network coordinator, four technology trainers, four computer technicians, a library media coordinator, two programmers, two full-time and one part-time student management system personnel, and an audiovisual technician. In addition to the regular technology staff there are one to two site-based technology contacts or instructional technology specialists (ITS) per school. These contacts are typically full-time teachers or library media specialists that have been “volunteered” by their principal to support technology at their school. The ITS position is a stipend position paying a single ITS approximately $900 per year or split evenly between two ITS at a given site.

The district is operating under a ten-year technology plan that scheduled to be revised in 2004. Their technology plan has been recognized as exemplary at both the state and national levels.

Rutherford Hayes Middle School

Rutherford Hayes Middle is a three-story structure. It was one of four middle schools renovated within the past four years. The school has an enrollment of approximately 500 students. The student body is predominately white, with 65.2%

Caucasian, 32.1% African American, 1.6% Hispanic, 1.0% Asian, and 0.1% other races. Forty-five percent of the students are eligible for free and reduced lunch.

The administrative staff at Rutherford Hayes consists of one principal, one assistant principal, two full-time guidance counselor, and two secretaries. The teaching staff comprises 38 full-time teachers. Support staff includes one full-time library media specialist and a full-time library media clerk. The librarian serves as the school ITS.

Rutherford Hayes houses 4 computer labs with 20 to 25 computers in each running *Windows 95®*. One lab is assigned to each of the three grade levels and the fourth is used solely as a foreign language lab. Each classroom has 3 computers. Of the three classroom computers, two are for student use and one is dedicated to teacher use. All have Internet access. In addition, there are 9 computers in the library media center.

Lincoln Elementary

Lincoln Elementary School is a two-story brick structure built in the 1950s. The school serves approximately 250 students in grades Pre-K through fifth. Like the middle school, the majority of the students are white. Of the 250 students 77.7% are Caucasian, 18.8% African American, 1.2% Hispanic, 1.2% Asian, and 1.1% other races. Forty-three percent of their students are eligible for free and reduced lunch.

The school staff consists of one principal, a secretary, and 22 classroom teachers. There is eighteen support staff, including a guidance counselor, a full-time library media specialist, and a half-time technology assistant. The technology assistant also serves as the school ITS.

While the administrative staff has *Windows®* PCs running *Windows 98®*, the rest of the school uses Apple computers. The school does not have any classrooms outfitted as dedicated computer labs. The school does have a bank of six computers in the library that is used by the school's ITS to teach classes. Each classroom is provided at least one Apple computer for teacher use with Internet access. In addition, each classroom has from one to four Apple computer systems of varying ages from ranging from LCIIs to G4s. The older systems, which cannot be connected to the network, are used to run standalone instructional software.

Participants and Data Collection Sources

Twelve individuals participated in this case study. They include three at the district level, five at the middle school, and four at the elementary level. The number at the middle school was increased from the planned four to five participants at the principal's request. Participant demographics are provided in Table 31. They range in age from 29 to 58 years with a mean age of 44. Participant years of experience in education range from 4 to 36 years with a mean of 19 years. Their years in their present positions range from 1 to 22 with a mean of 5 years.

Cheatham has a Director of Technology, Kelvin Ritter, who oversees all aspects of technology within the district. A staff of eighteen full-time and one half-time provide support in four primary areas (1) hardware, software, and network maintenance, (2) technology training, (3) administrative and student data management, and (4) library and audiovisual support. A technology training coordinator and three technology trainers have the primary responsibility of the computer training of teachers and staff. They also work with school-based "site-technology contacts" or instructional technology specialists (ITS) who are, in coordination with the ITS, partially responsible for signing off on those teacher and staff members who meet the *TSIP* standards. The ITS are designated by the principal as the most “technically savvy” teacher at their site. The ITS serve as the “front line support” at their school in terms of troubleshooting and technical assistance for teachers.

Participants’ data were collected from interviews, classroom observations, teacher lesson plans, technology checklists or portfolios, and the district technology plan. Data collection sources are shown in Table 32. Teacher participants identified by their principals as low-, mid-, and high-level users of technology are presented in Table 33.

A total of eighteen classroom observations were conducted including 9 at the middle school level and 9 at the elementary level.

Table 31

Participant Demographics for Cheatham City Public Schools

Name	Position	Sex	Race	Age	YIE	YIP
Central Administration						
Elizabeth Cramer	Asst. Sup. C&I	F	White	58	36	8
Kelvin Ritter	Dir. Tech.	M	White	44	20	8
Jane Sagan	Tech. Train. Coord.	F	White	49	24	5
Rutherford Hayes Middle						
Michelle Isherwood	Principal	F	White	47	25	2
Marco Liebs	Math Teacher	M	White	51	26	4
Marie Joyce	Science Teacher	F	White	46	23	22
Tatum Kelling	Math Teacher	F	White	32	4	4
Reed Stewart	English/History Teacher	M	White	29	6	1
Lincoln Elementary						
Skyler Barnes	Principal	F	White	46	23	1
Crystal Goldenbock	Tech. Asst./ITS	F	White	58	32	1
Regan Brink	LD Resource	F	White	33	5	4
Denise Styron	Kindergarten	F	White	29	6	4

Note: YIE = years in education; YIP = years in current position; Asst. Sup. C&I = assistant superintendent for curriculum and instruction; Dir. Tech. = director of technology; Tech. Train. Coord. = technology training coordinator; Specialist; Tech. Asst./ITS = technology assistant/instructional technology specialist;.

Table 32

Data Collection Sources from Cheatham City Public Schools

Name	Int.	Obs.	LP	TC	TP
Central Administration					
Elizabeth Cramer	X				
Kelvin Ritter	X				X
Jane Sagan	X				
Rutherford Hayes Middle					
Michelle Isherwood	X				
Marco Liebs	X	X	-		
Marie Joyce	X	X	X		
Tatum Kelling	X	X	-		
Lincoln Elementary					
Skyler Barnes	X				
Crystal Goldenbock	X	X	X		
Regan Brink	X	X	-		
Denise Styron	X	X	X		

Note: Int. = interview; Obs. = classroom observation; LP = class lesson plan; TC = technology checklist or portfolio; TP = district technology plan; Dashes indicate the data was not available.

Table 33

Teacher Level of Technology Expertise as Identified by the School Principal Participants in Cheatham City Public Schools

Name	HLU	MLU	LLU
Rutherford Hayes Middle			
Marco Liebs	X		
Marie Joyce		X	
Tatum Kelling		X	
Reed Stewart			X
Lincoln Elementary			
Crystal Goldenbock	X		
Regan Brink		X	
Denise Styron		X	

Note: HLU = high-level user of technology; MLU = mid-level user of technology; LLU = low-level user of technology.

Definition of Terms

Participants were asked to provide their definition of three terms relative to the Virginia state mandate for integrating technology into the classroom. These terms were mandates, Technology Standards for Instructional Personnel (*TSIP*), and technology integration. Their definitions are grouped by administrative and support staff (including school principals and ITS) and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Definition of Mandates

District administrative and support personnel generally see mandates, as something required to do or to implement. Elizabeth defines mandates as “requirements that the state [pause] the state insists that we do.” Kelvin recognizes the legal aspect to mandates, “I think that a state mandate is a legal definition, and it basically is a command or an order on the state level for us to do something.” Jane’s definition is more from a personal perspective. She feels that it is “something I’m expected to do or accomplish.” Michelle sees them from her perspective as a school principal, as “standards reasonably expected to be implemented at the school level.” Skyler believes that they “serve as a guide. While she says that mandates are for ”Consistency” so that “school to school” everyone has the “same goal and same objective,” she also believe that “they’re pretty idealistic, a lot of them, because we just don’t have the means to carry them out.”

The high-level technology using teachers, Marie and Crystal both state that it is something that they “have to do.” However, beyond this definition, they differ. Marie feels that the purpose of mandates is to “maintain knowledge and involvement on a local level from the state. It's a guarantee of involvement." Crystal feels that the purpose is to insure "that all schools are more on an equal playing field."

Mid-level technology users Tatum, Marco, and Regan, like their high-level counterparts, agree that it is something teachers "have to do."   Regan hopes that it is for "consistency" and says, "It's something that we definitely need to do as a directive. I think it's not up for debate."   Tatum believes that mandates are "usually legislated" and are "not optional" in order to "insure the quality of educators and the quality of education for students." Marco feels that they are something that the state "requires me to do with my instruction" to "bring in or implement new ideas."

Both low-level users, Reed and Denise see mandates from somewhat of a cynical perspective. Reed defines them as simply "more garbage put on top of teachers to do." While Denise believes that the are "restrictions on what you can teach the kids." She feels that mandates, in general, have moved teaching away from "creative learning" to "a lot of drill and practice."

Definition of the Technology Standards for Instructional Personnel (TSIP)

Administrative and support staff were split between district administration and site-based staff. Elizabeth, Kelvin, Jane, Michelle, and Skyler all defined the *TSIP* in terms of the district's technology assessment checklist. Elizabeth simply says, "I would probably pull out a piece of paper" and "say you've go to master the first side of this page and the next." Michelle defines them as "minimum competencies." While Jane refers to the *TSIP* as "reasonable competencies" to measure whether or not "instructional personnel are computer literate." Kelvin refers to the *TSIP* as a "standard of performance or skill level in technology." Skyler does not define the *TSIP*, but would rather refer anyone with a question about the *TSIP* to her technology assistant and ITS. “I would tell the person to sit down with Crystal Goldenbock and she could walk her through all that.”

High-level technology users, Crystal and Marco are both unable to define the *TSIP*. Marco offers the definition that it might be “to use technology to make instruction more efficient” but he is unsure. However, Crystal offered an explanation for their inability to define the *TSIP*.

> Well, I feel like right now that we're just at a little bit of a disadvantage because Michelle has decided to hold that over for us for the summer. We have not even seen the new standards, and I'm the technology person. She has decided to do two days of summer work and work on the technology standards then.

Mid-level technology users Marie and Tatum both define the *TSIP* through the division’s checklist. Marie notes that they are standards for “technology and we’re to use it, and the kids are to be technology literate.” Marie simply states that the “checklist” is composed of “the things expected of us.” At the elementary level, Regan is unsure of what the *TSIP* is and does not offer a definition.

Low-level technology user Reed and Denise mirror the division between the middle and high school participants at the other levels. While Reed defines the *TSIP* as the “different things that we have to learn how to do” to be “checked off,” Denise is unsure of the question and indicates that she doesn’t know.

Definition of Integration

Although it is expressed in different ways, the administrative and support staff in Cheatham generally define integration as a seamless part of the daily instructional process. Elizabeth defines integration as “how you think.” She explains, “I have a question, I can answer it. If I can get to a computer, I can answer it. But, I think when people start thinking like that, it is really integrated." Kelvin defines integration in terms of the current use of pencil and paper.

> True integration should be that all the technology that is around you and available to you becomes seamless so you do not think about it. You just go and do it. And, you say, what is the best tool for me to use at this point in time? If it's a pencil, you use a pencil and paper. If it's a computer, you use a computer. And, that requires a certain level of acceptance of the technology.

Jane defines integration as using technology as "just a natural extension of what you are already doing." Michelle also feels that integration is using technology as "just part of your regular day-to-day class materials." For Skyler it means using "technology as a tool to enhance whatever curriculum area" is being taught.

Crystal responds to the definition of mandate with, "It's using technology not to do anything different, but to extend what you're already doing and just use it as another tool." Marco believes integration is using technology "wisely" in order to "benefit the kid" rather than "so you can say, 'Well, I use technology in my classroom'."

Marie, Tatum, and Regan all define integration differently as mid-level users. Marie simply states, "To me technology integration is using everything available." However, Tatum sees integration from the perspective of the SOLs. "You're not teaching it on its own, you're teaching technology as a means to fulfill you SOL obligations." Regan believes that it is "using it as an instructional tool to reach the kids" so that they can "become functional members of society."

Low-level technology users Reed and Denise both offer terse definitions of integration. Reed defines it as, “To be able to use technology within the subject area you teach.” Denise, when asked to define integration, shakes her head and attempts to define it though example. “Technology integration. Well, I would think like slide shows. Maybe if you’re teaching something and you have pictures showing slide shows.”

Factors Inhibiting Integration

Like definitions, participants were asked to identify factors that inhibit the integration of technology from their perspectives. Their responses are presented grouped by administrative and support staff (including school principals and ITS), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

While not all of the Cheatham administrative and support staff participants agreed on factors inhibiting integration of technology, they consistently identify access to resources as a major inhibiting factor. Other factors identified, at this level, were personnel and support, training, time, and fear and resistance of staff to technology.

Elizabeth felt funding, time, and access to resources were inhibiting factors. Although she immediately responded “money,” she adds, “It just takes time. And I am not sure that we’ve got people willing to make that commitment.” She also believes that “access to the actual machine” is an important factor. However, she admits that “everybody wants the newest model of everything” and that “they are unwilling to learn on lesser machines.” She sees this as an “excuse for not using them, not using what they have in the classroom.”

Kelvin sees access to resources, time, personnel and support, and fear and resistance as factors. Within the district, “We probably have ten or twelve generations of computers out there” and with systems “that old, training becomes an issue.” Additionally, we “teach teachers how to use technology as though they have labs or as though they have a classroom full of computers.” Teachers return to “classrooms where they may only have one or two computers” thus, “when they go back to the classroom, it doesn’t fit.” In terms of personnel and support, Kelvin feels that they need “a full-time technology specialist in every school” to “instruct teachers how to do integration.” One “primary” factor for Kelvin is that of fear and resistance of staff. He says that “I see a lot of teachers right now who are basically, if they take an assessment, they’re going to retire first.” Another “problem” for Kelvin is time as it relates to training.

> The other problem is, and I hate to be because I've heard this over and over again, is time. That if you if I'm going to teach you something and I'm going to teach you a skill, do I do it in the afternoon when you're tired. Well, probably not. Do I bring you in on a Saturday and say make you come in on a Saturday for half a day. Well, you may not be as tired but you may be very, very angry that you're going to be made to lose part of your weekend with your family.

Like Kelvin, Jane also feels that time, access to resources, and fear and resistance are factors that prevent integration. Time for Jane is related to training and “finding time where people are fresh enough and attentive enough” to train. She believes that the district should “allow regular release time for teachers” for training as part of their “continual growth” professionally. Jane also notes the “wide range of what you’re going to find in our classrooms” in addition to the “age of the equipment” and the “lack of appropriate software." When Jane discusses fear and resistance, she says, "We still have teachers that are very, that are still threatened by technology." She relates a story of one teacher in one of the newly renovated middle schools that "was networked and, at the time, it was state-of-the-art." Due to "her phobia" she "truly doesn't use any technology."

Factors for Michelle Isherwood are time and access to resources. When asked about inhibiting factors she says, "I think number one on my list would be time." For Michelle, this is "time for your staff to really think through ways to use technology." She also thinks "it's been more a question of access" and feels that "I have to pull teeth with the ones that haven't had the access." Ideally, Michelle "would have every kid have a computer" and thinks that "teachers sometimes get real frustrated at trying to figure out how to use two computers."

Training, time, and access to resources are inhibiting factors for Skyler. She sees the "problem" as being "trainers who come in and they pick a particular grade level generally with it, and then people who are not at that grade level just kind of tune out." She believes that "the most beneficial thing would be to have a classroom teacher who is integrating technology really well with curriculum areas do the in-services for others" instead of district trainers. Skyler sees "time" in terms of teachers having to "sit down" with the technology and "get comfortable with it" and "really having the time to sit down and find the software that's going to meet that child's need." She also feels that access to resources is "the biggy." Frustrated that "the networks are so slow in the classrooms right now because they don't have enough memory, Skyler would like to "guarantee them that they would have one computer that would work" and calls that "a big step."

High-Level Technology Users (HLU)

High-level technology users Marco Liebs and Crystal Goldenbock differ on inhibiting factors. Marco sees time and fear and resistance as factors, while Crystal identifies training and access to resources.

When asked about inhibiting factors, Marco says, “Just time.” He adds, “Everything’s there. Everything’s there you need to do except time to do it.” In terms of fear and resistance, he feels that while “kids today are really open to it” and “just flow naturally with it,” that, “people that are my age are kind of hit and bump against it.” While Marco wants to be a good user of technology, he recognizes that “there are teachers that are my age, young teachers, that still don’t want any part of technology or want to do with it as little as possible.”

Crystal echoes Skyler’s comments about training from the school staff from district trainers. “I think teachers relate more to that maybe than to someone who’s not actually in the classroom.” While she feels that “lots of things sound great” when in training, when teachers return to the classroom, “it doesn’t have the practical applications.” When talking about access to resources, Crystal is frustrated because her computer “lab” is in the library. While she has tried to “work around” the librarian’s schedule she says, “It doesn’t work that well. We kind of interfere with each other.” Crystal feels that her “teachers are ready,” but says that “if you have two old LCIIs sitting around there’s just, it limits what you can do. I think right now the limitation basically is the equipment we have.”

Mid-Level Technology Users (MLU)

Mid-level technology users Marie Joyce, Tatum Kelling, and Regan Brink all agree that time and access to resources are inhibiting. However, Regan also thinks that funding, and fear and resistance are factors.

Marie feels that “time is the big thing.” However, after some thought, she adds, “I’m limited on the things that I want to do because of availability.” This availability includes lack of “server space,” “availability of equipment,” problems with the “functioning of the machine,” and lag time on “repairs of equipment.” She sees these issues with access add “more of a frustration than an excitement” to integrating technology. Marie also sees “individuals that are very intimidated” by technology. When discussing the *TSIP* standards she states, “I know of teachers in the building that said I will not do this. It’s not, ‘I will retire,’’ rather it’s “‘I refuse to do this.’”

From the perspective of Tatum Kelling, both time and access to resources are inhibiting. She identifies “time” as “number one because it takes a lot of effort and a lot of times to find the resources and get the lesson plans together for covering an SOL through technology.” Next to time, access to resources is a factor, because she is “not real good at using just the two computers. I haven’t really figured out how to do that.” Time is also a factor in scheduling lab time. “I’d like to use it more, but by the time I think of it the lab is taken up.”

Regan sees “time” as her “biggest frustration.” She feels that “with having mandates like this that we’re told to do these certain things where nobody has the time to do it.” However, she believes that, “If I could find the time, then I would be able to do this and it would really be fun.” Relative to time is the factor of access to resources.

While Regan is “fortunate to have one of the new Macs,” she hears from others that they “’can’t print in my room,’ ‘the printer is broken’.” So teachers are “roaming around trying to find somebody’s room with a CDROM that works or a printer that works.” Regan “sees so much on a daily basis that we need in the classrooms” but due to funding, “can’t afford it.” Thus, she thinks, “money is the huge issue.” Another “really big component” for Regan is that staff has “got to buy into” technology, but relates to the fear and resistance she believes teachers have regarding technology in the classroom.

> I've been doing this for 15 years. This is the kids that have learned it every year. I'm not going to vary. I can't take that risk. I don't have time to take that risk. I can't take 2 weeks out of a normal math unit to spend doing something that's related on technology with it even though it might enhance the lesson I can't take that risk.

Low-Level Technology Users (LLU)

Low-level technology users Reed Stewart and Denise Styron both see access to resources inhibiting. In addition, Reed sees time as inhibiting.

Reed believes that he does not integrate technology “as well as I should” since “time is definitely a factor.” He also sees scheduling of the lab as problematic and says frankly that when a conflict arises “you just move on and one goes and one doesn’t.” Even when the schedule works in his favor and Reed has “planned things in the computer lab” that “there haven’t been enough computers” working. He admits, “Technology is good, but technology is not the only means of getting something across” and says, “I think it needs to be toned down some.”

Denise believes that access to resources in her classroom has been inhibiting for her. Denise points out that she only has four computers in her classroom. While one is connected to the Internet, she indicates that, "it freezes and unfortunately there's nothing we can do about it because it is old." She would like to "have more than one computer linked into the Internet so that more kids could be working on it."

Factors Enhancing Integration

Participants were also asked to identify factors that enhance their integration of technology from their perspectives. Responses are presented grouped by administrative and support staff (including school principals and ITS), and teachers identified at each of the three levels of technology use (HLU, MLU, and LLU).

Administrative and Support Staff

The administrative and support are divided on enhancing factors. While Elizabeth, Kelvin, and Jane feel training has been enhancing, Michelle and Skyker identify personnel and support as factors.

When asked about enhancing factors, Elizabeth responds, "Training, training, training, training, and access to it." Training for her must show teachers "how their lives, if not easier" are "better" with technology.

Kelvin also believes that training is a positive factor in integration. He sees the importance of on-site support of the trainers and their "co-teaching" and "modeling" of technology. Trainers are "assigned to go out to our schools and spend an entire day, at least one day in a school every other week." Their goal is to "help with some of the training components and to show, to help, teachers learn how to integrate technology."

As the training coordinator, Jane sees herself "assessing [teachers'] personal needs as well as what [she] feel[s] like the needs of that particular school are and then suggesting certain in-services or developing courses." She and the other trainers have "tried to adjust to what we do based on what they've commented" on in the schools. In addition she has "looked at gosh twenty or thirty divisions, not just in Virginia, but in other states as well," to pick up best practices in technology training.

Skyler sees support from their technology specialist, Crystal Goldenbock, as an enhancing factor. Skyler explains that she has made a "trade-off of cafeteria aides" to hire Crystal half time. She thinks that Crystal "has really helped with some of the teachers." The teachers will "tell Crystal a week ahead of time what they were studying in class, and then she would do some research and find technology types of things that would go along with their curriculum."

Michelle does not identify central technical support as enhancing. However, like Skyler, Michelle sees support coming from within her school.

> I would say there are probably four or five people who have expertise in different areas and if I need somebody to work with Integrade® or I need somebody to develop, help a teacher develop, some lesson plans, I'll send them to, you know, the person who is using it well.

High-Level Technology Users (HLU)

High-level technology users Crystal Goldenbock and Marco Liebs both agree that training is an enhancing factor. However, Crystal sees training within the school as enhancing, while Marco sees district-level training as positive.

Crystal sees her position as supporting and enhancing for teachers. When asked about enhancing factors, Crystal responds,

> I think one of the ways is by the teachers deciding to fund my position so that I'm able to do a lot of the leg work for them and show them how they can fit it in without it being time consuming for them and an extra burden added on.

In addition, Crystal believes that training is enhancing for teachers at her school. However, she qualifies this as training that is "after school" and training "where you can actually go and sit at a computer and actually do it yourself."

Marco also agrees that training has been a positive factor for him. He feels that "it's been a gradual introduction" for him. While he admits that "I'm interested in it myself, so I pursue it," he feels that "every one that I've been to has been really good. Every one I've been to, I've gotten something out of."

Mid-Level Technology Users (MLU)

Marie feels that personnel and support are enhancing. She refers to "our technology person" as "a very good opportunity." In addition, she says that they "have very knowledgeable people with the building" and "are very free in saying 'show me how to do this.'"

Tatum sees access to resources as enhancing to her in terms of managing student grades. As part of a grade-level team she is responsible for sending out grade letters from other teachers on her team. As a math teacher, "I only know my math scores. I don't know the English teacher's grades." While "our own team which is math, science, English and social studies" requires her to have grades from other teachers. Through the network "I've got a spread sheet on the server that we update everybody's grades so we have all the grades on one spread sheet for math, English, science and social studies." Now "if a parent calls me and says what's happening, how's my kid doing?" she can "say well he's got such and such in English and such and such in social studies. And, that's been a huge tool."

Regan believes that the training at her school has been an enhancing factor for her. "I think it's much more real to have people come here at the school and do in-services here when we're all here and we're familiar and we're familiar with the computers." Regan feels that this has been "not near as threatening" as "having to go somewhere else, some other school with other people you don't know."

Low-Level Technology Users (LLU)

Low-level technology user Reed Stewart and Denise Styron both feel that access to resources is enhancing. While Reed sees this from a perspective of a working in another school division, Denise reflects on her access to four classroom computers.

Reed believes that his current situation with one teacher computer connected to a television and two student computers "is much better than where I came from." This was a situation with "one computer and no TV." He says, "at least now I can actually do presentations and keep them captivated with the television." He also notes, "We do have one computer lab on every floor. Where I came from we had one computer lab."

Denise is proud of the four computers in her Kindergarten classroom. She primarily uses *ClarisWorks®* and a mixture of standalone math and reading software from Scholastic. She tries to maximize their integration into the classroom in various ways and tries to have "a focus" related to what they are doing in class. She says, "I use it during reading time" for stories and she tells her students "to go to *ClarisWorks®*" to "draw a flower or a picture of flowers and then put their names on it."

Integration and Classroom Use of Technology

While both inhibiting and enhancing factors play a part in the integration of technology and its use in classrooms in Cheatham, there is a difference in its use at the middle and elementary levels.

Middle School

At the middle school level, teachers' integration of technology is designed to be a mix between classroom computer access and lab time. However, classroom access, was limited during observations to only one class and was primarily teacher-centered.

Observations with both Marie and Tatum were a combination of lecture and student seatwork. Technologies used during these observations were limited to Marie's use of the marker board and Tatum's use of the overhead projector. Both indicated that they did not have "formal" lesson plans.

During each of the three observations in Marco's class, he used the teacher computer and TV to present mathematics lessons via *PowerPoint®*. These were largely lecture format, with students taking paper and pencil notes. During one observation assignments were given to students to use pre-made spreadsheets to calculate the sum of angles given different regular polygon shapes. However, the spreadsheets were printed out and handed to students to complete. Lesson plans note the use of "drawing applications" by students to "construct regular polygons" and use of "a spreadsheet" to "calculate the number of sides, verticals, diagonals, triangles, angles, and sum of angles."

Like Marie and Tatum's class observations, Reed use lecture and seatwork with two classes. During the third observation students spent the entire time at their seats working on a term paper. No technologies were observed being used other than the classroom marker.

Elementary School

While Lincoln Elementary has one to four classroom computers of varying vintages, unlike the middle school, it has only a small six -computer "lab" as part of the school's library. This space is shared between the school library media specialist and Crystal, the school technology assistant.

During observations of Crystal's classes, students move into the library and are divided between those who will use the computers first and those that will use the traditional resources of the library. Two students sit at each of the six computers, while the others begin a traditional library period. With her first grade group, Crystal instructs the students at the computers how to access the Internet and conduct basic searches using the school's *Lifespan*® program, which offers filtered lists of web sites. After approximately fifteen minutes of instruction, students switch off with the next half of the class. The same routine is repeated for her third and fourth grade group. However, with the fourth grade students she provides instruction on creating small word processing documents and presentations using *ClarisWorks*®. Crystal's lesson plans reflect this routine of short lessons. For example, in one lesson plan she uses *Kid Pix*® software with students to illustrate numerals one to five.

Regan has a smaller classroom with six to ten students. During her observations, she used the three Macintosh LC580 computers in one corner of her room as a means of "rewarding" students for appropriate behavior. Students were allowed to "play" on the computers using *Reader Rabbit*® and *Jumpstart Math*® and *Jumpstart Reading*®.

Between observations of Denise's class, she went over the various software programs available to students in her classroom. They included *ClarisWorks*®, *Kid Keys*®, *Kid Works*®, *First Dictionary*®, *Kids Zoo*®, *Noah's Math House*®, *Sammy's Science House*®, and *Bailey's Bug House*®. During the three observation periods, the teacher's primary mode of delivery of instruction was through worksheets and teacher lecture/discussion with her students. Once during the second observation, the teacher gave a girl permission to go to one of the two classroom computers and look up a word on the dictionary. Denise's monthly lesson plans mentions use of the computer twice. Both instances refer to using the computer to go to activity and primary game web pages once students are through with their written desk assignments.

Leadership and Planning

Technology leadership in Cheatham is provided primarily through the Office of Technology and Kelvin Ritter and Jane Sagan. At the school level, the principal and the designated ITS provides leadership. However, during interviews some of the participants expressed varying views regarding leadership within the district. Elizabeth felt that the district's site-based focus has "been close to a total disaster" with regard to technology. "People with little or no training make many more errors. I think site-based management as it pertains to technology is a joke." Despite this Ritter and Jane both see the superintendent as being a leader by example. Kelvin believes that "he was very adamant and very supportive." Jane is "impressed with the fact that our superintendent is going through every level of that assessment himself" and says, "I am impressed that he's setting an example in my opinion for others."

At the middle school, Michelle sees herself as the leader for technology in the school and feels her role is to "encourage them to raise their own level of technology expertise." She also says, "if they don't, then I have to hold them accountable for that." However, once they are "comfortable with it" she doesn't feel it is her "job to walk around to see that that's happening and holding teachers accountable for doing the things I need them to do."

At the elementary level, Crystal agrees that the push for technology is "from the leadership at the school" and says, "I think one of the driving forces is Skyler." At the same time she notes that Skyler has told the teachers, "We've got enough to deal with right now. We're just going to wait and address [the *TSIP*] this summer." This has resulted in some of the teachers at Lincoln not knowing "what we're supposed to do." As Regan says, "Well at this point I'm still, I mean, I think we're totally in the dark."

The district's technology plan is comprehensive and includes thirty-one sections spanning approximately 400 pages. Sections include an introduction, executive summary, plan development, mission and goals, review of research, technology benefits, trends, needs assessment, planning, integration, personnel, public relations, facilities, networking, Internet, equipment, maintenance, security, legal issues, special needs learners, obsolescence, training, special projects, evaluation, assessment instruments, funding, implementation, conclusions, a glossary, references list, and appendices.

Through the efforts and leadership of the Office of Technology staff a "checklist" or "assessment" was developed. Integration is assessed through checking off 11 items across four of seven levels. While the assessment checklist includes 24 items across the all seven levels, the eight *TSIP* standards are correlated to levels two through four on the checklist. The checklist is as follows:

- Level One - Entrant:
    - On-line self-assessment (results printed for portfolio);
- Level Two - Adopter:
    - Basic technology (on disk) [requires staff to produce one product in each of three applications - word processing, spreadsheet, and database],
    - Understands technology vocabulary (print results from on-line self assessment for portfolio);
- Level Three – Adapter:
    - One page newsletter with a minimum of two columns, header, and one graphic,
    - Database with a minimum of five fields and five records (printed in two different formats or layouts
    - Spreadsheet with a minimum of either one math formula or function and a chart or graph;
- Level Four – Appropriator:
    - Submit two lesson plans showing the integration of technology,
    - Identify and submit a review of one software title or web site used to enhance instruction,
    - Demonstrate basic troubleshooting skills (i.e., check connections, reboot frozen computer, etc.),

    - Send an e-mail with an attachment,
    - Demonstrate knowledge of ethical issues involving the Internet and copyright laws concerning software and videos, as evidenced by integrating this information into a lesson;
- Level Five – Inventor:
    - Develop and post a web page,
    - Submit one lesson plan using a webquest or trackstar that addresses and SOL,
    - Submit an evaluation of two educational web sites,
    - Develop and submit a multimedia presentation addressing an SOL with a minimum of five slides, should include transitions and special effects,
    - Demonstrate ongoing routine hardware maintenance including running scan disk and defrag a hard drive, rebuild a desktop, and run virus protection software,
    - Create and use a MACRO (may create using a wizard),
    - Use technology to enhance communication with students, parents, and community;
- Level Six – Expert Collaborator:
    - Create a multimedia presentation that includes features such as video capture, sound editing, etc.,
    - Present at least one in-service modeling integration of technology into daily lesson plans and promoting "best practices" in the use of technology;
- Level Seven – Expert Technical Leader:

- Develop and submit a project (with teacher guide) for researching five internet sites that provide research for a SOL in a curriculum area,
- Teach a technology course (file the proposal which includes the title, description, when, where, and any prerequisites in your portfolio),
- Document evidence of ongoing learning and personal development of technical skills (demonstrates leadership in actively moving others from lower to higher skill and assessment levels), and
- Create a program or macro using a programming language.

The complete checklist for Cheatham City Public Schools is provided in Appendix R.

Accountability

Accountability for teachers in Cheatham completing the *TSIP* standards, including the integration of technology, is handled through the division-wide technology assessment checklist and "technology portfolio." While the portfolio varies in form and contents (e.g., file folder, notebook, etc.) from person to person, the related assessment checklist is recognized as the de facto standard across the district.

District Administration

At the district level, Elizabeth Cramer sees accountability in terms of the assessment checklist. She says, that the assessment extends to everyone in the district. They must be checked off and "that means everybody from clerical to administrative and certainly including teachers." She notes that the checklist predates the *TSIP* saying, "We had standards before the state had mandates."

Kelvin echoes Elizabeth's statement that Cheatham had technology standards before the *TSIP* went into effect. He explains, that the *TSIP* actually supported and enhanced what Cheatham was already trying to accomplish.

> So, all we did was we went through that first evaluation cycle and we found that all these people are now breathing sighs of relief and going 'Ah, I got through it. I don't have to do it anymore.' And it was really kind of a nice boost for us when the state came along and said, 'Guess what, you're going to be evaluated and you're going to…' and, we took that as an opportunity. So instead of saying we can sign off on everybody because we've already did this back in 1994, we revised all our standards to meet and exceed the states'. And, then said, 'Okay guess what. You went through he first evaluation process. That's really nice. But, now you've got to go through it again.

Jane adds to the understanding of the accountability process used by Cheatham by saying that they "have two assessors" who are used to sign off on the technology checklist. This was done because teachers "could easily bring in things that your wife had done for you."

Middle School

At the middle school level, Michelle, believes that "teachers are going to be a whole lot more accountable." However, she does not refer to the *TSIP* but to SOL accountability. She then adds, "I don't really see a whole lot of correlation with the SOLs and technology really, other than maybe that one SOL test.

For Marie accountability for technology comes as "a possible factor in our evaluation." She is concerned about "how am I going to document it."

Tatum sees accountability through the technology "checklist." However, she believes that "they really don't affect me." She feels this way because she "went through them and most of them [she] already [has]." For Tatum it is simply "a matter of printing certain things, I guess, and making sure somebody checked me off."

While Reed doesn't comment on accountability, Marco feels that accountability really has not happened. He states, "I think it's been done pretty well, actually there hasn't been any hand slapping or punishment." However, he sees the potential on the horizon and comments, "we may be getting there."

Elementary School

The "push" at the elementary level for technology and the accountability for the *TSIP* was not apparent. As Skyler puts it, with mandates, "sometimes you just have to let them slide."

The participants, Crystal, Regan, and Denise, were all relatively unaware of the *TSIP* and its contents. As such they did not discuss accountability surrounding it.

Discussion and Analysis

The following section presents a discussion and analysis of Cheatham City Public Schools. Definition of terms, influencing factors, inhibiting factors, integration and classroom use of technology, leadership and planning, and accountability are discussed.

Definition of Terms

In defining the terms mandates, *TSIP*, and technology integration, participants provided a range of responses. While their definitions did not vary greatly, as they moved from general to more specific terms, the nuance of meaning changed. These variances in meaning did not seem to depend on skill level or position. One explanation for the subtle differences may be the various perceptions, beliefs, and experiences that the individuals held about technology and about their experiences with past mandates such as the SOLs, or the positions that they hold.

Definition of mandates.

When defining the term “mandates,” most of the participants associate it with something that they have to do or are required to do. However, beyond this are individual nuances. For example some see mandates as a guidelines or standards, while others see them as a means of achieving a level of consistency or putting districts on an equal playing field across the state. Still others speak about mandates in more cynical terms, as “garbage” or “restrictions” by the state.

Definition of Technology Standards for Instructional Personnel (TSIP).

The *TSIP* are defined generally in terms of the division-wide technology assessment checklist. Beyond this definition, participants define them as “minimum” or “reasonable” competencies. However, some participants seem to be “left in the dark” and unaware of the *TSIP* beyond the knowledge that they exist.

Definition of integration.

In terms of technology integration, participants offered a variety of definitions, identifying it as using technology seamlessly, as a tool, or as a “natural extension” of instruction. Others see integration in terms of “just being able to use technology in your subject area.” Still others see it as a means of preparing students for the their place in society.

Inhibiting Factors

Participants were asked to identify factors that were inhibiting to technology integration. These factors were arbitrarily classified into six broad categories. These categories were (1) personnel and support, (2) training, (3) time, (4) funding, (5) access to resources, and (6) fear and resistance. Of the inhibiting factors, access to resources was reported most often (92%), followed by time (75%), and fear and resistance (33%). Training, and personnel and support were both reported with the same frequency (17% each). Funding was reported least often (8%). These factors can be seen in Table 34 and Table 35.

Table 34

Factors Identified as Inhibiting or Enhancing Integration of Technology by Location

Name	PS	TR	TI	FU	AR	FR
Central Administration						
Elizabeth Cramer		E	I		I	
Kelvin Ritter	I	E			I	I
Jane Sagan	I	E	I		I	
Rutherford Hayes Middle						
Michelle Isherwood	E		I		I	
Marco Liebs		E	I			I
Marie Joyce	E		I		I	I
Tatum Kelling			I		I/E	
Reed Stewart			I		I/E	
Lincoln Elementary						
Skyler Barnes	E	I	I		I	
Crystal Goldenbock		I/E			I	
Regan Brink		E	I	I	I	I
Denise Styron					I/E	

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance; I = inhibiting factor; E = enhancing factor.

Table 35

Factors Identified as Inhibiting or Enhancing Integration of Technology by Level

Name	PS	TR	TI	FU	AR	FR
Administration and Support						
Elizabeth Cramer		E	I		I	
Kelvin Ritter	I	E			I	I
Jane Sagan	I	E	I		I	
Michelle Isherwood	E		I		I	
Skyler Barnes	E	I	I		I	
High-Level Technology User						
Marco Liebs		E	I			I
Crystal Goldenbock		I/E			I	
Mid-Level Technology User						
Marie Joyce	E		I		I	I
Tatum Kelling			I		I/E	
Regan Brink		E	I	I	I	I
Low-Level Technology User						
Reed Stewart			I		I/E	
Denise Styron					I/E	

Note: PS = personnel and support; TR = training; TI = time; FU = funding; AR = access to resources; FR = fear and resistance; I = inhibiting factor; E = enhancing factor.

Enhancing Factors

Participants were asked to identify factors that were enhancing to the integration of technology. Like inhibiting factors, these were arbitrarily classified into the six broad categories of (1) personnel and support, (2) training, (3) time, (4) funding, (5) access to resources, and fear and resistance. Of the enhancing factors, training was reported most often (50%), followed by access to resources, and personnel and support (25% each). These factors can be seen in Table 34 and Table 35.

Integration and Classroom Use of Technology

At the middle school level, integration was presented as a mixture between classroom and lab use. Instruction, however, was predominantly teacher-centered, with one teacher using it to present lessons through a teacher computer connected to a television. While computer labs were available for classroom use at each grade level, no use of the labs was observed. In addition, beyond the observation of a single teacher's use of the classroom computer to present lessons, use of technology was not observed at the classroom level. Through observations and interviews it seems likely that the lack of use of technology in this recently renovated school is due, in part, to the lack of concern and expectation on the part of the school's leadership.

At the elementary level technology integration was done through the school's small group or "lab" of six computers housed in the library media center. In addition, classroom use of computers was conducted on a limited basis, as a research tool or as reward for appropriate behavior. From interviews and observations it is very likely that teachers, at least at this one elementary, are using technology at a minimal level. It is also likely that this is due to problems with access to resources. In addition, the site-based decision to withhold information about the *TSIP* seems to have caused the staff some frustration and may delay using existing technology in different ways in order to meet the standards.

Leadership and Planning

Technology within Cheatham is directed from the centralized Office of Technology. Central administrative technology officials oversee the site-based, volunteer technology contacts or ITS staff. The ITS staff, in turn, provide front-line troubleshooting and assist in signing off on the technology assessment checklist, as one of two signatures. While the ITS are provided an annual stipend, they are generally full-time teaching staff. Due to time and access factors the ITS staff do little to assist teachers in technology use and integration in the classroom, beyond providing materials and resources such as web sites that teachers can use in their lessons. In addition, the elementary teacher participants voiced concern over what they felt was a lack of information and knowledge about the *TSIP*. The elementary participants had not been informed about the *TSIP* and the related assessment checklist at the time of the interviews. This was in spite of the release of an initial assessment in 1994 and access to the new assessment via the school district's web site. This may be due to lack of responsiveness by the central technology staff. It is more likely that it is the result of the site-based nature of the district and its organizational reporting hierarchy (i.e., all information going to the school sites must go through the principal).

Accountability

Accountability in Cheatham has been achieved through the division-wide technology assessment checklist that requires two signatures of the site ITS and a central

Office of Technology staff member or two central Office of Technology staff members. The integration standard is achieved, according to the assessment checklist, when teachers can produce two lesson plans showing integration of technology. While this provides a minimum level of accountability, it is likely that integration of technology will remain elusive in Cheatham. The district's site-based focus requires that the principal at each school be a catalyst for integration and set the expectation that integration move beyond just producing two lesson plans.

Appendix F: Coding Categories Table

Definitions	D
Mandate	DM
TSIP	DTS
Integration	DI
Influencing Factors	IF
Accountability	IF-A
Access to Resources	IF-AR
Beliefs and Attitudes	IF-B
Funding	IF-F
Fear and Resistance	IF-R
Leadership and Planning	IF-LP
Support	IF-S
Time	IF-TI
Training	IF-TR
Personnel	IF-P
Implementation Approach	IA
Traditional /No Computer	IA-TN
Instructional Linkage	IA-IL
Lab	IA-L
Classroom	IA-C

<u>Other Factors</u>

Home Computer Access	HA
Comparisons to Other Districts	OC
Ubiquitous Computing	UC
Personal Use of Technology	PU

Appendix G: Recent Research on Integration of Technology

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
Barron, Kemker, Harmes, & Kalaydjian (2003)	To determine the extent to which teachers in a large school district were using technology as a tool for their students' education	Use and type of use varies by subject area and grade level	Quantitative study using Likert-type survey of 2,156 teachers in grades K-12.	• Elementary teachers twice as likely to use computers as problem-solving and decision making tools than secondary • Elementary teachers more likely to use computers as a communication tool • Science teachers were three times more likely

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				and twice as likely to use computers as research tools • Science teachers were three times as likely as English teachers and social studies teachers were more than twice as likely as English teachers to use computers as problem-solving tools
Becker, & Ravitz	To look at the	Indicates computers	Quantitative survey	• Elementary teachers

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
(1999)	relationship between computer use and changing teacher practice	can act as a catalyst for teacher change in districts where informational, social support, and sufficient technological infrastructure is made available.	utilizing a four-point Likert scale given to 441 teachers in 153 elementary and secondary schools that were part of the National School Network (NSN)	report more changes in practice than teachers of middle school or high school students • Secondary English teachers and computer teachers report greatest mean number of changes
Brennan, Miller, & Moniotte (2001)	To investigate the use of computers by faculty in business school course	Intrinsic factors may be related to positive technology use and integration	Quantitative study using a 66 question, Likert-type survey with 80 faculty	• Computer use varies by faculty demographics, application and course load

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	preparation and delivery		across thirteen colleges and schools of business	• Extrinsic factors are not consistently related to use
Brush, Glazewski, Rutowski, Berg, Stromfors, Van-Nest, Stock, & Sutton (2003)	To provide a detailed overview of the field-based methods used by faculty at Arizona State University to integrate technology into the preservice education program.	Model lessons and collaborative activities enhance the potential for integration	Mixed qualitative/ quantitative study using surveys, lesson plans, and interviews of 100 preservice teachers in the preservice education program at ASU	• Providing model lessons benefit preservice teachers • Collaborative activities were beneficial when resources were resources are limited • Preservice teachers demonstrate confidence and enthusiasm for

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				developing and using technology-integrative lessons
Butzin (2001)	To compare standardized test scores in reading and mathematics for students in two similar technology-rich elementary schools. One using the Computers Helping Instruction and Learning	Study identifies limited number of computers and lack of training as influencing factors to integration	Quantitative study using Stanford Achievement Tests in reading and mathematics in two K-5 schools in Florida – 2,175 students took the tests (974 in a Project CHILD school and	• Students using the Project CHILD model scored higher on all tests compared to non-CHILD students

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	Development (CHILD) model, the other a traditional model		1,201 in a non-Project CHILD school	
Byrom & Bingham (2001)	To study what factors affect schools' successes in technology adoption and integration	Leadership, planning, support, evaluation, and school affluence are factors to integration	Observational study of 12 schools located in southeastern United States, Puerto Rico, and the Virgin Islands in which a SEIR*TEC staff member spent three to four days per month between 1995	• Leadership is the single most important factor to successful integration • The degree of success a school has with implementing technology will depend on comprehensive planning • Integrating technology

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
			to 2000 providing technical assistance and professional development	is a slow process that requires substantial levels of support and encouragement • Some teachers have a natural proclivity toward using technology while others do not • Effective use of technology requires changes in teaching practice

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				• Teachers benefit from on-site, on-demand technical assistance • Economically disadvantaged schools have greater barriers than affluent schools • Evaluation is often the weakest element in technology implementation
Chiero (1997)	To explore teachers' computer use and the	Support, time, and self-perception of	Quantitative study using a 48-item,	• Technology support not generally available

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	factors that promote or inhibit computer use for specific teacher tasks	expertise	Likert-type survey of 36 K-12 classroom teachers	• Teachers' primary use of technology is the preparation of materials such as worksheets • Time to learn new software biggest obstacle to use • The higher the individual's self-perception of expertise, the higher frequency of use • Frequency of use

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				decreases as experience increases
Chisholm, & Carey (2002)	Do non-traditional, low-socioeconomic and traditionally underrepresented college students in high education have less access and training than traditional majority students	Access to computers	Quantitative study surveying 578 urban university students, across different ethnicities	• Minority students own computers at a lower rate than do majority students • Computer resources are more likely to be used by minority students • All students regardless of ethnicity do not feel well prepared to use technology

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
Christensen (2002)	To investigate the effects of technology integration education on elementary school teachers	Training in integration techniques increase the chances that teacher and student use will increase	Quantitative comparative study of 82 elementary teachers and their students across three elementary schools in Texas using the following instruments: • Teachers' Attitude Toward Computers	• Needs-based technology integration education fosters positive attitudes toward technology among elementary classroom teachers • Teacher education in needs-based technology education, combined with significant classroom use, fosters positive student

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
			Questionnaire (TAC) • Computer Attitude Toward Computers Questionnaire (CAS) • Young Children's Computer Inventory (YCCI)	attitudes toward information technology • Positive teacher attitudes toward information technology fosters positive attitudes in their students

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
Dexter, Anderson, & Becker (1999)	To examine the use of computers by teachers and their perception of the impact of computers on classroom practice	Time for reflection, training, and expectations by school leaders positively influence integration	Qualitative study utilizing a questionnaire, semi-structured interviews, and classroom observations of 47 teachers from 20 K-12 districts across three states	• Teachers use of technology helped change classroom practice, but was not the primary catalyst • Primary catalysts to change cited were reflection upon experience, classes taken, and context or culture of the school
Doering, Hughes, & Huffman (2003)	1) To understand how a group of	Access to computers, lack of cooperate	Qualitative study utilizing a set of	• Participants in an innovative teacher

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	preservice teachers, before and after participating in an innovative technology component of a teacher education program, envisioned the use of technology within their	teaching, support of computer hardware and software, and student behavior were inhibiting factors to technology use and integration	three focus group interviews of ten preservice teachers	education program developed, to a limited extent, a “thinking about technology” perspective • Issues include: - Role of cooperating teachers - Availability of technology integration models - Participants’ abilities to generate technology-

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	classrooms 2) To understand preservice teachers' ability to identify content-based technology uses for their anticipated teaching after completion of student teaching			supported lessons - Instructional approaches to technology integration - Their inclination to teach technology-supported lessons without a through understanding of the technology
Dusick, &	To explore the	Training can enhance	Quantitative study	• Competency and

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
Yildirum (2000)	relationships among basic demographic variables, different attitudes toward computer use and subsequent use of computers for instruction	use and integration of computers into instruction	utilizing the Computer Competency Scale (CCS) and the Computer Attitude Scale (CAS) with 550 full- and part-time faculty at one urban California community college	previous computer training courses were significant predictors of computer use for instruction • Users prefer training focusing on improving skill level, while non-users preferred short sessions focused on learning the benefits of computers in education
Ertmer, Addison,	To examine the	Beliefs	Qualitative study	• Despite all teachers

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
Lane, Ross, & Woods (1999)	relationship between first- and second-order barriers by exploring the differences in teachers' use of technology, their perceptions of the value or role of technology in the classroom, and their benefits about what constitutes effective		using survey, interview, and classroom observation of seven primary (K-2) teachers at one elementary school	having similar barriers their technology use was not affected the same way • Teacher beliefs interact with first-order barriers to facilitate or limit teachers' use of technology

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	classroom practice			
Ertmer, & Hruskoey (1999)	To study what impact a university-school partnership, designed to support technology integration efforts have on: - Teacher attitudes and uses of technology - Students' confidence with	Training and collaboration positively enhance integration	Qualitative study using teacher and student interviews, teacher and student surveys, and open-ended teacher questionnaires with 33 individuals at one school comprising 1 principal, 1 library media specialist, 13 teachers, and 18	• Teacher comfort levels with technology increased • Teachers increased the number and type of computer applications used • Students confidence level in using technology increased

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	technology, basic computer skills, and self-esteem - The school's approach to technology implementation, including the use of student-trainers		students	
Gonzales, Pickett, Hupert, & Martin (2002)	To examine the affects of the Regional Educational	Time, training, and collaboration enhance technology integration and use	Qualitative/ Quantitative study of 170 teacher participants and 5	• RETA participants reported greater home access to computers • RETA participants use

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	Assistance (RETA) program on teaching practices and collegial behaviors of its participants in terms of: - Use of technology in the classroom - Use of constructivist practices in the classroom - Collaboration with		instructors in the RETA program utilizing pre/post surveys, participant workshop evaluations, instructor interviews, instructor observations, and instructor self-assessments	e-mail and the web in their personal lives more often following RETA • RETA participants indicated greater access to Internet at school following their involvement in RETA • Participants reported greater use of e-mail and web with their students following

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	other teachers - Leadership			RETA • Participants reported using a greater variety of computer applications following RETA • Participants reported increased collaboration following RETA • Participants took on greater leadership roles following RETA
Halpin (1999)	To compare two	Teacher training not	Quantitative study of	• Integration of

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	technology integration models	taught in isolation from their subject area increases likelihood that the will integrate technology into their class	73 elementary preservice teachers in a methods course utilizing a pre/post course questionnaire	technology with integration methods courses increased the probability that teachers transferred the computer skills into their classroom compared to preservice teachers who learned computer skills in an isolated manner
Hoerup (2001)	To understand how teachers, as	Collaboration, level of comfort with	Qualitative ethnographic case	• Innovativeness of individual teachers

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	individuals and as teams adopted and integrated technology into their classroom practice	technology, and personal beliefs and values impact integration	study of seven, fifth-grade teachers over a six-month period	aligned with Rogers' theory • Comfort level and capability with the change agent alters rate of adoption • Comfort level of the participant with the innovation and compatibility of the innovation with the participants' values, beliefs, and educational

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				background has the most impact on adoption of an innovation • The greater collaboration and sharing of ideas about technology and its integration the greater teacher success in using technology
Lumpe, & Chambers (2001)	To develop an instrument designed	Beliefs	Quantitative study of 327 teachers (of	• Teachers' context and self-efficacy beliefs

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	to assess teachers' context beliefs about using technology in the classroom		which 20 were participating in technology related graduate studies and 307 were participating in professional development program supported by a Technology Innovation Challenge Grant through the U.S. Department of	were significant predictors of teachers' reported use of technology-related engaged learning practices

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
			Education) utilizing - Beliefs about Teaching with Technology (BATT) and - Microcomputer Utilization in Teaching Efficacy Beliefs Instrument (MUTEDI)	
Mulqueen (2001)	To investigate the Teaching for Interdisciplinary	Training especially additional in-service days and summer	Qualitative case study of 205 teachers participating in the	• Second-year cohort teachers indicate an overall improvement in

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	Problem-Solving (TIPS) program through its second year of implementation	workshops and enthusiasm and competence with teachers important	TIPS program in New York utilizing a 7 point Likert-type rating scale	both their comfort-level using technology and in their knowledge and use of technology compared with year one teachers
Mouza (2003)	To describe a professional development program designed to help K-12 teachers effectively integrate technology into their classrooms	Training, time and access to resources	Interpretive case study design study of fifteen teachers participating in the Effel project (a Technology Innovation Challenge Grant program to	• Program was effective in helping teachers improve their technology skills and become aware of new pedagogical strategies made possible with the use of technology

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
			prepare teachers in 67 New York City public schools to use classroom technology through effective professional development) utilizing workshop observations and teacher interviews	
Parr (1999)	To examine one schools' efforts in teacher development	Teacher beliefs and lack of a collaborative culture inhibited use	Longitudinal study of 48 teachers in a private secondary	• Teacher confidence and skills improved markedly

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	and support for technology over a five-year period	of technology	school utilizing questionnaires and interviews	• Use of computers remained relatively low in classrooms
Pedersen, & Liu (2003)	To identify key issues in the implementation of a computer-based program design to support student-centered learning and to examine teacher beliefs about those issues	Collaboration enhances, varied definitions change implementation	Qualitative case study of 15 middle school science teachers utilizing interviews, classroom observations, a reflexive journal, and focus groups	• Teachers definitions of CBL and facilitator varied • Teachers generally believed collaboration is a valuable component in any educational approach • Essential to grade students during student-

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				centered learning activities • Student-centered learning activities are not helpful in preparing for standardized tests • Student-centered learning activities are likely to support intrinsically motivated behaviors behavior on the part of students
Pierson (2001)	To investigate how	Individual definitions	Qualitative case	• The ways technology is

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
	teachers at various levels of technology use and teaching abilities used technology and how technology use related to general teaching practices	of technology integration changed the way it was used in the classroom	study of three elementary teachers using observations and interviews	used determine the teachers' personal definitions of technology integration • Teachers at the lower levels of either teaching or technology abilities altered their planning habits when planning for technology inclusion • Teachers taught with and about technology according to their own

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				personal learning strategies • Teachers' individual definitions of technology integration directed their management of student computer use • Teachers at the lower levels of either teaching or technology abilities altered their perspective on assessment when

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				assessing student use of technology
Prain, & Hand (2003)	To analyze the effects of a whole-school approach to the introduction to new technologies in teaching and learning	Integrating technology throughout an entire school instead of only selected classes enhances technology use and integration	Mixed quantitative / qualitative case study of 130 teachers, 1,700 students, and 8 administrators in a senior secondary school in Australia using Interviews, surveys, observations, document analysis	• Whole-school approach to using new technology is major catalyst in changed teacher and student beliefs and attitudes about the nature and method of effective teaching and learning as they have engaged with new technology

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
				• Consensus between students and teaching staff that enhanced student learning • Improved student performance across most subjects
Saye (1998)	To understand the substantial differences in teachers' technology decisions	Time to practice and plan for technology, personnel support, adequate resources, leadership	Qualitative critical case study of ten teachers in a small boarding school utilizing interviews, classroom	• Certain general conditions must be met before teachers will admit technology into their practice • Once teachers have

Author/Year	Study purpose(s)	Factors affecting integration	Methodology/Sample	Results/Findings
			observations, and documents review	accepted technology, individual teacher characteristics will determine how technology is used in each classroom

Appendix H: IRB Approval Letter

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Institutional Review Board

Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice Provost for Research Compliance
CVM Phase II - Duckpond Dr., Blacksburg, VA 24061-0442
Office: 540/231-4991; FAX: 540/231-6033
e-mail: moored@vt.edu

MEMORANDUM

TO: John Burton Teaching and Learning 0313
David Baker EDCI 0313

FROM: David M. Moore

DATE: March 6, 2002

SUBJECT: **Expedited Approval** – "Make It So: How Low Resourced School Districts Implement a Virginia State Technology Mandate to Prepare K-12 Teachers to Integrate Technology into the Classroom" – IRB #02-111

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective March 4, 2002.

Approval of your research by the IRB provides the appropriate review as required by federal and state laws regarding human subject research. It is your responsibility to report to the IRB any adverse reactions that can be attributed to this study.

To continue the project past the 12 month approval period, a continuing review application must be submitted (30) days prior to the anniversary of the original approval date and a summary of the project to date must be provided. My office will send you a reminder of this (60) days prior to the anniversary date.

cc:File
Department Reviewer: Jan Nespor

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Appendix I: Interview Guide

Interview Guide

Thank you for taking the time to help me with this study. I am student at Virginia Tech, and I am interested in the implementation of state mandates. For this study, I am focusing specifically on how districts implement the *Virginia Technology Standards for Instructional Personnel*.

(HAND THE PARTICIPANT THE IRB INFORMED CONSENT FORM. AFTER A FEW MINUTES ASK THE PARTICIPANT IF SHE/HE HAS ANY QUESTIONS)

The reason I am asking you these questions is because I'd like to know more about your experiences with implementing the *Virginia Technology Standards for Instructional Personnel* as a mandates in the [state/district/school/ classroom]. I will be asking you some general questions to obtain basic demographic information about yourself and your working environment. I'll follow those with some questions about your experiences with this state mandate generally and conclude with some questions about integrating technology into the classroom, as one specific aspect of the mandate.

The interview should take no more than **one hour and thirty minutes.** If we do not complete the interview within this time frame, with your permission, we can complete the interview later at your convenience.

I will **not give your name to anyone** and I will **not share the names of any of the people you choose to talk to me about**. Your name, the names of anyone you choose to talk about, or the name of your district will not appear in any reports.

With your permission, I would like to tape the interview. No one other than myself will have access to the tapes and the tapes will be destroyed after the interview is transcribed.

Remember that at any time, you are free to withdraw from this interview at any time without penalty. You are free to skip questions that make you feel uncomfortable.

Do you have any questions for me?

General Demographics

1. Gender (Note Gender): MALE [ ] FEMALE [ ]

2. In what year were you born: __________

3. How many years have you been working in the field of education? _________

4. How many years have you been in your present position? _________

5. What is your official position title (If classroom teacher, note grade level)?

   ____

Mandates

1. How do you as a [policy maker, practitioner] define the term “state mandate”?

2. As a [policy maker, practitioner] what do you see as the primary purpose of state mandates in education?

3. How do you feel state mandates affect or influence your work as a [policy maker, practitioner]?

Technology Standards for Instructional Personnel

1. What does the *Technology Standards for Instructional Personnel* mean to you as a [policy maker, practitioner]?

2. Please describe how you feel as a [policy maker, practitioner] are [meeting, assisting with meeting] the requirements of the *Technology Standards for Instructional Personnel*?

3. As a [policy maker, practitioner], how [are districts, is your district] implementing the *Technology Standards for Instructional Personnel*?

4. Ideally, how should the *Technology Standards for Instructional Personnel* be implemented?

5. As a [policy maker, practitioner], what professional development activities might facilitate the implementation of the *Technology Standards for Instructional Personnel*?

6. What professional development activities [are, do you see] as a [practitioner, policy maker] as available to support the implementation of the *Technology*

Standards for Instructional Personnel?

7. As a [policy maker, practitioner], what professional development activities might facilitate the implementation of the *Technology Standards for Instructional Personnel*?

8. What factors do you feel prevent or inhibit the implementation of the *Technology Standards for Instructional Personnel*?

Technology Integration Into the Classroom

1. What does the phrase "integrating technology into the classroom" mean to you?

2. How are you [policy maker, practitioner] [meeting, assisting with meeting] the requirement to integrate technology into the classroom?

3. How is the integration of technology into the classroom being implemented?

4. Ideally, how should integration of technology into the classroom be implemented?

5. As a [policy maker, practitioner], what professional development activities might facilitate the integration of technology into the classroom?

6. What factors prevent or inhibit the implementation of integration of technology into the classroom?

7. As a [policy maker, practitioner], what do you believe is the role of instructional technology in education?

8. How do you use technology for your personal and/or professional work?

Appendix J: Sample Analysis of Interview

Interview Transcript
[redacted]
Central Administration
[redacted]
March 15, 2002; 10:00a – 11:00a

Pseudonyms
Dr. Charles Sandburg
Central Administration
Anderson City P.S.

RES: So, to start with, as a policy maker in this district, how do you define mandates?

SUB: Not a very sophisticated definition. It's just a state requirement, something we have to do as established by the state since education's primarily a state responsibility. DM

RES: What do you feel is the primary purpose of mandates?

SUB: To set minimum expectations that are met across the Commonwealth in every school division since then again education is primarily a state responsibility. DM

RES: Given that, how do you think they influence or affect your work?

SUB: Well, they influence and affect it but you've got to make sure your plans reflect the state mandates. You've got to make sure that your programs reflect state mandates, personnel reflects state mandates. It affects program. It affects budget. It affects personnel. It kind of permeates everything that you do in working with a school division. IF-LP

RES: Moving on to technology standards for instructional personnel. If somebody says technology standards for instructional personnel to you, what does that mean?

SUB: The minimum requirements that the state has identified that every teacher should be able to demonstrate and should be able to do in a generic sense. I think the locality then has to take those standards that have been identified by the state and you have to break those down in terms of what they mean for your locality or to demonstrate this particular technology competency or standard as defined by the state. DTS
What kind of things do we think in the City of [redacted] do you need to be able to do or to demonstrate or to know in order to meet that particular standard?

RES: So, there's some leeway from your perspective in terms of definition?

DTS Flexibility

SUB: I think the standards are broadly-based standards exactly what they mean I think is left up to each locality although I think each locality is probably going to define them very similar. But, I do think there will be certain things that some localities will say you need to be able to do and other localities will say you really don't need to be able to do that in this school division.

RES: Is there anything that you unique that [redacted] has decided to do that you don't think anybody else is doing?

SUB: I don't know that there's anything unique. I honestly don't have a clue because I don't really don't look at, haven't DC

Page 1

Appendix K: Informed Consent form for Administrators

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects (Administrators Form)

Title of Project: Make It So: How Low-Resourced School Districts Implement a Virginia State Technology Mandate to Prepare K-12 Teachers to Integrate Technology Into the Classroom

Investigator(s): David Christopher Baker; Faculty – Dr. Sue Magliaro, Dr. John Burton

I. Purpose of this Research/Project

The purpose of this project is to describe and evaluate the degree of the implementation of a state technology mandate to prepare K-12 teachers to integrate technology into the classroom. By providing an opportunity for district and school-based instructional personnel to discuss how such implementation takes place within their respective districts, it is hoped that patterns and themes will emerge that can lead policy and decision-makers to a better understanding of what assists or hinders mandate implementation.

II. Procedures

Following an initial contact by phone, you will be sent a letter of explanation describing the study and the interview process. An interview time will be scheduled at your convenience. You will be asked to sign and return the Informed Consent form before the interview is conducted. The procedures for the following data sources are described below:

1. **Interview**
   Following the initial contact, you will be asked to schedule an interview at a time and place that is convenient for you. Interviews will be conducted through a set of semi-structured interview questions asked of all participants. It is anticipated that the interview will last approximately 60 to 90 minutes. Interviews will be analyzed according to the main themes that emerge from the data.

2. **Technology Plan**
   The technology plan that is currently in effect will be analyzed to determine how it supports teacher professional development and integration of technology into the curriculum.

3. **Professional Development Calendar**
   Samples of professional development calendars, from the past year, will be analyzed to determine the extent that it supports technology in teacher professional development and integration of technology into the curriculum.

4. **Professional Development Training Materials**
   Professional development training materials will be analyzed according to their alignment with and support of the eight technology standards of the *Technology Standards for Instructional Personnel in Virginia*.

5. **Follow-Up Questions**
   Any follow-up questions will be asked through e-mail, fax, phone, or follow-up meeting at a time that is convenient for both the participant and the researcher. Follow-up questions will be used solely for the purpose of clarifying issues raised during the interviews.

III. Risks

There is no risk to the participant. However, this consent form is being provided to help you better understand the scope of the project and document that you are willing to assist with this project.

IV. Benefits

There are no benefits promised from this study. Your assistance with this study may benefit school divisions in Virginia and elsewhere.

V. Extent of Anonymity and Confidentiality

The preservation of your anonymity in this study is of utmost importance. Every attempt will be made to preserve the anonymity of you, your district, school, and program. However, despite every effort to preserve it, anonymity may be compromised due to the uniqueness of your position or program.

Every attempt will be made to keep identifying information confidential. Only the investigators indicated above will actually know which districts, programs, or individuals are referred to in the study. Except for your signature on this Informed Consent form, address information on necessary correspondence (e.g., to send you a copy of the study results), or specific references to named people and places during the interview, all responses will be anonymous and there will be no identifying information collected in this research project.

At the beginning of the interview, you will be asked if you are willing to have the interview tape(s) recorded on audiocassette tape(s). Taping of the interview is for the purposes of ensuring accuracy of the information provided to the researcher. All tapes will be retained in a fireproof security lock-box at the researchers home until the transcription of the tape(s) is complete. The researcher will transcribe the tape(s) and the tape(s) will be destroyed once transcription is complete. Only the researcher will have access to the lock-box and tape during this period. When transcribed, all names of individuals, schools, programs, and districts used in the interview will be replaced with numbers or pseudonyms where appropriate. These numbers or pseudonyms will be referred to throughout the study.

Confidentiality is of the utmost importance in this study. However, confidentiality may not be maintained if situations arise where (1) child abuse is known or strongly suspected, or (2) the participant is believed to be a threat to herself/himself or others.

VI. Compensation

There is no compensation for participation in this project. All participation is strictly voluntary and you may withdraw at any time without penalty. The research findings will be made available to you and your district at the conclusion of the study.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. You are free not to answer questions or respond to any experimental situations that you choose.

VIII. Approval of Research

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of __Teaching and Learning (0313)______ and _Roanoke City Public Schools________ (if others, i.e., school or school system, hospital, daycare center, multi-institutional project etc.).

__March 4, 2002_______________	_March 4, 2003________________
IRB Approval Date	Approval Expiration Date

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:

You are asked to read, sign, and return this Informed Consent form to the researcher. The interview will be conducted once the Informed Consent form has been signed and returned to the researcher. The interview will be scheduled at a time and location convenient for you. You are asked to participate in an interview and respond as truthfully as possible. It is anticipated that the interview will last between 60-90 minutes.

X. Subject's Permission

The following data sources are released for the purpose described above.

_____ Technology Plan
_____ Professional Staff Development Calendars
_____ Professional Development Training Materials

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

____Date__________
Subject signature
____ Date __________
Witness (Optional except for certain classes of subjects)

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

David C. Baker Investigator(s)	540-772-1929 / dirtech@roanoke.infi.net Telephone/e-mail
Dr. Sue Magliaro / Dr. John Burton Faculty Advisor	540-231-8338 / sumags@vt.edu 540-231-7020 / jburton@vt.edu Telephone/e-mail
Dr. Jan Nespor Departmental Reviewer/Department Head	540-231-8327 / nespor@vt.edu Telephone/e-mail
David M. Moore Chair, IRB Office of Research Compliance Research & Graduate Studies	540-231-4991/moored@vt.edu Telephone/e-mail

This Informed Consent is valid from 3/4/2___ to 3/4/3___.

Appendix L: Informed Consent form for Teachers

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects (Teachers Form)

Title of Project: Make It So: How Low-Resourced School Districts Implement a Virginia State Technology Mandate to Prepare K-12 Teachers to Integrate Technology Into the Classroom

Investigator(s): David Christopher Baker; Faculty – Dr. Sue Magliaro, Dr. John Burton

I. Purpose of this Research/Project

The purpose of this project is to describe and evaluate the degree of the implementation of a state technology mandate to prepare K-12 teachers to integrate technology into the classroom. By providing an opportunity for district and school-based instructional personnel to discuss how such implementation takes place within their respective districts, it is hoped that patterns and themes will emerge that can lead policy and decision-makers to a better understanding of what assists or hinders mandate implementation.

II. Procedures

Following an initial contact by phone, you will be sent a letter of explanation describing the study and the interview process. An interview time will be scheduled at your convenience. You will be asked to sign and return the Informed Consent form before the interview is conducted. The procedures for the following data sources are described below:

6. **Interview**
   Following the initial contact, you will be asked to schedule an interview at a time and place that is convenient for you. Interviews will be conducted through a set of semi-structured interview questions asked of all participants. It is anticipated that the interview will last approximately 60 to 90 minutes. Interviews will be analyzed according to the main themes that emerge from the data.

7. **Observations**
   You will be requested to allow the researcher to observe three class periods (or three hours of instructional time) during one single block of time (consecutive hours). Observations will be scheduled in your classroom at a time that is convenient to you. The researcher will act as a non-participant observer of class activities. Observation data will be analyzed to determine how teachers are

integrating available technology into daily teaching practices.

8. **Sample Lesson Plans**
   Samples of two or three lesson plans, you select, from the past year, will be analyzed to determine how you integrate technology into your teaching practices.

9. **Follow-Up Questions**
   Any follow-up questions will be asked through e-mail, fax, phone, or follow-up meeting at a time that is convenient for both the participant and the researcher. Follow-up questions will be used solely for the purpose of clarifying issues raised during the interviews.

III. Risks

There is no risk to the participant. However, this consent form is being provided to help you better understand the scope of the project and document that you are willing to assist with this project.

IV. Benefits

There are no benefits promised from this study. Your assistance with this study may benefit school divisions in Virginia and elsewhere.

V. Extent of Anonymity and Confidentiality

The preservation of your anonymity in this study is of utmost importance. Every attempt will be made to preserve the anonymity of you, your district, school, and program. However, despite every effort to preserve it, anonymity may be compromised due to the uniqueness of your position or program.

Every attempt will be made to keep identifying information confidential. Only the investigators indicated above will actually know which districts, programs, or individuals are referred to in the study. Except for your signature on this Informed Consent form, address information on necessary correspondence (e.g., to send you a copy of the study results), or specific references to named people and places during the interview, all responses will be anonymous and there will be no identifying information collected in this research project.

At the beginning of the interview, you will be asked if you are willing to have the interview tape(s) recorded on audiocassette tape(s). Taping of the interview is for the purposes of ensuring accuracy of the information provided to the researcher. All tapes will be retained in a fireproof security lock-box at the researchers home until the transcription of the tape(s) is complete. The researcher will transcribe the tape(s) and the tape(s) will be destroyed once transcription is complete. Only the researcher will have access to the lock-box and tape during this period. When transcribed, all names of individuals, schools, programs, and districts used in the interview will be replaced with numbers or pseudonyms where appropriate. These numbers or pseudonyms will be referred to throughout the study.

Confidentiality is of the utmost importance in this study. However, confidentiality may not be maintained if situations arise where (1) child abuse is known or strongly suspected, or (2) the participant is believed to be a threat to herself/himself or others.

VI. Compensation

There is no compensation for participation in this project. All participation is strictly voluntary and you may withdraw at any time without penalty. The research findings will be made available to you and your district at the conclusion of the study.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. You are free not to answer questions or respond to any experimental situations that you choose.

VIII. Approval of Research

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of _Teaching and Learning (0313)________ and _Roanoke City Public Schools________ (if others, i.e., school or school system, hospital, daycare center, multi-institutional project etc.).

_March 4, 2002_________________ IRB Approval Date

_March 4, 2003_________________ Approval Expiration Date

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:

You are asked to read, sign, and return this Informed Consent form to the researcher. The interview will be conducted once the Informed Consent form has been signed and returned to the researcher. The interview and classroom observation will be scheduled at a time convenient for you. You are asked not to change your teaching methods, lesson plans, or otherwise alter the classroom setting for the purpose of the observations. You are asked to participate in an interview and respond as truthfully as possible. It is anticipated that the interview will last between 60-90 minutes.

X. Subject's Permission

The following data sources are released for the purpose described above.

_____ Classroom Lesson Plans

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

____

____Date__________

Subject signature

____ Date __________

Witness (Optional except for certain classes of subjects)

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

__David C. Baker________________________	540-772-1929 / dirtech@roanoke.infi.net
Investigator(s)	Telephone/e-mail
__Dr. Sue Magliaro / Dr. John Burton___	540-231-8338 / sumags@vt.edu 540-231-7020 / jburton@vt.edu________
Faculty Advisor	Telephone/e-mail
__Dr. Jan Nespor________________________	540-231-8327 / nespor@vt.edu________
Departmental Reviewer/Department Head	Telephone/e-mail
David M. Moore	540-231-4991/moored@vt.edu________
Chair, IRB Office of Research Compliance Research & Graduate Studies	Telephone/e-mail

This Informed Consent is valid from _3/4/2__ to _3/4/3__.

Appendix M: Sample Analysis of Field Notes

[redacted] MIDDLE SCHOOL
[redacted], VIRGINIA
FIELD NOTES

I asked him if the school had a technology plan or if their technology was strictly driven by the district plan? He said that they did have a technology plan, however, the plan was "unwritten and informal." He pointed out one of the computer labs (he seemed exceptionally proud of this) and told me that it was one of four that they have in the school. He said that they used to have a Macintosh lab but that they had gotten rid of all of the Macs in the school and finally, with the renovation, have all Windows PCs. "This is Ms. [redacted] lab," [redacted] tells me (pointing to the door). "She teaches computer science classes at the school when she's not teaching math." He moved to another door (Room [redacted]) and then realized that it was the wrong door. "Oh I keep forgetting the room numbers in this part of the building have been changed. She used to be in this room, she's now in [redacted]." He walked around the corner of the hallway. At this point I felt somewhat lost – like we were traveling in circles. "Here" – he pointed to the door. "Ms. [redacted]!" A young woman [redacted] comes forward. Her classroom is empty – no students. [redacted] confirmed that he had talked to her about my presence and introduced me. He told me that he was leaving me with her to attend to other business. He said that I was free to wonder around the school and observe whatever I wished. He leaves the room. Ms. [redacted] told me that she had a class in a few minutes and has

LP

AR

Appendix N: Superintendent's Regulatory Memo Regarding the TSIP

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF EDUCATION
P. O. BOX 2120
RICHMOND, VIRGINIA 23218-2120

SUPTS. MEMO. NO. 2
May 1, 1998

REGULATORY

TO:	Division Superintendents
FROM:	Paul D. Stapleton Superintendent of Public Instruction
SUBJECT:	Correction: Regulatory Superintendent's Memorandum # 2

Please replace the attached superintendent's memorandum with the one previously received dated April 17, 1998.

Inadvertently some wording was omitted from a portion of the memo that was previously disseminated. We are sorry for any inconvenience that this may have caused.

PDS/pg

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF EDUCATION
P. O. BOX 2120
RICHMOND, VIRGINIA 23218-2120

SUPTS. MEMO. NO. 2
April 17, 1998

REGULATORY

TO:	Division Superintendents
FROM:	Paul D. Stapleton Superintendent of Public Instruction
SUBJECT:	Licensure Regulations for School Personnel (8 VAC 20-21-10) and Technology Standards for Instructional Personnel (8 VAC 20-25-10)

During the January 8, 1998, meeting of the Board of Education, the Licensure Regulations for School Personnel were approved. The revisions approved by the Board aligned the licensure requirements for prospective teachers with the Virginia Standards of Learning; established a statewide licensure system that provides flexibility for the approved teacher preparation programs, and reduced the number of endorsements for licensure. With the exception of four endorsement areas in special education (learning disabilities, emotionally disturbed, mentally retarded, and severe disabilities), the regulations have completed the requirements of the Administrative Process Act (APA). The approved regulations will be accessible on the Department of Education's website by May 1, and printed copies will be available on or before July 1, 1998.

A workshop has tentatively been scheduled for May 15, 1998, in Charlottesville to review the licensure regulations and the technology standards. A letter of invitation will be sent to directors of personnel and licensure contacts within a week.

The Board of Education has also approved the Technology Standards for Instructional Personnel. The regulations will ensure that instructional personnel in Virginia have mastered and demonstrated competency in technology consistent with the Standards of Learning for students in the fifth and eighth grades. A copy of the technology standards is enclosed for your information.

This memorandum highlights some of the major revisions in the licensure regulations and provides information regarding the new technology standards. Guidance in the implementation of these new regulations is also provided.

LICENSURE REGULATIONS FOR SCHOOL PERSONNEL (8 VAC 20-21-10)

1. Effective Date of Licensure Regulations

   The implementation of the licensure regulations for school personnel will become effective on July 1, 1998. However, institutions of higher education with approved teacher preparation programs will be required to implement the regulations for individuals entering their programs by the fall of 2000.

   Individuals currently enrolled in Virginia approved teacher preparation programs will complete the program (endorsement area) in effect at the time of their enrollment. For example, an individual currently enrolled in a middle education teacher preparation program in Virginia will receive the middle education endorsement upon completion of that program. The endorsement will allow the prospective teacher to teach in any of the four areas of concentration. Individuals from other states seeking a middle education endorsement after July 1, 1998, or individuals entering Virginia programs in the fall of 2000 will receive a license designating at least two areas of concentration as required in the new regulations.

2. Competencies and Endorsement Requirements

   The regulations outline competencies and semester-hour requirements for each endorsement area. Institutions of higher education with approved programs must incorporate the competencies in their programs (these competencies are listed separately in each endorsement area); however, the institutions are not subject to the specific semester-hour requirements listed. The endorsement requirements (specific semester-hour requirements) will be applied to individuals seeking licensure outside of state-approved programs and individuals seeking licensure through the alternative route to licensure.

3. License Holders' Existing Endorsements

License holders will maintain their existing endorsements. Individuals who are working toward satisfying written evaluations received from the Licensure Office will continue to have three years from the date of the evaluation to satisfy the requirements stipulated on the evaluation. Individuals who are currently enrolled in a state-approved teacher preparation program are considered to be in the pipeline and may continue to follow the existing regulations until completion of their program. These individuals will receive the endorsement corresponding to the program in which they enrolled.

4. Provisional License

Provisional licenses may be issued for qualified individuals for a period not to exceed three years as allowed by the Code of Virginia. During the three-year period, individuals must meet all requirements (including the professional teacher's assessment (Praxis I and II), professional studies course work, and/or experience) specified at the time the provisional license is issued. An extension of the three-year provisional license may not be granted because state law does not allow the issuance of the provisional license beyond three years.

5. Endorsement Grade Levels

There are five grade configurations identified in the regulations: Early/primary PreKindergarten through Grade 3 (PreK-3), Elementary PreKindergarten through Grade 6 (PreK-6), Middle Education 6-8, PreK-Grade 12 (PreK-12), and secondary grades 6-12.

The secondary grades 6-12 configuration is a continuation of the previous regulations. Since the early 1960s, the Virginia Department of Education has developed and distributed to local school divisions, The School Administrators Handbook of Course Codes and Endorsement Codes for determining the appropriate teaching endorsement for each course offered within a school division. Those codes, used by school divisions to assign teachers, have always allowed an individual teacher with a secondary teaching endorsement such as English or mathematics to teach that subject in grades 6, 7, and 8 in a departmentalized setting. A revised School Administrators Handbook will be distributed to school divisions in the next few months.

6. Consolidation of Endorsements

The licensure regulations combine principal and supervision endorsements into one endorsement in Administration and Supervision PreK-12. Individuals seeking this endorsement must complete an approved preparation program in administration and supervision with a focus on educational leadership including knowledge and skills in both supervision and administration.

The elementary, middle, and secondary school counselor endorsements have been consolidated into one endorsement, School Counselor PreK-12. Endorsements in health and physical education have been combined into one endorsement, Health and Physical Education PreK-12.

7. Special Education Conditional License

The Special Education Conditional License is a three-year, nonrenewable teaching license issued to an individual employed as a special education teacher who does not hold the appropriate special education endorsement. An individual is no longer required to hold another license to receive a Special Education Conditional License; however, the initial application fee will be applicable. The conditional license is not applicable to individuals employed as speech pathologists. To receive the Special Education Conditional License an individual must: (1) be employed by a Virginia public or nonpublic school and have the recommendation of the employing educational agency; (2) hold a baccalaureate degree from an accredited college or university; (3) have an assigned mentor endorsed in special education; and (4) have a planned program of study in the assigned endorsement area and have completed a minimum of six semester hours in the core competencies of characteristics of students with disabilities and legal aspects associated with students with disabilities (Consideration may be given to individuals who have not completed the six semester hours but have been employed. They must complete the six semester hours of course work during the first year of the Special Education Conditional License.)

8. Technical Professional License

The Technical Professional License has been expanded to include individuals with or without a baccalaureate degree who have demonstrated academic proficiency and technical competency and who have completed occupational experience. The National Occupational Competency Testing Institute Test (NOCTI) will no longer be required for endorsements in trade and industrial education. However, an individual must be licensed or certified, if applicable, as a professional practitioner in the area in which he or she will be teaching or providing a service.

9. License Renewal

At least 90 points of the 180 points required for renewal for license holders without a master's degree must be satisfied by completing a three-semester-hour content course. A course in special education designed to assist classroom teachers and other school personnel in working with students with disabilities, a course in gifted education, a course in educational technology, or a course in English as a Second Language may be completed to satisfy the content course requirement for one cycle of the renewal process. Professional development activities designed to support the Virginia Standards of Learning, Standards of Accreditation, and the Virginia Assessment Program may be accepted in lieu of the content course for one renewal cycle.

10. Vocational Education-Technology Education Endorsement

An individual seeking the endorsement in technology education may become eligible for the endorsement by (1) completing of an approved program in technology education; (2) completing a major in technology education or 39 specified hours in technology education; or (3) earning a baccalaureate degree from an accredited college or university with a major in one of the following fields of study: architecture, design, engineering, or physics; and completing 18 semester hours in technology education. The third option is a new route to endorsement.

11. Middle Education 6-8 Endorsement

Individuals seeking a Middle Education 6-8 endorsement must complete two 21-semester-hour concentrations in the core areas of mathematics, science, English, or history/social science. The areas of concentration will appear on a license, and teaching assignments should be based on those areas of concentration.

12. Special Education Endorsements

Endorsement areas were approved by the Board of Education in special education early childhood, hearing impairments, speech-language disorders, and visual impairments. Proposals in special education mild-moderate disabilities and special education moderate-severe disabilities were not approved. The Board of Education appointed a task force to develop a compromise proposal for the four special education areas in learning disabilities, emotionally disturbed, mental retardation, and severe disabilities.

A meeting of the Special Education Task Force convened on February 11, 1998, with membership representing teacher preparation programs in institutions of higher education, the Virginia Branch of the International Dyslexia Society, the Learning Disabilities of Virginia, the State Special Education Advisory Committee, the Association for Retarded Citizens, the

Advisory Board on Teacher Education and Licensure, and Department of Education staff. On February 26, 1998, the Board of Education received and approved the substitute proposal in these four endorsement areas of special education.

A public hearing was held April 6, 1998, for individuals to share ideas and suggestions on these proposed licensure regulations. Based on the comments from this hearing, written comments that might be received through April 30, and advisement from the Advisory Board on Teacher Education and Licensure, the Board of Education will approve final licensure regulations in these areas of special education.

A copy of the Licensure Regulations for School Personnel will be forwarded to you upon final printing. We anticipate that you will be notified in the near future concerning a statewide workshop to overview the licensure regulations and provide assistance in implementing the regulations.

TECHNOLOGY STANDARDS FOR INSTRUCTIONAL PERSONNEL (8VAC 20-25-10)

Instructional personnel are ultimately responsible for the use of technology in the classroom. As a result of the availability of technology and the requirement that students in Virginia must master technology standards, instructional personnel will be required to meet the Technology Standards for Instructional Personnel. These technology standards set forth those competencies required of instructional personnel in Virginia. Individuals completing approved preparation programs will also be required to demonstrate competency in technology as a requirement of program completion.

School divisions must incorporate the technology standards into their local technology plans and develop strategies to implement the standards by December 1998. The goal is that all instructional personnel meet the standards prior to the 2002-2003 school year. The local technology plan must include a time line and strategies to meet this goal. School divisions must also ensure that newly-hired instructional personnel demonstrate proficiency in the technology standards during the three-year probationary period of employment. Even though this requirement is applicable to all school personnel required to hold a license issued by the Virginia Board of Education, it is not a requirement for continued licensure or license renewal. Please note, however, that instructional personnel without a master's degree may complete a course in educational technology in lieu of a content course for one renewal cycle.

School divisions must include strategies to implement and assess the standards in the local technology plans. The standards are intended to be entry level; therefore, school divisions will need to establish provisions for instructional personnel who have already acquired higher levels of knowledge and skills to test out of the entry-level requirements.

Institutions of higher education must incorporate technology standards in their approved programs and assess students' proficiency of the standards by December 1998. Institutions will verify that students have met the technology standards on form DA 035, College Verification Form, now used to recommend students for licensure. The form will be revised by the Department of Education and distributed directly to colleges and universities with approved programs prior to the beginning of the 1998 fall semester. Institutions will need to establish provisions by which students who have already acquired higher levels of knowledge and skills may test out of the standards which are intended to be entry level.

By the fall of the year 2000, institutions must align their teacher education programs with the licensure regulations. The newly-developed programs will be reviewed on a five-year cycle to verify both alignment with the licensure competencies and incorporation of the technology standards. Institutions will not be required to submit written documentation of the incorporation of the technology standards into their approved programs prior to the adoption of revised accreditation and program approval standards now being developed. The revised standards and procedures will establish the schedule for the reinstatement of the five-year review cycle. Institutions that are scheduled for national accreditation or technical assistance reviews prior to the fall of 2000 will be expected to demonstrate incorporation of the technology standards into their programs and strategies for assessing student competency in the use of technology at the time of their on-site review.

Please do not hesitate to contact Dr. Thomas A. Elliott, Assistant Superintendent for Compliance, at (804) 371-2522; Mr. Lan W. Neugent, Assistant Superintendent for Technology, at (804) 786-2260; or Mrs. Patty S. Pitts, Associate Director for Licensure, at (804) 225-2022 if you have any questions regarding the licensure regulations or the technology standards.

PDS:psp

Enclosure

c: Deans/Chairs, Schools/Departments of Education
Directors of Human Resources
Licensure Contact Persons

8 VAC 20-25-10 et seq.
TECHNOLOGY STANDARDS FOR INSTRUCTIONAL PERSONNEL

Statutory Authority: 22.1-16 of the Code of Virginia

Effective Date: March 4, 1998

8 VAC 20-25-10. Definitions.

The following words and terms, when used in this regulation, shall have the following meaning unless the context clearly indicates otherwise:

Demonstrated proficiency means a demonstrated level of competence of the technology standards as determined by school administrators.

Electronic technologies means electronic devices and systems to access and exchange information.

Instructional personnel means all school personnel required to hold a license issued by the Virginia Board of Education for instructional purposes.

Productivity tools means computer software tools to enhance student learning and job performance.

8 VAC 20-25-20. Administration of technology standards.

A. School divisions and institutions of higher education shall incorporate the technology standards for instructional personnel into their division-wide technology plans and approved teacher education programs, respectively, by December 1998.

B. School divisions and institutions of higher education shall develop implementation plans for pre-service and in-service training for instructional personnel. The implementation plan shall provide the requirements for demonstrated proficiency of the technology standards.

C. Waivers shall be considered on a case-by-case basis of the 18-hour professional studies cap placed on teacher preparation programs for institutions requesting additional instruction in educational technology.

D. School divisions shall ensure that newly-hired instructional personnel from out of state demonstrate proficiency in the technology standards during the three-year probation period of employment.

E. Course work in technology shall satisfy the content requirement for licensure renewal for license holders who do not have a master's degree.

F. School divisions shall incorporate the technology standards into their local technology plans and develop strategies to implement the standards by December 1998.

G. Institutions of higher education shall incorporate technology standards in their approved program requirements and assess students' demonstrated proficiency of the standards by December 1998.

8 VAC 20-25-30. Technology standards.

A. Instructional personnel shall be able to demonstrate effective use of a computer system and utilize computer software.

B. Instructional personnel shall be able to apply knowledge of terms associated with educational computing and technology.

C. Instructional personnel shall be able to apply computer productivity tools for professional use.

D. Instructional personnel shall be able to use electronic technologies to access and exchange information.

E. Instructional personnel shall be able to identify, locate, evaluate, and use appropriate instructional hardware and software to support Virginia's Standards of Learning and other instructional objectives.

F. Instructional personnel shall be able to use educational technologies for data collection, information management, problem solving, decision making, communication, and presentation within the curriculum.

G. Instructional personnel shall be able to plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings.

H. Instructional personnel shall demonstrate knowledge of ethical and legal issues relating to the use of technology.

Appendix O: Anderson City Public Schools TSIP *Checklist*

Technology Standards for instructional Personnel
Demonstrative Skill Analysis

I. Personal Technology Skills and Productivity

1) Operate a computer system and utilize software.

- **Use the basic functions of word processing software:**

Basic Skills (all)

_______ Create a new document
_______ Set margins
_______ Use the TAB key
_______ Change size
_______ Change font
_______ Underline text
_______ Bold text
_______ Italicize text
_______ Change text color
_______ Center text
_______ Set justifications (left / right)
_______ Check spelling
_______ Utilize the thesaurus
_______ Insert header
_______ Insert footer
_______ Highlight text
_______ Delete text
_______ Cut text
_______ Paste text
_______ Import a graphic
_______ Adjust line spacing
_______ Create columns

Advanced Skills

_______ Insert page numbers
_______ Insert today's date
_______ Wrap text around graphics
_______ Set tabs

- **Use the basic functions of database software:**

Basic Skills (all)

_______ Create a new document
_______ Define fields
_______ Modify fields
_______ Enter data
_______ Edit data
_______ Create new records
_______ Navigate through records
_______ Omit records
_______ Sort records by alpha order
_______ Sort records by category
_______ Create new layouts
_______ Produce reports in various forms (standard, columnar, label)
_______ Choose fields for new layout
_______ Manipulate fields in a layout
_______ Insert fields into a layout
_______ Delete fields from a layout
_______ Use the Find function
_______ Use the Show All Records function
_______ Integrate database into a word processed document

Advanced Skills

_______ Assign field type
_______ Use the Auto Data entry feature
_______ Change the tab order
_______ Use summary or calculation field
_______ Use the Hide Selected Records function

- **Use the basic functions of spreadsheet software:**

Basic Skills

_______ Create a new document
_______ Enter data
_______ Move data
_______ Delete data
_______ Enter formulas (sum, average)
_______ Paste values only
_______ Insert cells
_______ Delete cells
_______ Fill cells automatically
_______ Sort cells
_______ Protect cells
_______ Change text font
_______ Change text size
_______ Change text style
_______ Change size of rows / columns
_______ Change text alignment
_______ Adjust size of spreadsheet
_______ Remove row / column labels
_______ Set text wrap in cells
_______ Create a chart
_______ Change chart type
_______ Resize chart
_______ Change series color / pattern
_______ Set chart scale
_______ Add axis labels
_______ Remove legend
_______ Integrate spreadsheet into a word processed document
_______ Integrate a chart into a word processed document

Advanced Skills

_______ Enter functions
_______ Apply a look up table
_______ Set number format
_______ Change data range
_______ Create combination charts
_______ Label data on chart

- **Format and care for disks:**

Basic Skills (all)

_______ Initialize a new disk
_______ Delete files from a disk
_______ Erase a disk
_______ Copy files from one disk to another
_______ Lock / unlock disk
_______ Change name of disk
_______ Know disk capacity
_______ Care properly for CD-ROM disks
_______ Care properly for optical disks

- **Store and retrieve data from a computer hard drive and disk:**

Basic Skills (all)

_______ Create a folder
_______ Save document on a disk
_______ Save document under a different name
_______ Save document on a hard drive
_______ Open a document from a disk
_______ Delete a document from a disk
_______ Copy a document from hard drive to a disk
_______ Copy a document to another disk
_______ Copy a document from a disk to a folder on the hard drive
_______ Open a document from a hard drive
_______ Delete a document from a hard drive

As building / division networks are complete:

_______ Store information on network server
_______ Retrieve information from network server

Advanced Skills

_______ Save document as stationery / template file
_______ Lock / unlock a file

- **Perform print operations:**

Basic Skills (all)

_______ Choose a printer
_______ Print a document
_______ Change paper orientation
_______ Load paper into the printer
_______ Set number of copies to be printed
_______ Print part of a document
_______ Print a range of cells in spreadsheet
_______ Change computer ribbons / cartridges

- **Access information located on a CD-ROM or other peripherals:**

Basic Skills (all)

_______ Load CD-ROM into player
_______ Eject CD-ROM from player
_______ Access information on CD-ROM
_______ Load optical disc into player
_______ Eject optical disc from player
_______ Access information on optical disc

- **Other:**

_______ Display computer image on large screen monitor
____
____

2) Apply knowledge of terms associated with educational computing and technology. (all)

- **Know the vocabulary associate with computer technology:**

Computer Theory

______ bit
______ byte
______ megabyte (MB)
______ gigabyte (GB)
______ binary logic

Network

______ Internet
______ wide area network (WAN)
______ local area network (LAN)
______ network
______ file server
______ graphical user interface (GUI)

Hardware

______ monitor
______ mouse
______ keyboard
______ central processing unit (CPU)
______ disk drive
______ hard drive
______ CD-ROM drive
______ memory (hard drive, random access memory (RAM))
______ printer (laser, inkjet, matrix)
______ optical disc player
______ scanner
______ digital camera
______ modem

Software

______ floppy disk
______ compact disc - read only memory (CD-ROM)
______ optical disc
______ operating software
______ application software
______ utility software

Other

______ student vocabulary included in the K-8 Scope and Sequence

3) **Apply productivity tools for professional use.**

- **Use software tools to assist with administrative tasks: (minimum of one)**

_______ Produce forms
_______ Keep student records
_______ Develop lesson plans
_______ Design seating charts
_______ Establish schedules
_______ Record grades
_______ Maintain IEPs
_______ Other: ____________________

- **Use software tools to design or customize instructional materials: (minimum of one)**

_______ Generate tests
_______ Create curriculum materials
_______ Modify instructional materials
_______ Other: ____________________

- **Use software tools to enhance communications: (minimum of one)**

_______ Write letters to parents
_______ Correspond with colleagues
_______ Compose newsletters
_______ Other: ____________________

- **Use telecommunications to find resource materials: (minimum of one)**

_______ Locate lesson plans
_______ Collect materials to use in lessons
_______ Other: ____________________
_______ Collaborate with professionals

4) **Use electronic technologies to access and exchange information. (all – as building / division networks are completed)**

_______ Access resources on the local area network
_______ Access resources on the wide area network
_______ Communicate via e-mail
_______ Access the Internet
_______ Store selected Internet resources for retrieval at a later time
_______ Complete a Web search
_______ Develop a plan and teach a lesson which uses Internet resources

II. Technology Applications in Instruction

5) **Identify, locate, evaluate, and use appropriate instructional technology-based resources (hardware and software) to support SOLs and other instructional objectives.**

- **Effectively use software / technology resources appropriate to instructional content:**

______ Accelerated Reader	______ Other: ______________
______ Writing to Read / Apple	______ Other: ______________
______ Early Learning	______ Other: ______________
______ Word processing software	______ Other: ______________
______ Database software	______ Other: ______________
______ Spreadsheet software	______ Other: ______________
______ Electronic Calculators	______ Other: ______________
______ Science Probeware	______ Other: ______________
______ Josten's Learning Program	______ Other: ______________

- **Use technology tools including but not limited to:**

______ large screen monitor	______ CD-ROM player
______ network	______ optical disc player
______ scanner	______ digital camera
______ printer	______ Other: ______________
	______ Other: ______________

- **Other:**

______
______
______

6) **Use educational technologies for data collection, information management, problem solving, decision making, communications, and presentations within the curriculum.**

______ Incorporate word processing software into instruction
______ Incorporate spreadsheet software into instruction
______ Incorporate database software into instruction
______ Incorporate telecommunications as a component of instruction
______ Use software to present a lesson
______ Use presentation software (i.e., Power Point, HyperStudio, ClarisWorks slideshow) to develop instructional materials
______ Other: ______________
______ Other: ______________
______ Other: ______________

7) **Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings.**

- **Plan and implement lessons that utilize technology to facilitate instruction:**

_______ Student projects
_______ Small group instruction
_______ Individual instruction
_______ Whole class instruction

- **Use technology effectively in various educational settings:**

_______ Computer lab
_______ Multimedia station
_______ Computers in classroom clusters
_______ Single computer in classroom

- **Effectively utilize the automated library media center:**

_______ Access instructional materials

- **Other:**

____
____
____

8) **Demonstrate knowledge of ethical and legal issues relating to the use of technology. (all)**

- **Be aware of responsible technology use to include and understanding of:**

_______ Copyright laws
_______ Respect of intellectual property
_______ Software licensing
_______ Proper and effective uses of resources
_______ Correct citation of sources and bibliography

- **Expect students to use technology responsibly:**

_______ Inform students of copyright laws
_______ Explain the concept of intellectual property
_______ Encourage the proper and effective use of resources
_______ Require correct citation of sources and bibliography

Appendix P: Fort Campbell City Public Schools TSIP Checklist

****LABEL ALL PRINTOUTS WITH ...*
NAME ____________
POSITION ____________
SCHOOL ____________
STANDARD # ____________

[redacted] SCHOOLS
TECHNOLOGY PORTFOLIO REQUIREMENTS

***** REMEMBER to label each item, including floppy disks, with your name, school, the number of the Standard it supports, and the letter of the activity. Keep a copy of all items for your records. Items marked with ** must also be saved to disk.**

Portfolio work may be submitted on a continuous basis. Only submit work that completes a Standard or Standards. Items that do not complete an entire Standard **should not** be submitted. Your school's/location's Site Facilitator for this program will review your portfolio. Completion of your portfolio will entitle you to 90 recertification points under Option 10. IF YOU HOLD A BACHELOR'S DEGREE, remember that you must complete content area course work at a college/university for the remaining 90 points required to renew your license.

Note: Examples of resource forms are included in the portfolio and may be reproduced as needed.

STANDARD 1:

Operate a computer system and utilize software.
[You must complete **both** of the following:]

**a. _____The printout of two original documents created with different software such as MS Word, Print Shop, PowerPoint, MS Publisher, etc. You must save them to a disk.

b._____A printout of information from a CD-ROM
(ex: article from an electronic encyclopedia)

c. _____Other (with prior approval of your Site Facilitator)

STANDARD 2:

Apply knowledge of terms associated with educational computing and technology.
[Required:]

a. _____Successfully completed (score of 80% or better) "Technology Vocabulary Quiz".

STANDARD 3:

Apply productivity tools for professional use.
[You must complete **three** of the following:]

**a. _____ Two professional word processing documents, at least one of which contains a graphic relating to the subject or text. Detail should be given to proper use of grammar, punctuation, and style (use of an easily read font, format, etc.). Suggestions: class schedule, calendar, newsletter, class newspaper, syllabi, progress report, letters to parents, unit outline, class worksheet.

b._____ A computer-generated grade or class report on a student or class group (i.e. Micro Type Pro, Accelerated Reader, etc.)

c._____ A computer-generated test or activity (not word processed) for a class you teach (ex. a test generated from a disk accompanying your textbook).

**d. _____ A printout of a database of student or other professional information you have created. This document should include at least four fields.

**e. _____A printout of a spreadsheet used to record class or other professional information you have created. This document should include at least 20 cells and one mathematical function.

f. _____ A computer-generated crossword, word search, or other puzzle or game (not word processed). Optional: include the name of the program or web site you used.

g. _____ The URL and a printout of a Web page created by you as a resource for your students and/or their parents. Examples may include links to sources of information about curriculum topics, schedule of assignments, news of class accomplishments.

h._____ Evidence that you have used technology to produce a bulletin board, learning center, or learning games. Evidence may vary but could include a photograph, sketch, or copy of the item.

i. _____ A printout of a digital camera or scanned image that you produced for a professional activity.

j. _____ Other (with prior approval of your Site Facilitator)

STANDARD 4:

Use electronic technologies to access and exchange information.
[You must complete **two** of the following:]

**a. _____ A lesson plan that incorporates students' active use of the World Wide Web. (Use Lesson Plan Form and type.)

b. _____ Evidence of your class's participation in a Web project (the specific evidence will vary – Submit something that shows what the project was and that your class participated).

c._____ A printout of an e-mail correspondence.

d._____A bibliography of resources on a specific curriculum topic that you created using Danville Public Schools' electronic information databases and/or electronic catalog.

e._____A write-up of the search strategy you used to access specific information to or from the Web of an information database (i.e. SIRS, Grolier's, World Book, etc.). Include key words, path, and final URL or information gained.

f. _____ A printout of a thread or an e-mail conversation from a professional listserv you have joined and indicate name of listserv and subscription address.

g. ____ A printout of a web-based lesson plan OR pages that you used to conduct research that relates to your discipline.

h. _____ Other (with prior approval of your Site Facilitator)

STANDARD 5:

Identify, locate, evaluate, and use appropriate instructional technology-based resources (hardware and software) to support SOL and other instructional objectives.

[You must complete **two** of the following.]

**a. _____Lesson plan that incorporates student use of instructional software. (Use Lesson Plan Form and type).

**b. _____Lesson plan that incorporates use of video by teacher or student in an instructional setting. (Use Lesson Plan Form and type.)

**c. _____Lesson plan that incorporates use of a presentation device such as a WebTV, LCD projector or LCD panel (not an overhead projector) by teacher or student in an instructional setting. (Use Lesson Plan Form and type.)

d._____Three reviews of instructional software programs and/or Web sites that relate to your discipline. (Use Software Evaluation Form and/or Web Site Review Form.)

e._____ **[Media Specialists/Librarians only]** Assist teachers with the selection and use of all of the above. Include teacher and date of occurrence. Include detail such as topic, type of media selected, and how used.

f. _____Other (with prior approval of your Site Facilitator)

STANDARD 6:

Use educational technologies for data collection, information management, problem solving, decision-making, communications, and presentations within the curriculum.

[You must complete **three** of the following:]

**a. _____A copy of a desktop publication (i.e., newspaper, flyer, advertisement, illustrated story, brochure, etc.) activity.

**b. _____A copy of a database from a class assignment.

**c. _____A copy of a spreadsheet from a class assignment.

**d. _____A printout of a multi-media presentation (i.e., PowerPoint, Hyper Studio, etc.) generated by you for a professional or instructional purpose or one generated by your students.

e._____The URL and a printout of your class's Web page.

f. _____A copy of a management plan developed by you to assure frequent and equitable use of classroom computers or other technologies by your students.

g. _____A copy of a student or class generated computer-produced piece of art or musical composition.

h. ____Other (with prior approval of your Site Facilitator)

STANDARD 7:

Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings.

[You must complete one of the following:]

**a. _____A lesson plan that utilizes the computer in your classroom. (Use Lesson Plan Form and type.)

**b. _____A lesson plan that utilizes the computer lab. (Use Lesson Plan Form and type.)

**c. _____A lesson plan that utilizes augmentative communication devices and other software appropriate for special needs students.

d._____Other (with prior approval of your Site Facilitator)

STANDARD 8:

Demonstrate knowledge of ethical and legal issues relating to the use of technology.

[Required]

a._____A signed copy of the Danville Public Schools Acceptable Use Agreement.

b. _____The URL and a printout of web-based information regarding copyright infringement.

Appendix Q: Grainger City Public Schools TSIP *Checklist*

YEAR ONE STANDARDS (minimum)

Standard 1: Operate a computer system and utilize software. [Three of the following.]

(A) ___ A disk on which you have saved at least two files.
(B) ___ The print-out of two original documents created with different software (i.e., MS Works, Print Shop, Power Point, Cross Word Magic, HyperStudio, Page Maker, etc.)
(C) ___ A list of at least three trouble-shooting operations you have accomplished and their dates (ex.: unjammed classroom printer 2/12/99; connected cable to classroom computer 3/14/99)
(D) ___ A printout of information from a CD-ROM (ex.: article from an electronic encyclopedia).
(E) ___ Demonstrate to a technology specialist your ability to set up a computer system (i.e., hook-up cables, attach mouse, change print cartridge, etc.). Signature of specialist that you have performed these tasks satisfactorily: ______________________
Date: ______________

Standard 2: Apply knowledge of terms associated with educational computing and technology. [One of the following.]

(A) ___ Successfully completed (score of 80% or better) the school division "Technology Vocabulary Quiz". (Quiz provided by School Technology Coordinator.)
(B) ___ Activity or lesson you have developed to teach appropriate technology vocabulary to your students.
(C) ___ Printout of a multi-media presentation (HyperStudio, Power Point, etc.) you have developed to teach appropriate technology vocabulary to your students.

Standard 3: Apply productivity tools for professional use. [Four of the following.]

(A) ___ Two professional word processing documents, at least one of which contains a graphic relating to the subject or text. Detail should be given to proper use of grammar, punctuation, and style (use of an easily read font, format, etc.). Suggestions: newsletter, list of directions, note to parents, unit outline, course syllabus, class worksheet.
(B) ___ A computer generated grade report on a student or class group.
(C) ___ A computer generated test or activity (not word processed) for a class you teach (ex.: a test generated from a disk accompanying your textbook.)
(D) ___ A printout of a database of student or other professional information. This document should include at least four fields.
(E) ___ A printout of a spreadsheet used to record class or other professional information. This document should include at least 20 cells and one mathematical function.
(F) ___ A printout of e-mail correspondence (at least your message and a reply) with a colleague about a professional or curricular issue.

Standard 3 (continued)

(G) ___ A computer generated cross word, word search, or other puzzle or game (not word processed).
(H) ___ A print out of web based information you retrieved for professional use (ex.: a lesson plan or professional article from the web).
(I) ___ The URL and a printout of a web page created by you as a resource for your students and/or their parents. (Ex.: links to sources of information about curriculum topics, schedule of assignments, news of class accomplishments.)
(J) ___ Evidence that you have used technology to produce a bulletin board, learning center, or learning games. Evidence may vary but could include a photograph, sketch, or copy of the item.
(K) ___ A student activity for a class you teach, created with technology.
(L) ___ A printout of a digital camera image that you produced for a professional activity.

YEAR TWO STANDARDS (minimum)

Standard 4: Use electronic technologies to access and exchange information. [Three of the following.]

(A) ___ A lesson plan that incorporates students' active use of the World Wide Web. Date(s) lesson plan was actually used.
(B) ___ A printout of web based information you retrieved for instructional use (ex.: resource information for students about a subject you are presenting).
(C) ___ Evidence of your class's participation in a web project (the specific evidence will vary – submit something that shows what the pro was and that your class participated).
(D) ___ A print-out of e-mail correspondence between you or a member of your class and an adult "expert" at a remote site about a topic of curricular concerns or interest.
(E) ___ A printout of an electronically generated list of sources available in your school or an area library on a topic of interest to you and your class.
(F) ___ A write-up of the search strategy you used to access specific information from the web or an information database (i.e., SIRS, EBSO, Groliers, etc.) Include key words, path, and final URL or information gained.
(G) ___ A printout of a thread or an e-mail conversation from a professional listserv you have joined (indicate name of listserv and subscription address).

Standard 5: Identify, locate, evaluate, and use appropriate instructional technology-based resources (hardware and software) to support SOL's and other instructional objectives. [Four of the following.]

(A) ___ A printout of a digital camera image that you produced for a curriculum related activity.
(B) ___ A document that contains a scanned image that you produced for a curriculum related activity.
(C) ___ Lesson plan that incorporates student use of computer assisted instructional software. Indicate date lesson plan was actually used.

Standard 5 (continued)

(D) ___ Lesson plan that incorporates laser disk usage by teacher or student in an instructional setting. Include date lesson was taught or student made presentation.
(E) ___ Lesson plan that incorporates video usage by teacher or student in an instructional setting. Include date lesson was taught or student made presentation.
(F) ___ Lesson plan that incorporates use of presentation device (not an overhead projector) by teacher or student in an instructional setting. Include date lesson was taught or student made presentation.
(G) ___ Review of three instructional software programs. Include title, publisher, cost, a brief summary of each program, a critique of its effectiveness and your determination of grade level appropriateness and applicability to curriculum or professional use.
(H) ___ Review of three web sites that relate to your grade level or discipline. Include URL, title of site, a brief summary of site, a critique of its effectiveness and your determination of grade level appropriateness and applicability to curriculum or professional use.
(I) ___ Date and usage of a camcorder in a professional or instructional setting. Include class, lesson, and objective(s).

Standard 6: Use educational technologies for data collection, information management, problem solving, decision making, communications, and presentations within the curriculum. [Four of the following.]

(A) ___ A copy of a student generated word processing document from a class assignment. Include course, date, and lesson objective.
(B) ___ A copy of a student generated database from a class assignment. Include course, date, and lesson objective.
(C) ___ A copy of a student generated spreadsheet from a class assignment. Include course, date, and lesson objective.
(D) ___ A copy of a student generated desktop publication (ex.: newspaper, flyer, advertisement, illustrated story, etc.) from a class or extra-curricular activity. Include information about the purpose of the activity.
(E) ___ Evidence of your class's participation in a web project (the specific evidence will vary – submit something that shows what the project was and that your class participated).
(F) ___ A printout of e-mail correspondence between a member of your class (with teacher assistance if necessary) and an adult "expert" at a remote site.
(G) ___ A printout of a multi-media presentation (i.e., Power Point, HyperStudio, etc.) generated by you for a professional or instructional purpose.
(H) ___ A printout of a multi-media presentation (i.e. Power Point, HyperStudio, etc.) generated by your students. Include lesson objective(s).
(I) ___ The URL and a printout of your class's web page.
(J) ___ Date of usage of a presentation device (i.e. LCD pad, data projection system, etc.) in a professional or instructional setting (not to include overhead projector). Include objective(s).
(K) ___ A copy of a management plan developed by you to assure frequent and equitable use of classroom computers or other technologies by your students.

YEAR THREE STANDARD (minimum)

Standard 7: Plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in variety of educational settings. [Must do item (A); select one additional from the remaining choices.]

(A) ___ The signature of your principal or designee indicating that they observed a lesson that successfully included student use of technology.

Signature ______________________ Date ______________

(B) ___ A bibliography of resources on a specific curriculum topic that you created using your school's electronic information databases and/or electronic catalog.

(C) ___ A lesson plan that utilizes the one computer in your classroom. Indicate date lesson was taught.

(D) ___ A lesson plan that utilizes the computer lab. Indicate date lesson was taught.

Standard 8: Demonstrate knowledge of ethical and legal issues relating to the use of technology. [Required.]

(A) ___ Read a document on computer ethics and copyright guidelines or attend a staff development session that reviews the document; sign and submit a statement that you have read it and agree to abide. (Document provided by School Technology Coordinator.)

The SAME sample may be submitted for more than one standard if it combines elements of more than one lettered activity. For example, one document may incorporate word processing and a spreadsheet and thereby satisfy two items. Likewise, if your web page contains several distinct sections (i.e., student work as well as resource information for parents and/or students) it could satisfy requirements for both 31 and 6L. However, ONE lesson presented with a presentation device will not suffice for both 5F and 6J. Final judgment will be made by the administrator reviewing the submissions.

Appendix R: Cheatham City Public Schools TSIP *Checklist*

Certification for Virginia's Instructional Personnel Technology Standards

[redacted]

Name________________________ Position________________ School____________

Assessor 1 and Date	Assessor 2 and Date	Level (skills)	Correlation to Virginia's Instructional Personnel Technology Standards
		Level One: Entrant 1. On-line Self-Assessment (print results for portfolio)	
		Level Two: Adopter 1. Basic Technology Assessment (on disk)	**B.** Instructional Personnel shall be able to apply knowledge of terms associated with educational computing and technology.
		2. Understands technology vocabulary (print results from the on-line self assessment for portfolio)	
		Level Three: Adapter 1. One page newsletter with minimum 2 columns, header, and 1 graphic	**A.** Instructional personnel shall be able to demonstrate effective use of a computer system and utilize computer software.
		2. Database with a minimum of 5 fields and 5 records (printed in 2 different formats or layouts, i.e. lists or mailing labels)	**C.** Instructional personnel shall be able to apply computer productivity tools for professional use.
		3. Spreadsheet with a minimum of either one math formula or function and a chart or graph	**F.** Instructional personnel shall be able to use educational technologies for data collection, information management, problem solving, decision making, communication, and presentation within the curriculum.
		Level Four: Appropriator 1. Submit 2 lesson plans showing the integration of technology, should support curriculum SOL(s) and technology SOL(s)	**D.** Instructional personnel shall be able to use electronic technologies to access and exchange information. **E.** Instructional personnel shall be able to identify, locate, evaluate, and use appropriate instructional hardware and software to support Virginia's Standards of Learning and other instructional objectives. **G.** Instructional personnel shall be able to plan and implement lessons and strategies that integrate technology to meet the diverse needs of learners in a variety of educational settings. **H.** Instructional personnel shall demonstrate knowledge of ethical and legal issues relating to the use of technology.
		2. Identify and submit a review of 1 software title or web site used to enhance instruction. Use the downloadable software/website review form found on the [redacted] technology web page. (exclude AppleWorks and Microsoft Office)	
		3. Demonstrate basic troubleshooting skills (i.e. check connections, reboot frozen computer, etc.)	
		4. Send an e-mail with an attachment	
		5. Demonstrate knowledge of ethical issues involving the Internet and copyright laws concerning software and videos. Evidenced by integrating this information into a lesson. Copyright information can be found on [redacted] copyright brochures or on the WWW.	

Assessor 1 and Date	Assessor 2 and Date	Level (skills)	Correlation to Virginia's Instructional Personnel Technology Standards
		Level 5: Inventor 1. Develop and post a web page	
		2. Submit 1 lesson plan using a webquest or trackstar that addresses an SOL	
		3. Submit an evaluation of 2 educational web sites	
		4. Develop and submit a multimedia presentation addressing an SOL with a minimum of 5 slides, should include transitions and special affects (HyperStudio, Power Point, AppleWorks slide show, Kid Pix, etc.)	
		5. Demonstrate ongoing routine hardware maintenance including running scan disk and defrag a hard drive, rebuild a desktop, and run virus protection software	
		6. Create and use a MACRO (May create using a Wizard)	
		7. Use technology to enhance communication with students, parents, and community	
		Level 6: Expert Collaborator 1. Create a multimedia presentation that includes features such as video capture, sound editing, etc. (project must address an SOL)	
		2. Develop a collaborative project using a variety of technology (project must address an SOL)	
		3. Present at least one inservice modeling integration of technology into daily lesson plans and promoting "best practices" in the use of technology	
		Level 7: Expert Technical Leader 1. Develop and submit a project (with teacher guide) for researching 5 internet sites that provide research for a SOL in a curriculum area	
		2. Teach a technology course (file the proposal which includes the title, description, when, where, and any prerequisites in your portfolio)	
		3. Documents evidence of ongoing learning and personal development of technical skills (demonstrates leadership in actively moving others from lower to higher skill and assessment levels)	
		4. Create a program or macro using a programming language	

David C. Baker
Curriculum Vitae

EDUCATION

1997-1980	East Tennessee State University, BS (English, History, Political Science)
1981-1982	East Tennessee State University, MA (English, Library Science, Computer Science)
	Thesis title: *The Heavenly Foothold: John Milton and the Concept of the Dignity of Man*
1988-1982	Radford University, Additional Study (Library Science)
1995-Present	Virginia Polytechnic & State University, Ph.D. Program Curriculum and Instruction (Instructional Technology) – Currently ABD - Anticipated completion date December, 2003

CERTIFICATIONS

Tennessee Professional Teaching Endorsements in English 7-12, History 7-12, Library Media K-12

Virginia Postgraduate Professional Certificate Endorsement in English 7-12, History 7-12, Library Media N-12, Government 7-12, Supervision K-12

Certified Trainer - Teacher Expectations and Student Achievement (TESA)

EXPERIENCE

1993-Present

Director of Technology & Information Services

Roanoke City Public Schools, Roanoke, Virginia

Develop and maintain both short- and long-range technology plans for a school division of approximately 13,000 students and 1,700 staff. Implement a program of technology training/staff development for administrative and instructional staff that uses state-of-the-art technology methods to support administrative management and to enhance and integrate instructional program. Supervise staff of 18 professional staff and 8-12 student employees. Supervise the selection, evaluation, implementation, and maintenance of all computers, networks, and audiovisual equipment in the division. Provide instructional supervision for library media services in 29 schools.

EXPERIENCE (continued)

1988-1993	Library Media Coordinator Roanoke City Public Schools, Roanoke, Virginia Coordinated all aspects of a district library media program for 29 libraries serving a student population of approximately 13,000. Managed district library media budget of approximately $1.7 million. Supervised and assisted 29 professional and 13 clerical library staff members. Represented the School Board on various boards and committees. Presented in-service training programs to students and staff relating to technology integration, media, and library service issues.
1986-1988	Library Media Specialist Roanoke City Public Schools, Roanoke, Virginia Taught library skills classes to approximately 1,200 students. Assisted in student and faculty research projects. Developed library computer applications as requested. Repaired audiovisual equipment and troubleshot technical problems as needed. Conducted information retrieval via DIALOG computer network. Provided assistance in automating library circulation.
1985-1986	Educational Consultant – Computer/Research Systems Tennessee Department of Education, Nashville, Tennessee Developed and implemented full office automation program. Designed application programs for use in the division. Conducted research on major educational problems including planning research design and validation of data. Trained and supervised personnel in data collection methods. Trained and supervised personnel in computer use.
1984-1985	Educational Consultant – Computer Hardware Tennessee Department of Education, Nashville, Tennessee Developed programs for department and local education agencies. Provided technical assistance to state and local education agencies. Maintained state bid contracts. Provided technical assistance to other state educational agencies. Planned state technical conferences. Directed the repair and maintenance of computer equipment. Assisted in planning and implementing statewide telecommunication networks.

EXPERIENCE (continued)

1982-1984	Librarian / Microcomputer Specialist David Crockett High School, Jonesboro, Tennessee Directed audiovisual and microcomputer activities for school programs. Wrote administrative computer software for the school system. Performed all cataloging of audiovisual computer and technical materials. Supervised circulation of book and non-book collections. Developed audiovisual, microcomputer, and periodical collections. Taught elective computer classes to advanced students. Directed and taught summer computer camp for K-12 students in the district.

OTHER EXPERIENCE

1988-1993	Adult Education Program Instructor – Computer Science Roanoke County Public Schools, Salem, Virginia Taught 6-9 hours of computer science classes per week. Developed curriculum and training materials used in classes. Directed computer laboratory.
1986-1988	Adjunct Instructor – Computer Science National Business College, Roanoke, Virginia Taught 16 hours of classes per quarter. Assisted in directing computer laboratory. Assisted in curriculum planning and implementation.
1984	Educational Computer Representative Computer Corner, Inc. Presented computer hardware and software to educational institutions and demonstrated various applications of computer software in educational settings. Assisted in repair of computers and building interface devices for printer to computer connections.
1983-1984	Adult Education Program Instructor – Computer Science Kingsport Adult Basic Education Program Taught 12-18 hours of computer programming classes per quarter. Instructed other teachers in the use of Corvas hard disk network. Directed computer laboratory.

OTHER EXPERIENCE (continued)	
1983-1984	Adult Education Program Instructor – Computer Science Washington County Public School, Jonesboro, Tennessee Taught 3-6 semester hours of computer programming classes and directed computer laboratory.
1985	Adjunct Faculty – English Nashville Tech, Nashville, Tennessee Taught English composition course.
1981-1982	Chairman, Computer and Information Sciences Department Bristol/Steed Business College, Johnson City, Tennessee Developed administrative program related to computer science as a new program at this institution. Taught 16 hours of classes per quarter. Supervised staff of six to ten faculty members and student workers.
1980-1982	Graduate Teaching Assistant – English/Computer Science East Tennessee State University, Johnson City, Tennessee Taught 6 hours of classes per semester in English and computer science. Assisted in development of programs for departmental use. Tutored students in English and computer programming.
HONORS/AWARDS	Phi Delta Kappa Education Fraternity Phi Kappa Phi Academic Honor Society Kappa Delta Pi Education Honor Society Pi Gamma Mu Social Science Honor Society National Forensics League Speech and Debate Honor Society Southern Regional Education Board SREB Leadership Academy, 1996-1998 McGraw-Hill 21st Century Schools Technology Award for Exemplary Technology Planning, 1996 Virginia Department of Education Award for Exemplary Technology Planning, 1995 IBM Education Executive Program, 1985 Jaycee’s Outstanding Young Men of America, 1984 Nominated Outstanding Graduate Teaching Assistant, 1982, East Tennessee State University English Department Outstanding Student Teacher of The Year, 1980 Dean’s List, East Tennessee State University, 1980 Carson-Newman College Scholarship for Academic Excellence, 1977

OFFICES HELD

1988-Present	School Board Representative, Blue Ridge Public Television Executive Board
1988-Present	School Board Representative, Blue Ridge Public Television Regional Schools Contract and Planning Committee
1996-1998	School Board Representative, New Century Communications Network
1994-1997	School Board Representative, Southwest Virginia Technology Consortium
1994-1995	Chairman, Blue Ridge Public Television Regional Schools Contract and Planning Committee
1988-1993	School Board Representative, Roanoke City Public Library Board

PROFESSIONAL ASSOCIATIONS

American Association of School Librarians
International Society for Technology in Education
Institute of Electrical and Electronics Engineers
Institute for Technology Transfer to Education
National School Boards Association
Virginia Educational Media Association
Virginia Society for Technology in Education

INSERVICE COURSES TAUGHT

These courses are too numerous to list here. However, a summary of each is available at the following web address: http://www.roanoke.k12.va.us/central_office/TechOffice/courses.htm

REPRESENTATIVE PUBLICATIONS

Baker, D. C. (2000, April). The best laid plans. *NSBA Technology Leadership News*, 4 (3), 1,5.

Baker, D. C. (2000, March 12). Youngsters are awash in a sea of information, and they must be taught to swing. *The Roanoke Times*. Horizon 4.

Baker, D. C. (1998, April). Roanoke City Public Schools long-range strategic technology plan. (2nd ed). Roanoke City Public Schools, Roanoke, VA.

Baker, D. C. (1993). *Using and programming DOS: An adult education course for Roanoke County Schools*. Roanoke County Public Schools: Salem, VA.

Baker, D. C. (1995, April). Roanoke City Public Schools long-range strategic technology plan. Roanoke City Public Schools, Roanoke, VA.

REPRESENTATIVE PUBLICATIONS (continued)

Baker, D. C. (1990, August). The Roanoke City Public Schools library media services handbook. Roanoke City Public Schools, Roanoke, VA.

CONTRIBUTIONS TO PUBLICATIONS

Harris, L. A. (2000) *Patterns of promise*. AEL: Charleston, WV.

REPRESENTATIVE PRESENTATIONS

Baker, D. C. (1999, February). *How one district uses technology to achieve results*. Paper presented at the annual meeting of the American Association of School Administrators. New Orleans, LA.

Baker, D. C. (1997, August). *Deep reading, deep thinking in the information age*. Paper presented at the annual meeting of the Blue Ridge Public Television ITV Awareness Workshop. Roanoke, VA.

Baker, D. C. (1997, December). *Thoughtful teaching and learning in an age of information glut and information glitter.* Paper presented at the annual meeting Virginia Department of Education Technology Leadership Conference. Roanoke, VA.

Baker, D. C. (1987, October). *Technology planning: Overview of promises and pitfalls*. Paper presented at the annual meeting of McGraw-Hill School System’s People Network Conference, Anaheim, CA.

Baker, D. C. (1996, August). *Writing web pages in fifteen minutes (or less).* Paper presented at the annual meeting of the Blue Ridge Public Television ITV Awareness Workshop. Roanoke, VA.

Baker, D. C. (1996, May). *Developing effective technology plans for school sites*. Paper presented at the annual meeting of the Virginia Society for Technology in Education. Norfolk, VA.

Stigman, T., C. Fifer, D. Foreman, & Baker, D. C. (1995, November) *Internet connectivity: Child safety on the Internet.* Paper presented at the annual meeting Virginia Department of Education Technology Leadership Conference. Richmond, VA.

Baker, D. C. (1995, February). *Technomorphs: Becoming leaders for technology change in a global village.* Paper presented at the annual meeting of the Virginia Quality Education in Sciences and Technology Conference, Norfolk, VA.

SKILLS

Computer Languages

Toolbook, Authorware, HTML, BASIC, Visual Basic, Pascal, LOGO

Computer Applications

Word Perfect, Word, Excel, PowerPoint, Microsoft Publisher, Microsoft Photo Editor, Access, Aldus Persuasion, Circulation Plus, Alexandria, Microsoft Works, Claris Works, Corel Flow, R-Flow, Netscape Composer, Claris Home Page, Adobe Page Mill, WinComm Pro, WinFax Pro, Lotus 123, Ami Pro, Lotus Approach, Action!, Harvard Graphics, Visual FoxPro

AREAS OF RESEARCH INTEREST

Teacher and adult education
Legal and ethical issues in technology
Integration of technology and learning
Libraries and information management