A Model Assessment Tool for Classroom Technology Infrastructure in Higher Education

by

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Abstract

Purpose: The purpose of this research is threefold. The first purpose is to establish a practical ideal model to assess current classroom technology infrastructure in higher education. Second, is to assess current classroom technology infrastructure at Texas State University. The final purpose is to provide recommendations for improving classroom technology infrastructure at Texas State University. A thorough review of the literature identified six key components of classroom technology infrastructure. The components include technology planning and policies, equipment, technology applications, maintenance and support, professional development, and technology infrastructure

Methodology: The components of classroom technology infrastructure identified in the literature led to the development of a conceptual framework. This framework allowed the researcher to develop an assessment tool designed to gauge classroom technology infrastructure at Texas State University. An assessment is accomplished through the use of a case study approach employing multiple methods. The methods used to collect data include focused interviews, document analysis, direct observation, and survey research.

Findings: Overall, classroom technology infrastructure at Texas State University is consistent with the practical ideal type model developed through the literature. Classroom technology infrastructure could be improved by implementing software support training programs, instituting faculty training programs, strengthening faculty evaluation procedures, and ensuring that technology proficiencies and measures are incorporated into classroom learning standards.

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About the Author

Jason Vaden is a student in the Master of Public Administration program at Texas State University. He is a member of Pi Alpha Alpha, the National Honor Society for Public Affairs and Administration. Mr. Vaden completed his undergraduate education at Texas State University as well, earning his Bachelors Degree in Applied Sociology in 2005. During his time as a graduate student, he served as a research assistant in the department of Instructional Technologies Support- sparking his interest in classroom technology. The author can be contacted by e-mail at jvaden3@hotmail.com.

Chapter I: Introduction

Technology plays an important role across the world in all avenues of life. It drives the operations of public, private, and non-profit organizations and is a source of entertainment and recreation. Technology[1] is defined as, "the diverse collection of processes and knowledge that people use to extend human abilities and to satisfy human wants and needs" (Shields and Rogers 2005, 72). The emerging role of technology in education today is an important issue.

The impact of technology can be viewed across the entire field of education. Rule et al. (2006, 3) discuss a boom in 1980's where technology revolutionized the sharing of information and knowledge in numerous fields including technology. This change is taking place around the world at an astounding rate, but in many cases educational institutions are struggling to keep up (Okojie and Olinzock, 2006, 33). Some of the reasons attributed to this are lack of resources, administrative focus, and improper evaluation programs[2].

Despite this lag, classroom technologies are having a positive impact in educational institutions across the nation. According to Moersch (2001, 23), "The proliferation of hardware and software has provided students and faculty with fingertip access to easy-to-use, yet powerful productivity tools, multimedia applications, and virtual simulation to support the learning environment in ways never thought possible." These innovations are providing new benefits to the teaching and learning process. Johnson, Schwab, and Foa (1999, 30) highlight the fact that, "Technology is empowering

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[1] Definition of technology as defined by The International Technology Association within the *Standards for Technological Literacy and Content for the Study* document.

[2] Iding, Crosby, and Speital (2002, 159); Moersch (2002, 11); Rakes, Fields, and Cox (2006, 1).

teachers and students to create exiting and dynamic learning environments and experiences." It is clear that technology is supplying educators and students with tools that can revolutionize teaching and learning in the classroom.

Technology in Higher Education

Educators must be prepared to both understand and use classroom technologies to the fullest. Okojie and Olinzock (2006, 39) describe technology as a "nerve center" of our modern lifestyle. They (Okojie and Olinzock, 2006, 39) maintain that due to this, "we must make sure that teachers who have the responsibility of training our children to be productive members of this society are consciously aware of various technologies as they emerge and are also able to demonstrate their different uses to their students." Hence, it is imperative that the benefits provided by technology are recognized and utilized to the fullest.

Classroom technologies are having a profound effect in universities across the nation. The University of Georgia is one such educational institution that has emphasized technology in student learning in recent years (Tallman and Fitzgerald, 2005, 25). The university takes into account such factors as content, location, course sequence, student learning modes, and department support when designing programs that integrate technology into the classroom. By using these factors the university has designed classroom technology programs that enhance teaching and learning.

The University of Illinois at Springfield is a model of the ideal integration of technologies into the classroom (Whittenberg, 2005, 44). The university has constructed an entire "Smart" campus, which is designed to integrate a wide variety of technologies into the classroom. The campus is also entirely wireless and promotes various online learning tools. Whittenberg (2005, 44) points out that students and faculty members can broadcast presentations on digital projectors and access information wirelessly. Other tools such as digital whiteboards improve communication between instructors and students. These resources have enabled students to learn in ways never thought possible. Whittenberg (2005, 44) maintains that, “current and prospective students are-very excited about the university's continued commitment to providing the latest technology in our classrooms.”

Lack of Model Assessment Tool

There is currently a need for a model assessment tool to evaluate classroom technology infrastructure programs. Many institutions have some form of assessment tool in place, but these assessments vary in scope and rigor. This makes regional, state, or national comparison of programs virtually impossible. Some institutions have technology programs in place but no way to perform accurate assessments. The University of Georgia is one such institution that has implemented classroom technology programs in recent years. The university is still in the process of building a model to assess their technology programs (Tallman and Fitzgerald, 2005, 25). While classroom technology programs are in place, tools to access the program are limited.

Barlow and Wetherill (2005, 21) have found that faculty from the University of North Carolina at Wilmington have been working to develop a program that can successfully assess classroom technology integration programs on their campus. The work of these individuals has had a profound impact and has led some to suggest that their model be applied across the state of North Carolina. Barlow and Wetherill (2005, 24) also point out that many professors are beginning to use online assessment tools as a way to evaluate performance. Online assessments are just one tool that educational institutions could move toward in the future. Unfortunately, this promising model is not being applied to enough educational institutions to make comparisons of programs possible.

The University of West Georgia is another educational institution that has created an extensive assessment process (Larkin et al., 2005, 65). The university takes into account such factors as effectiveness of resources, benefits of technology programs, faculty and staff satisfaction levels, and changes created by new programs. This has led to a new approach in which models are created to evaluate the process of technology integration. Larkin et al. (2005, 65) maintain that the, "Models brought up fundamental questions regarding learning theory, systematic theory building, and the use of theory in evaluation." The utilization of ideas such as these is leading towards innovations in assessment tools.

Texas State University

Texas State University, located in San Marcos, Texas, has experienced a boom in the use of classroom technologies. Situated about thirty miles south of Austin, San Marcos has a population of over 46,000 residents[3], many of whom either attend or work for the university. Texas State University has a student body of 27,503 undergraduate, masters, and Ph. D. candidates[4], along with over nine hundred full-time faculty members[5]. The university has the largest campus within the Texas State University system, has been identified as one of the 75th largest universities in the country, and

[3] Information obtained from U.S. Census Bureau 2005 population estimates, also located at http://www.census.gov.
[4] Enrollment numbers as of Spring 2006 semester.
[5] Full-time faculty numbers as of 2004.

boasts being named by the Princeton Review as one of America's Best Value Colleges for 2007[6].

Any university of this size must have a department responsible for coordinating and supporting both faculty and students with their classroom technology needs. The department of Instructional Technologies Support provides this support for Texas State University. The goal of Instructional Technologies Support is to provide leadership, instruction, and support to faculty and students with various technological needs[7]. These needs include software and hardware training, support with the use of classroom technologies, development and production of instructional materials, and support with instructional design practices.

Research Purpose

Ultimately, scholars, administrators, and educators must be willing to identify the strengths and weakness of current classroom technology infrastructure. **The purpose of this research is threefold. First, is to establish a practical ideal model to assess current classroom technology infrastructure. The second purpose is to assess current classroom technology infrastructure at Texas State University. The third purpose is to provide recommendations for improving classroom technology infrastructure at Texas State University.** The model assessment tool includes six components-technology planning and policies, equipment, technology applications, maintenance and support, professional development, and technology infrastructure- that will be used to gauge the effectiveness of classroom technology infrastructure at Texas State University. Table 2.1 presents each component of the model assessment tool along

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[6] http://www.txstate.edu.
[7] http://www.its.txstate.edu/about_its.

with the corresponding literature used to justify each component. As noted above, there is a need for a classroom technology infrastructure assessment tool. The remainder of this work is an attempt to meet this need.

Chapter Overview

This chapter provides a brief background of classroom technologies as well as the need for a model assessment tool. **Chapter 2** presents the model assessment tool constructed to gauge the effectiveness of classroom technology infrastructure. The model assessment tool consists of seven components-technology planning and policies, finance, equipment, technology applications, maintenance and support, professional development, and technology infrastructure. Chapter 2 serves to explain and justify each component of the model tool. The methodology of the paper is presented in **chapter 3**. A case study approach, using focused interviews, document analysis, direct observation, and survey research, is used to gauge classroom technology infrastructure at Texas State University. **Chapter 4** presents the findings of the case study using the model assessment tool. Finally, conclusions and recommendations are presented in **chapter 5**.

Chapter II: Model Assessment Tool

Chapter Purpose

The purpose of this chapter is to identify and describe the components of a model classroom technology infrastructure assessment tool for higher education. Currently there is a need for an assessment tool to gauge the effectiveness of classroom technology infrastructure. The literature outlines components that are essential to the development of the model assessment tool. This chapter develops, explains, and justifies the model assessment tool.

Introduction to the Model Assessment Tool

There is a great deal of literature regarding classroom technology infrastructure. While there are currently many agreed upon assessment tools for elementary and secondary educational institutions, there is the need for an accepted tool to assess post-secondary educational institutions. This section is an attempt to fill this need. The United States Department of Education[8] outlines key themes within elementary and secondary classroom technology infrastructure. These identified themes are then developed to create a model assessment tool (Shields and Tajalli, 2006, 324)[9] that is applicable for post secondary education. The model assessment tool will later be used to gauge classroom technology infrastructure at Texas State University.

The practical ideal type helps determine "how close a situation is to the ideal standard" and how the current situation can be improved (Shields, 1998, 203). The purpose of this model assessment tool is to provide an approach for gauging classroom technology infrastructure. Six crucial components of classroom technology infrastructure

[8] National Center for Education Statistics report. *Technology in schools: Suggestions, tools, and guidelines for assessing technology in elementary and secondary education*. 2002.
[9] This model is referred to as a practical ideal type.

are identified in the model assessment tool. The components of a model classroom technology assessment tool are:

- Technology Planning and Policies
- Equipment
- Technology Applications
- Maintenance and Support
- Professional Development
- Technology Integration

The remainder of this chapter focuses on developing these components as well as discussing issues pertaining to each.

Model Assessment Tool Components

Technology Planning and Policies

Technology plans and policies are the first key component within the classroom technology infrastructure model. Administrators must have clearly defined plans and policies in place. Dawson and Rakes (2003, 33) find that educational leadership essentially determines the role technology will have in their institutions. It is imperative that leadership understands the benefits technology provides in order to provide clear policies. Policies that improve the organizational structure of universities are essential. Organizational structure is one important area directly influenced by university policies. Glenn (1997, 127) maintains that:

> The organizational structure of most schools also limits the amount of time available to teachers to learn about new technologies, inhibits teachers from working collaboratively to develop new environments, and works against innovation and change.

When determining technology plans and policies, funding should be clearly outlined. "Substantial public resources are devoted to this effort. The government dollars pumped into technology programs may not be a fiat but it is certainly a strong push" (Whale, 2006, 70). In 2005, the federal budget[10] for educational technologies was 496 million dollars. Brown and Warschauer (2006, 600) find that even though millions of dollars are spent on classroom technologies, they are often unused. Others, such as Rule et al. (2006, 6) suggest that many times the only cost taken into account is the cost of purchasing equipment. Costs should also include installation, maintenance, support, and personnel costs. Factoring in the costs of entire technology programs as well as purchasing the proper equipment are critical when establishing classroom technology plans and policies.

The implementation of the plan is the next step in the process. Most educational institutions are just in the beginning stages of integrating classroom technology (Johnson et al., 1999, 28). In all cases, the implementation of a technology plan must be approached as a partnership. Dawson and Rakes (2003, 32) suggest that commitment to learning and successfully integrating technology into the classroom should be a collaborative work between both teachers and administrators. Educators must also have the support of their administration when implementing this plan. Many times educators do not sense that administration fully supports learning with technology in the classroom (Iding et al., 2002, 159).

Administrators must also **have an evaluation process in place** to measure outcomes. According to Moersch (2002, 11), "During the past few years, a major trend

[10] Information located within fiscal year 2001-2007 State Tables for the U.S Department of Education: http://www.ed.gov/about/overview/budget/statetables/index.html. 2006.

throughout the United States has been to access teachers' technology use in the classroom." Accountability in technology spending must be a focus today due to the sheer amount of dollars being spent (Christensen, 2002, 413). Moersch (2001, 23) suggests that the issue now is accountability- trying to find a way to measure if we have been successful with technology in the classroom. Motivations for this have varied. Some are due to grant requirement information[11] while other motivations lie in the fact that educators and administrators want to obtain information so that their classes can be more successful (Moersch, 2002,11). Administrators need to have a good understanding of technology if they want to properly evaluate their educators. Moersch (2001, 27) also suggests that:

> Embracing an empirically tested set of measures to ascertain teacher growth with technology use in the classroom will give policy makers, school administrators, and classroom practitioners the most consistent data to make informed decisions as to the real needs for improving technology infrastructure beyond hardware and software issues.

Whale (2006, 66) asserts that, "Thus, while teacher technology evaluation is recommended for administrators, the actual use and application of this teacher assessment tool by administrators remains inconsistent." Many times evaluations are not used simply because administrators do not feel proficient enough to assess educators (Whale, 2006, 70; Dawson and Rakes, 2003, 33)[12]. The frequency[13] of which policy assessments are conducted is another issue in the evaluation process. Moersch (2001, 24) points out that this could have an impact on the results and interpretation of the evaluation. It is

[11] Refers to grant programs such as No Child Left Behind Act and the Enhancing Education Through Technology Act. These programs provide grants that require schools to measure levels of technology implementation in their own schools.
[12] Dawson and Rakes (2003, p. 33) highlight the importance of training administrators.
[13] Time based. Example: annually, semester end, quarterly.

essential that an evaluation process be in place to measure the effectiveness of technology planning and policies.

Equipment

Equipment is identified as the second key component in the model classroom technology infrastructure. **Equipment must be present in instructional settings.** Debevec et al. (2006, 293) find that technology based learning has grown in recent years with more reliance on visual presentation, the Internet, and other tools that make interaction possible. Tools such as digital projectors, file management systems, graphics, multimedia, spreadsheets, electronic communication devices, and graphics calculators are all present in the contemporary classroom (Forgaz, 2006,78). These tools are shaping the ways faculty teach and students learn.

Equipment should be available for educator use. The technology needs of any classroom must be supported by the infrastructure in place. In many instances this is not the case. Research conducted by Iding et al. (2002, 157) finds that a large number of respondents never use technology in conjunction with tutorials, student progress reports, demonstrations, and student collaboration. This is due in part to the fact that many educators still have needs that are not met by current infrastructure. Research by Forgaz (2006, 90) finds that, “In particular, greater access to hardware, more technical support, the availability of high quality software, and ongoing professional development were the significant issues identified by the teachers.” Attention must be devoted to equipment available for educator use.

Equipment must also be available and useful to students. Research by Debevec et al. (2006, 294) has shown that the use of technology has helped students in note taking and exam preparation. The authors[14] also indicate that students were just as reliant on downloaded technologies such as PowerPoint notes as they were with reading the textbook when preparing for class. Students were also proficient at downloading slides when preparing for exams. Equipment such as laptop computers and smart boards[15] give students fingertip access to class materials. Debevec et al. (2006, 294) go on to point out that equipment "allows instructors and students to access a wealth of multimedia information, tutorials, live data, and assessment tools that replicate and expand the traditional classroom." Brush et al. (2002, 57) also find that there is a multitude of equipment available to support educators in the classroom. Moersch (2001, 23) asserts that, "During the past decade, hundreds of billions of dollars were spent on the creation of these digital environments." Focus must now be given to maximizing the impact that these new technologies can have in the classroom.

Technology Applications

Technology applications are identified as the third component within the classroom technology infrastructure assessment model. These **applications must support teaching and learning**. Applications, such as educational software and classroom management programs, can enhance education in the classroom. Burns and Polman (2006, 366) find that as faculty utilize more technology applications, they develop new teaching strategies and ways to integrate technology into the classroom. The change that technology creates should be presented to students, thereby giving them the chance to see the impact that various technologies have. Shields and Rogers (2005, 76) suggest that, "By bringing these topics to the classroom, the teacher demonstrates to

[14] Debevec, Shih, and, Kashyap, 2006, 294.
[15] Smart boards are small tablets that let students have information presented in front of class at their fingertips, akin to notebook computers.

the students that technologies now deemed experimental may in time affect a profound change in world politics and the world economy."

Software support must be in place for technology skill development. Iding et al. (2002, 160) find that faculty and preservice candidates are quite interested in learning about the different software platforms and resources that are currently available. Once intent is stimulated, opportunities for faculty to learn the software applications are necessary. Johnson et al. (1999, 24) suggests that, "Thousands of teachers are now faced with the dilemma of how to learn to use and effectively incorporate all of these information tools into their teaching practice."

In many cases faculty members do not use technology, including educational software, in their teaching practices because they are unaware that technology even exists (Iding et al., 2002, 163). It is important that educational software is presented and explained to faculty members. When proper presentation and explanation does not occur, pressure to use unfamiliar or un-mastered technology applications can cause faculty members to experience higher levels of anxiety in the classroom (Christensen, 2002, 431). One way to relive this pressure is to use collaborative teaching teams. This model has groups of instructors meeting on a regular basis to determine how technology can help in their classrooms. They can also obtain information from each other on the benefits and detractions of classroom technology and make the necessary changes or modifications (Johnson et al., 1999, 27-28). The collaborative teaching team model is just one tool used to support technology in educational settings[16].

Technology applications must also improve communication in the classroom. Research finds that when technology is used effectively, attitudes regarding teaching and

[16] For additional tools see Johnson et al., 1999, 25-30; Mackey, 2005, 21-35; Brush et al., 2003, 69-71.

learning tend to improve. Research by Brush et al. (2003, 66) finds that many faculty members "…responded enthusiastically that the technology had a positive impact on their instruction and the attitudes of their students." When faculty have more knowledge about technology, their comfort levels also tend to increase. Brown and Warschauer (2006, 612) suggest that higher levels of proficiency in computer skills results in individuals feeling more comfortable about teaching using technology. Positive changes occur in the classroom when technology is properly utilized. Burns and Polman (2006, 366) find that, "Classrooms that adopt computer technology as a learning tool experience a change in the construction of the classroom context and the practices of those participating in that context."

Technology application evaluations should also be utilized. This process should provide incentives for faculty to become proficient in using classroom technologies. One issue that Burns and Polman (2006, 371) raise is the weight that technology is given in the evaluation process. They[17] find that if the percentage of technology evaluation is low faculty will have little incentive to use technology, or use it properly, because there is little to no impact on their paychecks. If a portion of the evaluation is dedicated to technology, proper technology usage should increase. Barriers such as lack of support, poor software knowledge, limited time, and computer phobia should be taken into account when evaluating educators (Forgaz, 2006, 80). Administrators should look to the evaluation process as a way to assess faculty use of technology applications.

Maintenance and Support

Maintenance and support is the fourth component within an ideal classroom technology infrastructure assessment model. **Resources and processes to maintain**

[17] Burns and Polman, 2006, 371.

school technology must be in place. Brush et al. (2003, 61) identify some support issues such as help with the acquisition of classroom technology related resources, education about using technology in a classroom setting, and help resolving technical problems. Okojie and Olinzock (2006, 36) maintain that faculty must have strong support systems in place in order to succeed. This includes training, funds, technical specialists, and administrative systems. In some cases, faculty do not feel that they receive this support. Brush et al. (2003, 58) discuss the fact that many times the necessary support to effectively use technology in the classroom is not provided. This could be due in part to issues with hardware and software training.

According to Glenn (1997, 125), without proper training faculty will spend a bulk of their time dealing with hardware and software issues, leading to frustration and a negative attitude toward the use of technology. Glenn suggests good technical support can make up for less than adequate faculty training. The issue has led some to suggest that relationships between educational institutions and representatives of hardware and software companies should be developed. Okojie and Olinzock (2006, 36) maintain that, "Manufacturers of both hardware and software technologies should work closely with educational institutions to identify future technologies and adapt them to learning strategies and instructional objectives." Manufacturers and educational institutions working together is just one way to bridge the technology gap.

Personnel must be in place to provide effective technical support. Okojie and Olinzock (2006, 34) suggest that a strong support system personnel around faculty members is essential. They find that support system personnel are the backbone of a good technology program no matter what the size and characteristics of that program.

Faculty have many needs that require support system assistance. Brush et al. (2003, 61) find that support issues can include the acquisition of resources, help with technical and pedagogical topics, and the proper use of technology in certain situations. Support staff personnel should be proficient in these areas in order to effectively help educators when technology needs arise.

Professional Development

Professional development is the fifth component of the classroom technology infrastructure model. Glenn (1997, 123) maintains that:

> The public support for technology is strong and vocal, and there is an expectation that no school can prepare students for tomorrow's society if new technologies are not available for students. Teachers, therefore, are expected to know how to use technology as a part of instruction even though most teachers feel they do not have skills needed to use technology.

Brogan (2000, 57) ascertains that this is multiplied due to the fact that many educators did not grow up with technology and are essentially playing catch-up with today's students. Johnson, Schwab, and Foa (1999, 29) maintain that professional development is just as important as acquiring equipment. Many times equipment and software will sit unused when training and development programs are inadequate.

It is necessary that **faculty receive technology training and professional development**. Much of the burden to learn technology aplications is placed on faculty. Okojie & Olinzock (2006, 36) suggest that, "One of the characteristics of a lifelong learner is that he or she is always on the lookout for new developments in both theoretical and technical knowledge and exhibits willingness to explore and remain current." Lewis (1996, 2) identifies instructional improvement and personal development as key developmental areas for faculty. Instructional improvement refers to efforts to improve teaching and learning strategies while personal development programs seek to strengthen skills in certain areas. Glenn (1997, 122) points out that if faculty truly want to excel in their field, then they should take initiative in continuing education. Others, such as Brown and Warschauer (2006, 601) find that the use of technology in the classroom greatly depends on training covering the uses and benefits of technology. They[18] go on to point out that training must start early and continue throughout the course of a career. Whale (2006, 65) asserts that, "Despite the paucity of research about how teachers are evaluated on their technology skills, teachers today enter the classroom better prepared to use technology than their longer-serving colleagues." This is clearly an encouraging finding.

Even though training today is better preparing faculty to use technology in the classroom, there are still some issues. Lewis (1996, 4) points out that many times elementary and secondary educators must obtain certifications and training, including areas focusing on technology, in order to teach. This is not the case for university faculty. Lewis (1996, 4) maintains, "For college and university faculty, however, there is no credential required other than the possession of a graduate degree in a certain discipline." Many times faculty do not rely on technology as much as educators at other levels, but technology training is still an area that must be addressed. Reliance on technology in future years makes this issue hard to ignore. Lewis (1996, 12) points out that many universities are making a concerted effort to train future faculty. Teaching assistants are being better trained to improve their communication and pedagogical skills. This is accomplished through a number of training programs, including technology skill development. The hope is that these individuals will be better prepared to teach in the

[18] Brown and Warschauer, 2006, 601.

modern classroom today than their predecessors.

Brown and Warschauer (2006, 616) also find that development programs do not provide enough training about the uses of educational technologies. The authors attribute this to a lack of technology information development programs. Training courses must be improved because of the benefits that classroom technologies provide. Christensen (2002, 431) contends that, "Training appears to foster meaningful use by teachers in the classroom, which, in turn, fosters student computer enjoyment and later a perception of importance of computers." Research by Brush et al. (2003, 70) indicates negative opinions of technology training courses and technology workshops. Other scholars point out the problems with one shot day long workshop training programs. They advocate for comprehensive on going training programs that let faculty develop and use their skills over time (Dawson and Rakes, 2003, 30).

Training and development goals and methods must be clearly stated. Burns and Polman (2006, 381) maintain that administration must, "…ensure that teachers have a good understanding of the basics of computer technology before they are expected to use the technology in the classroom." There are many different programs that can be used to promote development in faculty. Lewis (1996, 2) highlights the importance of faculty development training centers that provide training in classroom computer technology as a means to improve learning in the classroom. Other programs can include individual sessions with graphic artists and media specialists. Glenn (1997, 124-125) identifies programs[19] such as technology workshops and resource centers as useful tools. Whale (2006, 61) points out that university courses, ongoing training, workshops, conferences, and independent research are some resources that faculty can use to improve

[19] See Glenn, 1997, 124-125 for in depth description of these programs.

their technology skills. Brown and Warschauer (2006, 619) identify a collaborative approach to training. The authors find that working together in groups to better understand technology issues can provide positive outcomes.

It is also important to **evaluate training and development programs**. Moersch (2001, 27) suggests that:

> Embracing an empirically tested set of measures to ascertain teacher growth with technology use in the classroom will give policy makers, school administrators, and classroom practitioners the most consistent data to make informed decisions as to the real needs for improving technology infrastructure beyond hardware and software issues.

Lewis (1996, 4) discusses the growing trend for accountability in universities across the nation. Programs must be developed that can accurately assess technology training programs. Whale (2006, 61) finds proper evaluation about technology training is usually limited, giving administrators no proper way to gauge if current resources are effective. In the end, Glenn (1997, 128) maintains that technology skills must be acquired early on and be developed throughout the course of a professional career.

Technology Integration

Technology integration is the sixth and final component in the classroom technology infrastructure model. Faculty must be prepared to **effectively integrate technology into the teaching/learning environment**. Burns and Polman (2006, 383) point out that in the future, transitioning to the use of technology in classrooms should not be as demanding as once thought. The impact of this integration can be seen across the board. Christensen (2002, 431) also finds that the proper integration of technology in the classroom tends to positively influence the attitudes of faculty. The integration of technology in the classroom also has an effect on students. Debevec et al. (2006, 304) find that most students integrate technology into class preparation and studying. The integration of Web tools into the classroom can also have an impact on students. Mackey (2005, 23) suggests that web development is one tool that allows students to research and analyze information on the Internet and in turn, communicate about these topics.

Administrators must also be proficient in the integration of technology. Dawson and Rakes (2003, 43) find that the more training administrators receive, the more likely technology will be properly integrated. Okojie and Olinzock (2006, 37) point out that technology integration is a process in which integration specialists must understand concepts and how these concepts should be applied to the teaching and learning process. Dawson and Rakes (2003, 30) find that technology has not been integrated in many cases simply because attention has not been given to faculty concerns. Developing confidence is an important part of this process. Christensen (2002, 411) suggests that, "The amount of confidence a teacher possesses in using computers and related information technologies may greatly influence his or her effective implementation of technology methods in the classroom." Shields and Rogers (2005, 72) maintain that despite these concerns faculty should be able to successfully integrate technology into the classroom.

There are some barriers to technology integration. Findings by Dawson and Rakes (2003, 42) indicate that the largest barrier in regards to using and implementing technology in the classroom is simply lack of time. Iding et al. (2002, 153) find that, "A perennial difficulty is finding the time and resources to implement the use of educational technology in classrooms." Another issue is the focus of technology implementation courses. Research by Brown and Warschauer (2006, 607) find that the emphasis in courses is on hardware and software issues instead of technology integration. They go on to point out that, "At the end of the course, most participants did not feel prepared to enter a classroom ready to teach in technology rich environments."

It is important that technology integration is **incorporated into teaching and learning standards**. Christensen (2002, 413) maintains that instructors who have integrated technology into the classroom tend to have a positive effect on their students views about the various uses of technology. Ojokie and Olinzock (2006, 38) contend that, "Technology integration represents an inclusive concept which embodies the ability and the skill to use various kinds of resources to enhance and aid teaching as well as promote meaningful learning." Rule et al. (2006, 5) point out that a great deal of testing must occur prior to the integration of technology to ensure optimal performance. This testing must be rigorous in nature and include input from educators, students, and integration specialists.

It is also important that **technology is incorporated into administrative processes**. Moersch (2001, 2) finds that more use of new technologies by administration can have a positive impact on technology integration in the classroom. There are many tools[20] available for administrators to evaluate levels of technology integration. Some of these are item analysis, feedback, summary reports, surveys, standards alignment, and prescriptive reports (Moersch, 2002, 11). Lewis (1996, 5) finds universities are asking faculty to help in the design of these evaluation programs. Faculty input can lead to an evaluation process that can more accurately measure classroom technology usage. Evaluation tools such as these can be used as a component in assessing technology integration in the classroom.

[20] See Moersch, 2002, 24.

Summary of Conceptual Framework

Table 2.1 presents the six practical ideal type categories- technology planning and policies, equipment, technology applications, maintenance and support, professional development, and technology infrastructure- that are identified as part of the assessment model.

Table 2.1: Conceptual Framework Linking Ideal Type Categories to the Literature

Conceptual Framework	
Ideal Type Categories	**Literature**
Technology Planning and Policies • Clear technology plan and policies in place • Implementation of plan • Evaluation of plan	Glenn (1997) Johnson, Schwab, and Foa (1999) Moersch (2001) Moersch (2002) Rakes, Fields, and Cox (2006) Brown and Warschauer (2006) Rule, Salzberg, Higbee, Menlove, and Smith (2006) U.S. Department of Education (2002) Dawson and Rakes (2003) Christensen (2002) Okojie and Olinzock (2006)
Equipment • Presence of equipment in instructional settings • Availability of equipment for student use • Availability of equipment for faculty use • Availability of equipment for administrators and support staff	Forgaz (2006) Glenn (1997) Johnson, Schwab, and Foa (1999) Burns and Polman (2006) Mackey (2005) Rakes, Fields, and Cox (2006) Debevec, Shih, and Kashyap (2006) Brown and Warschauer (2006) U.S. Department of Education (2002) Iding , Crosby, and Speital (2002) Christensen (2002)
Technology Applications • Instructional applications support teaching and learning standards • Software support in place for technology tool skill development • Use of technology applications to improve communication • Evaluation of effectiveness for applications in place	Forgaz (2006) Glenn (1997) Johnson, Schwab, and Foa (1999) Burns and Polman (2006) Mackey (2005) Rakes, Fields, and Cox (2006) U.S. Department of Education (2002) Dawson and Rakes (2003) Iding, Crosby, and Speital (2002) Brush and Glazewski (2003)

Table 2.1: Conceptual Framework Linking Ideal Type Categories to the Literature

Conceptual Framework	
Maintenance and Support • Resources and processes to maintain school technology are in place • Personnel are available to provide technical support	Burns and Polman (2006) Forgaz (2006) Glenn (1997) Okojie and Olinzock (2006) Rakes, Fields, and Cox (2006) U.S. Department of Education (2002) Iding , Crosby, and Speital (2002)
Professional Development • Faculty and staff receive technology-related training and/or professional development • Goals, methods, incentives, and content of technology-related training and/or professional development for staff are clear • Evaluation process in place for training and/or professional development	Burns and Polman (2006) Forgaz (2006) Glenn (1997) Johnson, Schwab, and Foa (1999) Okojie and Olinzock (2006) Rakes, Fields, and Cox (2006) Shields and Rogers (2005) Whale (2006) Moersch (2001) Moersch (2002) Mackey (2005) U.S. Department of Education (2002) Dawson and Rakes (2003) Christensen (2002) Brush and Glazewski (2003) Brogan (2000) Lewis (1996)
Technology Integration • Technology is integrated into the teaching/learning environment • Technology proficiencies and measures are incorporated into teaching and learning standards • Technology is incorporated into administrative processes • Technology proficiency is integrated into faculty evaluation	Burns and Polman (2006) Forgaz (2006) Glenn (1997) Johnson, Schwab, and Foa (1999) Okojie and Olinzock (2006) Rakes, Fields, and Cox (2006) Shields and Rogers (2005) Whale (2006) Moersch (2001) Moersch (2002) Mackey (2005) Brown and Warschauer (2006) Debevec, Shih, and Kashyap (2006) U.S. Department of Education (2002) Dawson and Rakes (2003) Iding , Crosby, and Speital (2002) Christensen (2002) Brush and Glazewski (2003) Brogan (2000) Lewis (1996)

The first component for an ideal classroom technology infrastructure model at the university level is **technology planning and policies**. The literature suggests that administrators must have **clear technology plans and policies in place**[21], be prepared to **implement the plan**[22], and be able to **evaluate the plan**[23]. Rule et al. (2006, 6) find that all costs of a program should be taken into account, including equipment, installation, maintenance, support, and personnel costs. These must be clearly outlined during the planning stage. Dawson and Rakes (2003, 33) contend that institutional leadership essentially determines the role of technology in their institution. It is imperative that leadership understands the benefits technology provides in order to provide clear policies, implementation practices, and evaluation procedures.

Equipment is identified as the second key component in the model classroom technology infrastructure. Any model classroom must have the **presence of equipment in instructional settings**[24]. Tools such as digital projectors, file management systems, graphics, multimedia, spreadsheets, electronic communication devices, and graphics calculators are all present in the classroom of today (Forgaz, 2006, 78). It is also essential that there is availability of **equipment for student use**[25], **faculty use**[26], and **administrative and support staff use**[27]. Debevec et al. (2006, 294) maintain that equipment "allows instructors and students to access a wealth of multimedia information, tutorials, live data, and assessment tools that replicate and expand the traditional classroom." Clearly, equipment plays a vital role in the technology oriented classroom of today.

Technology applications are identified as the third component within classroom

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[21] Dawson and Rakes (2003, 33); Glenn (1997, 127).
[22] Dawson and Rakes (2003, 33); Iding, Crosby, and Speital (2002, 159); Johnson, Schwab, and Foa (1999, 28).
[23] Dawson and Rakes (2003, 33); Moersch (2001, 27); Moersch (2002, 11); Whale (2006, 66, 70).
[24] Debevec et al. (2006, 293); Forgaz (2006, 78).
[25] Brush et al. (2003, 57); Debevec et al. (2006, 293).
[26] Brush et al. (2003, 57); Iding et al. (2002, 157); Forgaz (2006, 79).
[27] Debevec et al. (2006, 293).

technology infrastructure model. It is important that **instructional applications support teaching and learning standards**[28] and **software support is in place for technology tool skill development**[29]. Research by Brush et al. (2003, 66) finds that, "many participants responded enthusiastically that the technology had a positive impact on their instruction and the attitudes of their students." Also, the **use of technology applications to improve communication**[30] is essential to any classroom using technology. In addition, there should be some process of **evaluation of effectiveness for applications in place**[31]. Burns and Polman (2006, 371) point out that this process should provide incentives to instructors who are proficient using classroom technologies.

Maintenance and support is the fourth component within an ideal classroom technology infrastructure model. When **resources and processes to maintain school technology are in place**[32], the institution has a better chance to achieve goals that have been set. Okojie and Olinzock (2006, 36) find that faculty must have strong support systems in place in order to succeed. This includes training, funds, technical specialists, and administrative systems. An institution must also insure that **personnel are available to provide technical support**[33] when the need arises. Brush et al. (2003, 61) maintain that personnel should be able to provide support in the areas of resolving technical issues, acquiring technical resources, and technology related training.

Professional development is the fifth component of a classroom technology infrastructure model. It is important that **faculty receive technology-related training**

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[28] Burns and Polman (2006, 366); Shields and Rogers (2005, 76).
[29] Christensen (2002, 431); Iding et al. (2002, 160); Johnson, Schwab, and Foa (1999, 24);
[30] Brown and Warschauer (2006, 612); Brush et al. (2003, 66); Burns and Polman (2006, 366);
[31] Burns and Polman (2006, 366); Forgaz (2006, 80).
[32] Brush et al. (2003, 58, 61); Glenn (1997, 125); Okojie and Olinzock (2006, 36).
[33] Brush et al. (2003, 61); Okojie and Olinzock (2006, 34).

and/or professional development[34]. Brown and Warschauer (2006, 601) point out that this must start during training and continue throughout the course of a career. When staff receive adequate training and the **goals, methods, incentives, and content of technology-related training and/or professional development for staff are clear**[35] there is a greater chance for success in the classroom. There must also be an **evaluation process in place for training and/or professional development**[36] if administrators want to gauge the effectiveness of these programs. Whale (2006, 61) finds that few instructors are evaluated in relation to technology training, giving administrators no proper way to gauge if current resources are effective.

Technology integration is the sixth and final component within an ideal classroom technology infrastructure model. It is important that **technology is integrated into the teaching and learning environment**[37]. Ojokie and Olinzock (2006, 38) contend that, "Technology integration represents an inclusive concept which embodies the ability and the skill to use various kinds of resources to enhance and aid teaching as well as promote meaningful learning." Also, **technology proficiencies and measures should be incorporated into teaching and learning standards**[38]. Burns and Polman (2006, 383) point out that, "As computer technology continues to penetrate all aspects of our lives, the transition to using technology in our classrooms may not be as dramatic or difficult as once predicted." In addition, it is essential that **technology is incorporated**

[34] Brown and Warschauer (2006, 601); Christensen (2002, 431); Glenn (1997, 122); Okojie and Olinzock (2006, 36); Whale (2006, 65).
[35] Brown and Warschauer (2006, 619); Burns and Polman (2006, 381); Glenn (1997, 124-125); Whale (2006, 61).
[36] Glenn (1997, 128); Moersch (2001, 27); Whale (2006, 61).
[37] Burns and Polman (2006, 383); Christensen (2002, 413, 431); Ojokie and Olinzock (2006, 38); Rule et al. (2006, 5); Shields and Rogers (2005, 72).
[38] Dawson and Rakes (2003, 42); Debevec et al. (2006, 304); Mackey (2005, 23).

into administrative processes[39] and that **technology proficiency is integrated into the evaluation of faculty and staff**[40]. Okojie and Olinzock (2006, 37) maintain that technology integration is a process in which integration specialists must understand concepts and how these concepts should be applied to the teaching and learning process.

Chapter Summary

Now more than ever, technology is playing an important role in the classroom. Due to this, administrators must have some way to assess the impact and effectiveness of classroom technology infrastructure. This chapter has presented six practical ideal type categories- technology planning and policies, equipment, technology applications, maintenance and support, professional development, and technology infrastructure- that are described in the literature as being important components of a model assessment tool. The next chapter explains the methodology used to assess classroom technology infrastructure and connects each method to the conceptual framework.

[39] Dawson and Rakes (2003, 43); Okojie and Olinzock (2006, 37); Moersch (2001, 2).
[40] Moersch (2002, 11).

Chapter III: Methodology

Chapter Purpose

The purpose of this chapter is to describe the methodology used to gauge classroom technology infrastructure at the university level. This research, a case study approach, specifically focuses on gauging classroom technology at Texas State University. Focused interviews, document analysis, direct observation, and survey research are used within the case study to collect data. Each method is explained and connected to the conceptual framework in this chapter.

Case Study

The classroom technology assessment model developed in chapter two fills a gap in the literature. It is also a systematic framework that can be used to direct data collection in an actual technology infrastructure assessment. The case study methodology is appropriate because Texas State University's classroom technology infrastructure program can be viewed as a "case". Further no single method such as survey research would be sufficient to comprehensively analyze the program. It is important to visit classrooms and observe technology as well as learning student and faculty opinions about the technology available in the classroom. **Table 3.1** summarizes the connection between the framework, data collection methods, and expected evidence.

The research design selected for this project is a case study. Yin (2003, 2) maintains that, "the case study method allows investigators to retain the holistic and meaningful characteristics of real life events- such as individual life cycles, organizational and managerial processes, neighborhood change, international relations, and the maturation of industries." Babbie (2004, 293) finds that the case study approach

Table 3.1: Operationalizing the Conceptual Framework

Operationalization Table			
Ideal Type Categories	**Research Method**	**Evidence**	**Sources**
Technology Planning and Policies			
•Clear technology plan and policies in place	Document Analysis	•Existence of policies. •The major planning components are present. •Plan funding is in place. •Funding for technology programs is clearly outlines.	•Organizational records •Written reports •Handbook •Brochures •University/department budget
	Focused Interviews	•Describe the current planning and policy making process at Texas State (Q. #1)	•Administrators and staff at Texas State University
•Implementation of plan	Document Analysis	•Existence of implementation procedures. •Existence of plan schedules and benchmarks.	•Organizational records •Written reports
•Evaluation of plan	Document Analysis	•Existence of evaluation process.	•Organizational records •Written reports •University/department budget
	Focused Interviews	•What processes are you using to determine whether the current plan is achieving its goals? (Q. #2)	•Administrators and staff at Texas State University
Equipment			
•Presence of equipment in instructional settings	Direct Observation	•One or more computers per classroom. •One or more multimedia computers per classroom. •One or more projection devices per classroom. •One or more computers connected to a network per classroom.	•Classrooms at Texas State University •Organizational records
•Availability of equipment for student and faculty use	Document Analysis	•Students have regular access to computers.	•Organizational records •Written reports •Texas State web site

Table 3.1: Operationalizing the Conceptual Framework

Operationalization Table			
Technology Applications			
•Instructional applications support teaching and learning standards	Document Analysis	•Existence and current status of software alignment plan. •Applications are aligned to teaching and learning standards. •Approved instructional applications in regular use.	•Organizational records •Written reports •Handbook •Department documents
•Software support in place for technology tool development	Direct Observation	•Applications in use in classrooms that support technology tool skill development meet university goals.	•Classrooms at Texas State University
•Use of technology applications to improve communication	Document Analysis	•All faculty and students have active e-mail accounts.	•Organizational records
	Direct Observation	•Existence of active school web site.	•Texas State University web site
•Use of technology applications to improve communication (cont.)	Focused Interview	• What tools are available to aid instructional staff in regards to support and communication issues? (Q. #3,)	•Administrators and staff at Texas State University
•Evaluation of effectiveness for applications in place	Document Analysis	•Existence of software evaluation plan.	•Organizational records •Written reports •Department documents
Maintenance and Support			
•Resources and processes to maintain technology are in place	Document Analysis	•Preventive maintenance schedule established. •Replacement/upgrade schedule established for hardware and software.	•Organizational records •Written reports
	Direct Observation	•Help desk support software available. •Access to technical manuals provided for end users. •Disaster recovery procedures in place.	•Texas State University support staff
•Personnel are available to provide technical support	Document Analysis	•Dedicated persons assigned to classroom technical support. •Personnel available to support web-based and distance learning programs.	•Organizational records •Written reports

Table 3.1: Operationalizing the Conceptual Framework

Operationalization Table			
Professional Development			
•Faculty and staff receive technology related training and/or professional development	Survey (1)	• How many hours of technology related training or professional development have you received in the past three academic years? (S. 1, Q #3)	•Instructors/Faculty at Texas State University
	Focused Interview	•How many hours do you spend, per academic year, on professional development (training)? (Q. #4)	•Administrators and staff at Texas State University
•Goals, methods, incentives, and content of technology related training and/or professional development for staff are clear	Document Analysis	•Existence of a written goal statement for technology-related professional development.	•Organizational records •Handbook •Training manuals
	Survey (1)	• Do you feel that technology related content areas are adequately covered in training? (S. 1, Q #4) • Are you provided incentives for completing technology-related training programs? (S. 1, Q #5)	•Instructors/Faculty at Texas State University
•Evaluation processes in place for training and/or professional development	Focused Interview	•What type of training do you receive in regards to evaluating proficiency in support staff? (Q. #5)	•Administrators and staff at Texas State University
	Direct Observation	•Existence of evaluation criteria.	•Organizational records •University staff members
Technology Integration			
•Technology is integrated into the teaching/learning environment	Survey (1)	• Do you feel equipped to adequately incorporate technology into the classroom? (S. 1, Q #6)	•Instructors/Faculty at Texas State University
	Document Analysis	• University programs in place to help faculty integrate technology into the teaching/learning environment.	•Organizational records •Written reports •Training manuals
	Survey (2)	•5) How many courses have you taken at Texas State University that utilized some form of technology in the classroom? (S. 2, Q #3)	•Students at Texas State University

Table 3.1: Operationalizing the Conceptual Framework

Operationalization Table			
•Technology proficiencies and measures are incorporated into classroom learning standards	Survey (2)	• How many courses have you taken at Texas State University that included training or instruction in the use classroom technology or computer based technology? (S. 2, Q #5) • In how many of your classes at Texas State University have you been tested over technology proficiency? (S. 2, Q #4)	•Students at Texas State University
	Document Analysis	•Adopted standards in place for technology proficiency in each college.	•Organizational records •Written reports •College web sites
•Technology is incorporated into administrative processes	Focused Interview	•What types of technology are incorporated into administrative processes? (Q. #6)	•Administrators and staff at Texas State University
•Technology proficiency is integrated into faculty evaluation	Survey (1)	• Are you required to demonstrate proficiency in the usage of technology in the classroom? (S.1 Q#7) • Are technology proficiency and technology integration components within your annual faculty assessment? (S. 1, Q #8)	•Instructors/Faculty at Texas State University

can provide an "explanatory insight" into a particular case that would otherwise be difficult observe. Case study approaches are many times characterized by the use of multiple research methods[41], a process known as triangulation. Yin (2003, 97) points out that this is one of the strengths of the case study approach. Focused interviews, document analysis, direction observation, and survey research are used as a means for collecting data in this research.

[41] As discussed by Yin (2003, 97-101). Yin discusses the four main types of triangulation as identified by Patton.

Focused Interviews

Focused interviews are one tool utilized in this research to assess classroom technology infrastructure at Texas State University. Yin (2003, 89) finds that, "one of the most important sources of case study information is the interview." Also, Babbie (2004, 236-264) points out that there are many advantages to using focused interviews. These include high response rates, a decrease in the number of no response answers, a heightened level of clarity, and firsthand observation of the respondent. Weaknesses of focused interviews can include biased responses and inaccuracies due to weak question construction or faulty articulation (Yin, 2003, 86). Overall, when constructed and conducted properly[42], interviews can prove to be a useful tool.

For the purpose of this research, focused interview questions[43] are developed from information in the literature review and the corresponding conceptual framework. The questions are developed with the six ideal type categories in mind. For example, questions regarding the existence of a technology plan (**Technology Planning and Policies category)** and what communication tools are available (**Equipment category**) can be directly linked to the corresponding practical ideal type category**.** Also, questions concerning the applications available to support staff members **(Technology Applications category)** and the numbers of hours spent on training (**Professional Development category)** are best observed using a focused interview. In addition, the utilization of a focused interview to find out what types of technology are incorporated into administrative processes (**Technology Integration category)** should prove to be useful.

[42] See Babbie, 2004, 265-266.
[43] See Appendix A for Focused Interview Questions.

Sample: Focused Interviews

The sample will include fifteen to twenty administrators and staff members within the department of Instructional Technologies Support at Texas State University. Quota sampling is used to insure that individuals from multiple areas of the department are interviewed. Quota sampling is a non-random form of sampling where the researcher selects respondents based on the need to fill different sub groups of a given population[44]. The sample should be representative of the entire department because of this.

Document Analysis

Document analysis is another tool used in this research to assess classroom technology infrastructure at Texas State University. Yin (2003, 85) insists that, "documentary information is likely to be relevant to every case study topic." Strengths of document analysis include the fact that it is stable, unobtrusive, exact, and provides a broad level of coverage to a given topic (Yin, 2003, 86). Some weaknesses of document analysis are access and reporting bias.

Document analysis is used to confirm the existence of a technology plan and that funding is provided (**Technology Planning and Policies category)**. Also, these documents are beneficial in determining equipment availability for faculty and students **(Equipment category)**, current status of software programs and departmental initiatives (**Technology Applications category)**, and the time spent performing technical support **(Maintenance and Support category)**. Finally, documents are examined in order to determine what training programs are in place (**Professional Development category)** and if technology proficiency programs are in place for faculty and students **(Technology Integration category)**.

[44] See Babbie, 2004,

Sample: Document Analysis

The sampling frame using document analysis is purposive. The researcher, with input from knowledgeable individuals within the department, will select which documents are analyzed. In this case, the small number of documents available and the input from knowledgeable individuals within the department should make the sample representative.

Documents including written reports, administrative proposals, progress reports, site evaluations, meeting minutes, memoranda's, budgets, department handbooks, and training and evaluation materials will be used to assess classroom technology in each of the seven ideal type categories. **Table 3.2** presents these documents in greater detail and connects them to the corresponding components.

Table 3.2: Individual documents connected with model ideal categories

Categories	Documents Used
Technology Planning and Policies	• Teaching theater mission document • ITS strategic planning document • Classroom staff mission document • Texas State University- San Marcos Fiscal Year 2007 Operating Budget • Instructional Technologies Fiscal Year 2007 Operating Budget • Texas State Strategic Plan 2004-2009
Equipment	• Classroom equipment schematics • Installation records • Texas State Strategic Plan 2004-2009 • Building design plans
Technology Applications	• ITS strategic planning document • Texas State Strategic Plan 2004-2009 • Information technology connectivity records (number of active e-mail accounts)
Maintenance and Support	• Maintenance logs • Support manual • Support incidence occurrence logs • Equipment manuals • Texas State Strategic Plan 2004-2009

Table 3.2: Individual documents connected with model ideal categories

Categories	Documents Used
Professional Development	• Training days document • Strategic planning document • Employee handbook • Workshop schedules • Workshop content documents • Sample evaluation document • SCTT training objectives document • ATT training objectives document
Technology Integration	• Strategic planning document • Sample student assessment form • Texas State Strategic Plan 2004-2009

Direct Observation

Direct observation is also used to assess classroom technology infrastructure at Texas State University. Yin (2003, 93) maintains that, "Observational evidence is often useful in providing additional information about the topic being studied." Babbie (2004, 285) points out that observation by a researcher can cause events to proceed differently than they normally would, a concept known as reflexivity[45]. Other issues with direct observation are that it can be time consuming and expensive (Yin, 2003, 86). Even with these issues, direct observation can still provide many benefits to the researcher. Two of these are the ability to cover events in real time as well as the ability to cover the entire context of an event (Yin, 2003, 86). While direct observation is not an ideal method when used alone, it can prove to be beneficial when used in conjunction with other methods.

Direct observation, in conjunction with the other research techniques, is used to assess classroom technology in three of the practical ideal type categories. This technique should provide valuable insight regarding the type and amount of equipment

[45] See Yin, 2003, Figure 4.1 (p. 86).

present in classrooms **(Equipment category)**. Direct observation also provides a first hand look at the number of applications in use in classrooms that support technology tool skill development (**Technology Applications category)** and help desk operating procedures **(Maintenance and Support category)**.

Sample: Direct Observation

For the purposes of this study classrooms are broken down into three categories based on capacity. The categories are teaching theaters (over 300 seats), lecture halls (76-299 seats), and traditional classrooms (75 and under). All teaching theaters and lecture halls were observed to determine what equipment and applications are used. Ten traditional classrooms from large teaching buildings on campus were observed using a stratified sample format. Classrooms will be selected in a way so that the entire building is represented. The researcher rolled a die to determine which classroom to select first. After this, every *n*th classroom was observed based on the size of the building. The results were then compared with documents on file to ensure accuracy. The sheer number of classrooms across the university makes this a difficult task. The stratified sample with a random start approaches a random sample and allows for generalization of the findings.

Survey

A final technique that is used to assess classroom technology infrastructure at Texas State University is survey research. Survey research is not commonly associated with case study research, but is a relevant technique that can be used in some situations[46]. Yin (2003, 91) identifies the formal survey as a type of interview. He also points out that

[46] Yin (2003, 91) gives the example of research done by Hanna (2000) using survey research in a case study.

sampling procedures and instrumentation should be designed just as a regular survey, but that the role of the survey is as a complement to the other research and not as a stand alone tool (Yin, 2003, 91). Babbie (2004, 274) discusses advantages provided by survey research such as the ability to describe the characteristics of a sizable population as well as being both cost and time effective. He also presents weaknesses of survey research including standardization, lack of flexibility, and artificiality (Babbie, 2004, 275). Despite these weaknesses, survey research can be useful when combined with other techniques within a case study approach. Survey research is used to assess classroom technology in two of the six ideal type categories. There were two short formal surveys[47] conducted within this research.

Faculty Sample: Survey

The first survey was administered to roughly thirty faculty members at Texas State University and covered the categories of **Professional Development** and **Technology Integration**. Sampling was conducted in a purposive manner with individual faculty members serving as the units of analysis. The surveys were then distributed among faculty members from different colleges across the university in order to strengthen the representativeness of the sample. Descriptive statistics are used to sum up all data collected.

Student Sample: Survey

The second survey focuses on students at Texas State University and will cover the category of **Technology Integration**. This survey was administered to approximately three hundred students in large technology oriented classrooms. Surveys will be administered in a simple random fashion before the beginning of a class. To insure that

[47] See Appendix B and C for sample survey format.

the sample is representative, one hundred surveys were administered on three different occasions with a different group of students. Each student served as an individual unit of analysis. As with the first sample, descriptive statistics are used to sum up all data collected.

Criteria for Support

Criteria must be developed in order to determine if the evidence collected supports the model assessment tool. Four levels of support are identified. The levels are strong support, adequate support, limited support, and no support. The first level**,** strong support, indicates that more than the necessary amount of attention has been given to an individual element or component of the model. Adequate support, the second level, signifies that ample attention has been given to an individual element or component. The third level, limited support indicates that some support has been given to an element or component but, this support does not meet the adequate need. No support, the fourth level, signifies that no support whatsoever has been given to an individual element or component. Once all the data has been collected, the researcher will assign each element a level of support.

The analysis of a case study can present some difficulties. Yin (2003, 109) maintains that the case study analysis presents difficulties because the, "strategies and techniques have not been well defined." He does point out that building a framework, as presented earlier in this paper, is one strategy that can be used to effectively analyze case study data. Assigning of a level of support is subjective, and could thus present a weakness. The researcher must interpret and analyze the data to the best of his or her ability. Yin (2003, 109) contends that researchers must think about all the evidence collected, present the evidence aside from any interpretations, and offer an interpretation of the evidence.

Human Subjects Protection

Protection is given to all interviewees and survey respondents within this case study. There should be no foreseeable risks or discomforts to any of the respondents. All individuals were provided with information about the research topic and assured that any responses or observable actions will be confidential. Names are kept only by the researcher and viewed by no other party. Subjects are also be given information concerning contact information about the research and their rights as subjects. The researcher informed all subjects that their participation in the case study is voluntary and can be terminated at their decision at any time. In addition, the research topic has been examined by the Texas State Institutional Review Board[48] and found to be exempt. Overall, the nature of this research does not present harm to any of the faculty, staff, or students that contributed to this study.

Chapter Summary

This chapter has presented the methodology of this research, a case study approach. Techniques including focused interviews, document analysis, direct observation, and survey research are used within the case study to collect data. The next chapter presents the results of the case study used to assess classroom technology infrastructure at Texas State University.

[48] For more information see http://www.txstate.edu/research/irb/index.php.

Chapter IV: Results

Chapter Purpose

As stated earlier, the purpose of this research is to assess classroom technology infrastructure through a case study of Texas State University as compared to the components of an ideal classroom technology infrastructure model. The purpose of this chapter is to summarize all data used to assess classroom technology infrastructure at Texas State University.

Six components are included in the model classroom technology infrastructure assessment tool. The components include technology planning and policies, equipment, technology applications, maintenance and support, professional development, and technology integration. Assessment results indicated that classroom technology infrastructure at Texas State University is strong in the areas of technology planning and policies, equipment, technology applications, and maintenance and support. However, the components of professional development and technology integration could use improvement, especially in the areas of student and faculty training.

Technology Planning and Policies

The first component for an ideal classroom technology infrastructure model at the university level is having technology planning and policies in place. Dawson and Rakes (2003, 33) point out that leadership essentially determines the role technology will have in their institutions and organizations. Plans and policies that improve the organizational structure of universities are essential. Having clear technology plans and policies in place, preparation to implement the plan, and the ability to evaluate the plan are all identified as elements of the technology planning and policies component within the model assessment tool. **Table 4.1**[49] summarizes the results for the first component.

Document Analysis: Clear Technology Plan and Policies in Place

Documents including the Instructional Technologies Support Planning Document and the Texas State University "Embracing Change" 2004-2009 University Plan were analyzed to determine if Texas State University has clear classroom technology plans and policies in place. The Instructional Support Strategic Planning document revealed a commitment to classroom technologies. The document contends that the vision of Information Technologies is to:

> Develop, enhance, and maintain the technology infrastructure, access, support, training, and professional development that are needed to successfully empower the university community to achieve its varied instructional, research, and business service activities.[50]

Document analysis further identifies that the mission of Instructional Technologies Support is to provide the faculty and the University community instruction, leadership, and support for all phases of instructional design, development, and deployment[51]. The document also outlines crucial areas such as research, teaching, learning, and administrative activities[52]. Attention is also given to providing the highest levels of service in each of these areas to faculty, staff, and students. Planning components are identified and developed in the documents. These include the development of a comprehensive plan for monitoring needs in academic environments, the development of processes for allocating technology based instructional needs, and the

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[49] Table 4.1 is located on page 52.
[50] Instructional Technologies Support Planning Document, 2.
[51] Instructional Technologies Support Planning Document, 3.
[52] Instructional Technologies Support Planning Document, 2.

initiation of a new acquisition cycle program[53]. Other components of the plan include the integration of classroom technologies, development of routine maintenance procedure systems, and the development of a long-term support and replacement processes. Definitions and key terms are provided and procedures are outlined in detail.

The Texas State University 2004-2009 "Embracing Change" Planning document[54] also outlines key strategic themes in technology areas. The document identifies a commitment to significantly enhancing technology in the teaching and learning environment during this time period[55]. Key areas are identified through a comprehensive process of review conducted by various divisions and departments. Planning areas, as well as funding procedures, are identified and subsequently developed in the document. These include the development of classroom technology maintenance plans, continuation of existing update and replacement procedures, and sustaining classroom technology support programs[56]. In addition, plans for distance education programs are outlined along with increased support for web-based applications[57].

Focused Interviews: Clear Technology Plan and Policies in Place

Focused interviews also provided insight into planning and policy procedures. Eight of the thirteen respondents interviewed accurately identified major department plans. Five of the thirteen could not identify all major department plans, but all could identify some components. One respondent stated that, "this was because he was in a specialized area and had a different set of planning goals." Respondents in three of the

[53] Instructional Technologies Support Planning Document, 4-8.
[54] The Texas State University "Embracing Change" 2004-2009 University Plan can be found at http://www.upa.txstate.edu/University-Plans/University-Plans/contentParagraph/0/content_files/file/2004-2009%20University%20Plan.pdf
[55] Texas State University "Embracing Change" 2004-2009 University Plan, 61.
[56] Ibid., 65-66.
[57] Ibid., 66.

five cases where major plans could not be identified noted that plans could easily be found in departmental documents.

Document Analysis: Implementation of the Plan

The Instructional Technologies Support Panning document was analyzed to determine if implementation procedures exist for classroom technology plans and policies. Analysis indicated that implementation schedules for classroom technologies at Texas State University are clearly outlined. Conducting task analysis, identifying important milestones, and creating detailed timelines for implementation status are shown to be important[58]. One example identified is the implementation procedure for classroom technology support programs and resources. The support implementation procedure consists of the creation of a system that integrates all support services into a single center and the development of a database containing responses for any support issue that might occur. The Texas State University "Embracing Change" 2004-2009 University Plan also clearly outlines implementation procedures for project planning and management programs[59]. In addition, analysis also identified implementation procedures for classroom technology instructional programs enabling faculty to better integrate technology into the teaching-learning environment[60]. The goals and timelines for this program are clearly stated.

Document Analysis: Evaluation of the Plan

Analysis of the Instructional Technologies Support Strategic Planning document revealed the existence of technology plan evaluation procedures at Texas State University. Focus is given to assessment processes for all classroom technology areas.

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[58] Instructional Technologies Support Planning Document, 3, 9.
[59] Texas State University "Embracing Change" 2004-2009 University Plan, 63-67.
[60] Ibid., 62.

These include conducting needs assessments of teaching environments, equipment, and software platforms. The Instructional Technologies Support Strategic Planning document outlines components of evaluation as:

> Conducting a thorough front-end analysis including: needs assessment, learner analysis, context analysis, definition of goals and objectives, identification of assessment strategies, evaluation plan, and quality analysis planning.[61]

Evaluation procedures also call for a periodical review of classroom technology components. Evaluations are conducted in both individual and group settings at various times based on need.

Focused Interviews: Evaluation of the Plan

Focused interviews also revealed the existence of technology plan evaluation procedures at Texas State University. All respondents identified various evaluation tools such as teaching theater assessment reports, technology needs assessments, and instructional needs analysis. One individual stated that evaluations are, "Viewed as being very important to the department." Many respondents commented on evaluation process procedures. The scope and rigor of evaluation procedures varied by respondent, due in large part to the different assessments conducted within each department. Some evaluations were conducted by a single individual in a short time period while others used a group of individuals and took weeks to complete. For the most part, evaluation processes were described as useful tools. One respondent pointed out that, "Assessment tools are of great help when comparing programs from year to year." Another respondent pointed out that evaluation tools allow staff members to identify areas that need to be strengthened in existing programs.

[61] Instructional Technologies Support Planning Document, 15.

Table 4.1 illustrates the findings for the component of technology planning and policies. The areas of plan implementation and evaluation received strong levels of support. Varying levels of support existed in regards to having clear technology plans and policies in place.

Table 4.1: Technology Planning and Policies Results

Technology Planning and Policies		
Component	**Method**	**Evidence**
Clear technology plan and policies in place	Document Analysis	Strong Support
	Focused Interview	Limited Support
Implementation of plan	Document Analysis	Strong Support
Evaluation of plan	Document Analysis	Strong Support
	Focused Interview	Strong Support

Equipment

The second key component identified in the model assessment tool is equipment. Debevec et al. (2006, 293) find that technology based learning has grown in recent years with more reliance on visual presentation, the Internet, and other tools that make interaction possible. Tools such as digital projectors, file management systems, graphics, multimedia, spreadsheets, electronic communication devices, and graphics calculators are all present in the contemporary classroom (Forgaz, 2006,78). Elements of the equipment component within the model assessment tool include the presence of equipment in instructional settings, availability of equipment for student use, availability of equipment for faculty use, and availability of equipment for administrative and support staff use. **Table 4.5**[62] illustrates the results for the equipment component.

Direct Observation: Presence of Equipment in Instructional Settings

Direct observation was conducted to determine if equipment was present in instructional settings. Nine major teaching buildings across the campus of Texas State University were observed. The buildings included Centennial Hall, the Education building, Derrick Hall, McCoy Hall, Evans Liberal Arts building, Flowers Hall, Taylor-Murphy History building, the Psychology building, and the Mitte Technology and Physics building. Instructional settings were divided into three different categories based on size. The first category observed was teaching theaters, classrooms with more than 300 seats.

Table 4.2 depicts the results for teaching theaters. All three teaching theaters on the campus of Texas State University were observed. One hundred percent of teaching theaters contained more than one computer, more than one multimedia computer, a projection device, and a network connection.

Table 4.2: Equipment- Teaching Theater Results

Teaching Theater Equipment Results (N=3)				
		Yes	**No**	**Total**
One or more computers per classroom	**%** **N**	100 3	0 0	100 3
One or more multimedia computers per classroom	**%** **N**	100 3	0 0	100 3
Projection device in the classroom	**%** **N**	100 3	0 0	100 3
One or more computers connected to a network per classroom	**%** **N**	100 3	0 0	100 3

[62] Table 4.5 is located on page 56.

Lecture halls were next category of classrooms to be observed. These classrooms consist of 76 to 299 seats. **Table 4.3** illustrates the results for the category of lecture halls. Over ninety percent of lecture halls observed contained one or more computers and had one or more computers connected to a network. A projection device was present in twenty of the twenty-three lecture halls observed. Nineteen of the twenty-three lecture halls contained a multimedia computer.

Table 4.3: Equipment- Lecture Hall Results

Lecture Hall Equipment Results (N=23)				
		Yes	**No**	**Total**
One or more computers per classroom	**%** **N**	91 21	9 2	100 23
One or more multimedia computers per classroom	**%** **N**	83 19	17 4	100 23
Projection device in the classroom	**%** **N**	87 20	13 3	100 23
One or more computers connected to a network per classroom	**%** **N**	91 21	9 2	100 23

Traditional classrooms make up the final category of instructional settings observed. These classrooms consist of seventy-five or fewer seats. **Table 4.4**[63] presents the results for the category of traditional classrooms. Over ninety percent of traditional classrooms contained at least one computer and a network connection. Eighty-seven percent of traditional classrooms contained a multimedia computer. A projection device was present in eighty-four percent of traditional classrooms.

[63] Table 4.4 is located on page 55.

Table 4.4: Equipment- Traditional Classroom Results

Traditional Classroom Equipment Results (N=90)				
		Yes	**No**	**Total**
One or more computers per classroom	**%** **N**	92 83	8 7	100 90
One or more multimedia computers per classroom	**%** **N**	87 78	13 12	100 90
Projection device in the classroom	**%** **N**	84 76	16 14	100 90
One or more computers connected to a network per classroom	**%** **N**	91 82	9 8	100 90

Document Analysis: Availability of Equipment for Student and Faculty Use

The Building Room Inventory document[64] and the Facilities Inventory-Classroom and Procedures document[65] were both analyzed to determine if equipment is available for student and faculty use. Both documents revealed the presence of equipment in instructional settings for student and faculty use. The Building Room Inventory document outlines the equipment that is present in each classroom. Results from this document are consistent with those from the observation of individual instructional settings.

The Instructional Technologies web site was also analyzed to determine if equipment is available for student and faculty use. The front page of the classroom technologies web site[66] states that:

> A number of large and medium-sized classrooms have been re-engineered for multimedia, Internet, interactive conferencing and distance education. These classrooms provide data and video projection, networked computers, and many

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[64] See http://www.vpfss.txstate.edu/spacemgt/Inventory/database.htm
[65] See http://www.thecb.state.tx.us/reports/pdf/0420.pdf for the complete document.
[66] See http://www.its.txstate.edu/classroom_technologies

are equipped with video cassette players, visual presenters and other media equipment.

The site also discusses the integration and maintenance of equipment in the classroom as well as the capabilities of distance education equipment

Table 4.5 presents the findings for the component of equipment. The areas of the presence of equipment in instructional settings and the availability of equipment for student use both received strong support.

Table 4.5: Equipment Results

Equipment		
Component	**Method**	**Evidence**
Presence of equipment in instructional settings	Direct Observation*	Strong Support
Availability of equipment for student and faculty use	Document Analysis	Strong Support

*See Tables 4.2, 4.3, 4.4

Technology Applications

The third component within the model classroom technology infrastructure assessment tool is technology applications. Applications, such as educational software and classroom management programs, can enhance education in the classroom. Burns and Polman (2006, 366) find that as faculty utilize more technology applications, they develop new teaching strategies and ways to integrate technology into the classroom. Elements of technology applications within the model assessment tool include instructional application support of teaching and learning, software support in place for technology tool development, use of technology applications to improve communication, and evaluation of effectiveness for application in place. **Table 4.6**[67] depicts the results for the component of technology applications

Document Analysis: Instructional Applications Support Teaching and Learning

The Texas State Strategic Planning document was analyzed to determine if instructional applications support teaching and learning in the classroom. Analysis revealed that Instructional Technologies Support has a comprehensive plan for instructional application software in the classroom[68]. Applications are constantly assessed and upgraded when necessary. Also, new applications are researched, reviewed, and tested to determine if they could provide benefits in the classroom[69]. Technology application support courses are also offered for faculty who want to learn more about instructional software and the impact it can have on the teaching and learning environment[70].

Analysis also revealed that faculty members are dependent on applications in the classroom. These applications included Microsoft Word and PowerPoint, SPSS, BlackBoard, TRACS, My Math Lab, QuickTime media player, photography applications, and multiple web-browsers. In addition, the Texas State University "Embracing Change" 2004-2009 University Plan revealed an emphasis on providing high end technology applications. Goals include a comprehensive software update program, enhanced software procurement processes, and the development of software applications for labs[71]. Texas State University has devoted a significant amount of resources to these technology application initiatives.

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[67] Table 4.6 is located on page 61.
[68] Instructional Technologies Support Planning Document, 4, 17.
[69] Ibid., 17.
[70] A brief description of these course can be found at http://www.its.txstate.edu/sign_up
[71] Texas State University "Embracing Change" 2004-2009 University Plan, 65-66.

Direct Observation: Software Support in Place for Technology Tool Development

Direct observation was used to determine if software support is in place for classroom technology tool development. No University goals could be found identifying the type or number of applications that should be in use in individual classrooms to support tool development. The department of Instructional Technologies Support does offer many comprehensive software support courses, but these are usually attended at the discretion of the user. There are no current programs in place that provide large scale software support in the area of classroom technology tool development.

Document Analysis: Use of Technology Applications to Improve Communication

The Texas State University "Embracing Change" 2004-2009 University Plan was analyzed to find if technology applications are being used to improve communication at the University. E-mail use was one area used to ascertain if technology applications enhanced communication. Document analysis indicated that faculty should use internet applications, such as e-mail, to better communicate with students[72]. This communication occurs through access to a Texas State user e-mail account, although no official records detail the percentage of users that have active accounts[73]. Fortunately, the Texas State University has recognized this issue and is taking steps to address future procedures. University plans call for an increase of e-mail and web based applications to support communication between faculty and students. The new plan calls for a hold to be placed on student University accounts if they fail to activate and maintain a Texas State e-mail account. This procedure should be in place by the end of 2007. Analysis also outlined

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[72] Texas State University "Embracing Change" 2004-2009 University Plan, 108.

[73] No document could be found detailing the percentage of active e-mail account users. Follow up contact with the Technology Resources department confirmed this. Also, an outline of the measures to correct this issue was given. See http://www.tr.txstate.edu/ for more information.

plans for communication and information sharing processes. These plans involved a thorough investigation of communication patterns, identification of points where communication is lacking, and the implementation of appropriate changes to improve communication and information sharing[74].

Direct Observation: Use of Technology Applications to Improve Communication

Direct observation was also used to determine if technology applications are used to improve communication. The Texas State University website[75] was observed and analyzed to determine its existence served to promote communication. The site has clear links to BobcatMail[76] (e-mail accounts), BlackBoard[77] and TRACS[78] (class management and communication applications), and CatsWeb[79] (administrative services database) on the front page. A link is also provided on the front page to technology resources,[80] for assistance and support with communication tool issues. The site provides online access to reference guides and supports real time communication applications to resolve issues promptly.

Focused Interviews: Use of Technology Applications to Improve Communication

Focused interviews also served to provide information regarding the use of technology applications to improve communication. All thirteen respondents identified types of technology applications that improve communication. Each respondent identified e-mail as an essential communication tool. Other applications that were identified included BlackBoard for communication between faculty and students and a

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[74] Texas State University "Embracing Change" 2004-2009 University Plan, 65-66.
[75] http://www.txstate.edu/
[76] https://synergy.txstate.edu/exchange
[77] https://blackboard.its.txstate.edu/
[78] https://tracs.txstate.edu/portal
[79] http://catsweb.txstate.edu/catsweb/index.htm
[80] http://www.tr.txstate.edu/

new application, TRACS. TRACS consists of both course and project sites. Course sites are used for coursework, documents, and presentation and storage of course materials. Project sites are used for collaboration on research and development projects, committee work, group communication, and data storage. One respondent pointed out that this new application will, “provide multiple benefits for faculty and students.” Four respondents pointed out the use of desktop messaging applications as means of effective communication. Wireless network access across campus was also cited as being an important aspect of communication.

Document Analysis: Evaluation of Effectiveness for Applications in Place

Analysis of the Texas State Strategic Planning document was conducted to determine if technology application evaluation processes are in place. Analysis indicates a clear evaluation process. Evaluations are shown to be conducted periodically with an emphasis on needs analysis[81]. The evaluation process is revealed to be quite comprehensive, encompassing applications throughout the University. Applications that do not meet standards are either replaced or upgraded. Other applications that currently meet standards are prioritized for future assessment and possible upgrade[82].

Table 4.6 illustrates the findings for the component of technology applications. Strong support was given to the areas of teaching and learning supported by instructional applications and effective application evaluation procedures. The improvement of communication through the use of technology received varying levels of support. Software support for technology tool development received limited support.

[81] Instructional Technologies Support Planning Document, 9-10.
[82] Ibid., 9-10.

Table 4.6: Technology Applications Results

Technology Applications		
Component	**Method**	**Evidence**
Instructional applications support teaching and learning	Document Analysis	Strong Support
Software support in place for technology tool development	Direct Observation	Limited Support
Use of technology applications to improve communication	Document Analysis	No Support
	Direct Observation	Strong Support
	Focused Interview	Strong Support
Evaluation of effectiveness for applications in place	Document Analysis	Strong Support

Maintenance and Support

The fourth component within an ideal classroom technology infrastructure model is maintenance and support. Brush et al. (2003, 61) identify some support issues including help with the acquisition of classroom technology related resources, education about using technology in a classroom setting, and help resolving technical problems. Maintenance and support is an important but often overlooked area. Elements of maintenance and support within the model assessment tool include having resources and processes to maintain technology in place and having personnel who are able to provide technical support. **Table 4.7**[83] illustrates findings for the component of maintenance and support.

Document Analysis: Resources and Processes to Maintain Technology are in Place

Analysis of the Texas State Strategic Planning document was used to determine if resources and processes to maintain technology are in place at Texas State University. Maintenance and support processes are clearly outlined. Preventative maintenance and

[83] Table 4.7 is located on page 64.

repair programs for classroom technologies are described. The maintenance and repair program is conducted by identifying routine and cyclic maintenance needs and recovery strategies, diagnosing maintenance performance needs, and implementing corrective and preventative maintenance and repair[84].

The department has also established guidelines for replacing existing classroom technologies that are still functioning. This process begins with an analysis of learning needs[85]. Next, an analysis of all classroom technologies is conducted. The goal is to identify technologies that are due for replacement and those that could help to better meet learning needs. Items are then ranked and critical issues are given priority. Finally, integration of technology occurs through installation procedures and the process begins again. Analysis also revealed the existence of classroom technology support plans. This process involves the integration of all classroom technology support systems into a single location[86]. Support procedures and responses are located in a single database. Procedures are in place so that a user can resolve classroom technology issues with a single call.

Direct Observation: Resources and Processes to Maintain Technology are in Place

Direct observation was used to gain more insight into support procedures. Observation indicated that support software and technical manuals are available to end users. Manuals can be accessed online for convenience[87]. Support programs in the form of training programs are also available to users. Resources such as e-learning modules

[84] Instructional Technologies Support Planning Document, 9-10.
[85] Ibid., 10.
[86] Ibid., 11.
[87] http://www.tr.txstate.edu/training/quick-refs.html.

are available to support faculty and students with basic technology applications[88]. These modules can be accessed online and can be completed at the pace of an individual student or faculty member. In addition, technicians are available to respond to classroom technology needs. Contact numbers are posted on equipment cabinets. Technicians will respond to any classroom technology need that can not be resolved via a phone call.

Document Analysis: Personnel are Available to Provide Technical Support

The Texas State Strategic Planning document and web documents were analyzed to determine if personnel are available to provide technical support. Analysis indicates that support personnel are available to provide technical support. Support staff personnel are identified as being knowledgeable and capable in the areas of equipment usage, presentation and course management software as well as furnishing just-in-time assistance, counseling, and training.[89] Support staff members are trained to provide assistance with the use of classroom equipment, critique of presentation material format, counseling on classroom management techniques, and consultation and referral in the areas of course management and desktop software[90]. The Texas State University "Embracing Change" 2004-2009 University Plan also identified support personnel as a key area, creating and finding six new full time positions[91]. These positions are to be filled by 2008 and will deal mainly with support issues arising from around distance education programs.

Table 4.7 presents the findings for the component of maintenance and support. Texas State University showed strong levels of support in providing resources and

[88] See http://www.tr.txstate.edu/training/e-learning.html for more information.
[89] See http://www.its.txstate.edu/ for more information.
[90] See http://www.its.txstate.edu/teaching_theaters for more information.
[91] Texas State University "Embracing Change" 2004-2009 University Plan, 66.

processes to maintain technology. The University also demonstrated strong support in ensuring that personnel are available to provide technical support.

Table 4.7: Maintenance and Support Results

Maintenance and Support		
Component	**Method**	**Evidence**
Resources and processes to maintain technology are in place	Document Analysis	Strong Support
	Direct Observation	Strong Support
Personnel are available to provide technical support	Document Analysis	Adequate Support

Professional Development

The fifth component within an ideal classroom technology infrastructure model is professional development. Johnson, Schwab, and Foa (1999, 29) maintain that professional development is extremely important to unlocking the resources provided by classroom technologies. Elements of professional development within the model assessment tool are that faculty receive technology related training and/or professional development and having an evaluation processes in place for training and/or professional development. Also, goals, methods, incentives, and content of technology related training and/or professional development must be clear. **Table 4.10**[92] displays findings for the component of professional development.

Survey Research: Faculty and Staff Receive Technology Related Training

Survey research was used to determine if faculty and staff receive adequate technology related training or professional development. Survey results (see **Table 4.8**) indicate that one third of faculty members have received no technology related training or professional development within the last three years. Over seventy five percent of

[92] Table 4.10 is located on page 69.

respondents have received six or fewer hours of training or development in the past three years. The numbers of those receiving training was quite low, although six of the thirty-three respondents did report receiving ten or more hours of technology training or professional development in the past three years.

Table 4.8: Professional Development- Faculty Survey Results I

Faculty Survey Results (N=33)								
		Hours of Training						
Question:		**0**	**1-3**	**4-6**	**7-9**	**10+**	**Total**
1. How many hours of technology related training or professional development have you received in the past three academic years?	**%**	33%	30%	15%	3%	18%	100%
	N	11	10	5	1	6	33

Focused Interviews: Faculty and Staff Receive Technology Related Training

Focused interviews were another method used to determine how many hours of professional development and technology training staff received per academic year. Results varied by position. Professional development and training programs were identified as both formal and informal processes. These processes ranged from technology workshops and conferences to browsing the internet and reading journal articles. Respondents whose positions required direct classroom support cited a high number of hours spent on technology training each year. One respondent stated that he had “attended so many workshops and seminars that it was hard to gauge how many hours per year, but that the number was high”. Respondents stated that they took much of the initiative in professional development and training programs because they were vital to the function of their jobs. Other respondents whose job duties did not put them in direct contact with classroom technology on a daily basis cited a lower number of hours devoted each year to professional development. On average, respondents indicated that they spent over forty hours per year on technology training and professional development.

Survey Research: Goals, Methods, Incentives, and Content are Clear

Survey research was used to determine if goals, methods, content, and incentives of technology training and professional development programs are clear. Surveys of faculty members were used to determine if content areas are adequately covered in training (see **Table 4.9**). Two thirds of faculty members indicated that technology content was adequately covered in training. Only thirty percent of respondents indicated that they received some type of incentive for completing technology related training programs. Twenty-three of thirty-three respondents indicated receiving no incentives for completing technology related programs.

Table 4.9: Professional Development- Faculty Survey Results II

Faculty Survey Results (N=33)			
Question:		**Yes**	**No**
2. Do you feel that technology related content areas are adequately covered in training?	**%**	67%	33%
	N	22	11
3. Are you provided incentives for completing technology related training programs?	**%**	30%	70%
	N	10	23

Document Analysis: Goals, Methods, Incentives, and Content are Clear

Brochures[93], fliers, and other department publications[94] were analyzed to determine if goals, methods, and content for technology training programs existed. The

[93] See http://www.tr.txstate.edu/training/brochures.html for sample brochures.
[94] A brief description of individual courses can be found at http://www.its.txstate.edu/sign_up

programs included courses in adding media to PowerPoint presentations, creating educational videos, using screen capture software, tips and tricks for teaching interactive classes, and effectively using media cabinets. Other course topics included creating and delivering online courses, introduction to podcasting, and creating survey and assessment programs with technology applications[95]. Also, content and methods for courses are clearly identified. For example, the course pertaining to the creation and delivery of online classes presented a variety of content and methods. They included teaching and learning online, instructional design planning, web-based instructional strategies, community building, facilitating discussion forums, writing for the web, assessment strategies, copyright, evaluation, and TRACS tools. The goal of the course is the completion of one class unit or topic. Other training and development courses are described and outlined in a similar fashion.

Direct Observation: Evaluation Processes in Place for Training

Direct Observation was used to determine if evaluation processes were in place for training and professional development. Observation revealed clear and accurate evaluation procedures. Staff evaluations are conducted on a yearly basis with professional development being a component within the evaluation tool. The evaluation process also gives the employee the opportunity to plan career development procedures, such as workshops and conferences, for the upcoming year. The employee will be judged on these criteria during the next evaluation. Evaluation measurement can come in the form of questions, tests, or employee demonstrations. In addition, training analysis procedures are used for faculty members who have undergone professional development

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[95] See http://www.its.txstate.edu/sign_up and http://www.tr.txstate.edu/training.html for further information.

classes. This type of evaluation tool is designed to measure knowledge gained in the use of specialized tools and processes. These evaluations are conducted periodically when faculty and staff have completed technology training classes.

Focused Interview: Evaluation Processes in Place for Training

Focused interviews were used to determine if evaluation processes are in place for training. Responses indicated that attention is given to evaluation of training. Staff members who have subordinates beneath them attend evaluation training classes or workshops. These classes or workshops usually last from one to four hours and are an ongoing process. Respondents pointed out that the training programs provide key skills needed to conduct thorough evaluations. One respondent indicated that, "The evaluation classes do consume a lot of time but help when evaluations are conducted."

Table 4.10[96] illustrates the overall findings for the component of professional development. Overall, staff received adequate training while faculty received limited training. The goals, methods, and incentives of technology training were clearly stated in most cases but were lacking for some faculty members. Adequate support was provided in the area of the training evaluation process.

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[96] Table 4.10 is located on page 69.

Table 4.10: Professional Development Results

Professional Development		
Component	**Method**	**Evidence**
Faculty and staff receive technology related training and/or professional development	Survey*	No Support
	Focused Interview	Adequate Support
Goals, methods, incentives, and content of technology related training and/or professional development for staff are clear	Document Analysis	Strong Support
	Survey°	Limited Support
Evaluation processes in place for training and/or professional development	Direct Observation	Adequate Support
	Focused Interview	Adequate Support

*See Table 4.8
°See Table 4.9

Technology Integration

Technology integration is the sixth and final component within the model assessment tool. Classroom technology integration can affect the way faculty teach and the ways students learn. Christensen (2002, 431) finds that the proper integration of technology in the classroom tends to positively influence the attitudes of faculty. Debevec et al. (2006, 304) find that most students integrate technology into class preparation and studying. Elements of technology integration within the model assessment tool are technology integration into the teaching/learning environment, incorporation of technology proficiencies and measures into classroom learning standards, incorporation of technology into administrative processes, and integration of technology proficiency into faculty evaluation. **Table 4.16**[97] illustrates the findings for the component of technology integration.

[97] Table 4.16 is located on page 75.

Survey Research: Technology is Integrated into the Teaching/Learning Environment

Survey research was used to determine if technology is integrated into the teaching and learning environment. Evidence of technology integration was found using survey research. Both faculty members and students were surveyed in order to obtain technology integration information. Each of the thirty-three faculty members surveyed (see **Table 4.11**) indicated that they felt adequately equipped to incorporate technology into the classroom.

Table 4.11: Technology Integration- Faculty Survey Results I

Faculty Survey Results (N=33)			
Question:		**Yes**	**No**
1. Do you feel equipped to adequately incorporate technology into the classroom?	**%**	100%	0%
	N	33	0

Student survey data (see **Table 4.12**) revealed that technology is incorporated into a large number of classes throughout Texas State University. Sixty-nine percent of respondents indicated that four or more classes that they had taken at Texas State University had integrated technology into the classroom. Over one third of those surveyed identified that technology had been integrated into ten or more classes they had taken at Texas State.

Table 4.12: Technology Integration- Student Survey Results I

Student Survey Results (N=302)						
Question:		**0**	**1-3**	**4-6**	**7-9**	**10 +**
1. How many courses have you taken at Texas State University that utilized some form of technology in the classroom?	**%**	7%	25%	19%	15%	34%
	N	22	74	56	46	104

Document Analysis: Technology is Integrated into the Teaching/Learning Environment

The Texas State University "Embracing Change" 2004-2009 University Plan was analyzed to determine if technology is implemented into the teaching and learning environment. Texas State University has made a commitment in this area. The University strategic plan states that, "Providing instructional technology programs that allow faculty to appropriately integrate technology into the teaching and learning process" is currently an area of importance[98]. The document also indicates that this will be an area of emphasis in the coming years.

Survey Research: Technology Proficiencies are Incorporated into Learning

Survey research was used to determine if technology proficiencies are incorporated into learning standards. Survey research (see **Table 4.13**) revealed that the incorporation of technology proficiency into the classroom was quite low.

Table 4.13: Technology Integration- Student Survey Results II

Student Survey Results (N=302)						
Question:		**0**	**1-3**	**4-6**	**7-9**	**10 +**
2. In how many of your classes at Texas State University have you been tested over technology proficiency?	**%** **N**	64% 194	29% 88	5% 14	1% 4	1% 2
3. How many courses have you taken at Texas State University that included training or instruction in the use classroom technology or computer based technology?	**%** **N**	59% 178	32% 96	7% 22	1% 2	1% 4

Sixty-four percent of respondents replied that they had never been tested over technology proficiency in the classroom. Only seven percent of respondents reported that they had

[98] Texas State University "Embracing Change" 2004-2009 University Plan, 65.

been tested over technology proficiency in four or more classes. Also, almost sixty percent of respondents reported that they had never taken a class that had included training or instruction in the use of classroom or computer based technologies. Furthermore, less than one out of ten respondents indicated that they had taken four or more classes in which training or instruction of classroom technologies had occurred.

Document Analysis: Technology Proficiencies are Incorporated into Learning

Evidence of technology proficiencies and measures being incorporated into classroom learning standards is somewhat supported through document analysis. Web site content[99] of each of the seven colleges at Texas State University was analyzed to determine if technology proficiency was incorporated into classroom learning standards (**see Table 4.14**).

Table 4.14: Technology Integration- Analysis of College Proficiency Standards

Analysis of College Proficiency Standards		
Component	**College**	**Evidence Supported**
Technology proficiencies and measures are incorporated into classroom learning standards: *Adopted standards in place for technology proficiency in each department*	Applied Arts	No
	Business Administration	Yes
	Education	Yes
	Fine Arts/ Communication	No
	Health Professions	Yes
	Liberal Arts	Yes
	Science	Yes

[99] Individual College Web Sites:
Applied Arts: http://www.txstate.edu/appliedarts/
Business Administration: http://www.business.txstate.edu/
Education: http://www.education.txstate.edu/
Fine Arts/ Communication: http://www.finearts.txstate.edu/
Health Professions: http://www.health.txstate.edu/
Liberal Arts: http://www.liberalarts.txstate.edu/
Science: http://www.science.txstate.edu/

The colleges analyzed included applied arts, business administration, education, fine arts and communication, health professions, liberal arts, and science. Five of the seven colleges have some type of technology proficiency standards in place. These included the 2004-2009 college plan for the college of business administration, the college technology strategic plan for the college of education, the policies and procedures for the college of health professions, the 2004-2012 academic plan for the college of liberal arts, and the strategic plan for the department of science. The colleges of applied arts and fine arts and communication had no reference to technology proficiency standards.

Focused Interviews: Technology is Incorporated into Administrative Processes

Focused interviews were used to find if technology is incorporated into administrative processes. The interview data revealed that a great deal of technology is incorporated into administrative processes, ranging from planning to accounting to assessment procedures. Each of the thirteen individuals interviewed indicated that technology was incorporated into administrative processes. The bulk of responses revolved around computer technology and software applications. Most respondents identified communication tools, such as e-mail and real time calendars, as crucial to administrative processes. One individual responded that "without e-mail she would be lost". Technology applications such as accounting software, inventory programs, and assessment applications were also identified as being important pieces of technology in the administrative process.

Survey Research: Technology Proficiency is Integrated into Faculty Evaluation

Survey research was used to determine if technology proficiency is integrated into faculty evaluations (see **Table 4.15**).

Table 4.15: Technology Integration- Faculty Survey Results II

Faculty Survey Results (N=33)			
Question:		**Yes**	**No**
2. Are you required to demonstrate proficiency in the usage of technology in the classroom?	**%** **N**	12% 4	88% 29
3. Are technology proficiency and technology integration components within your annual faculty assessment?	**%** **N**	18% 6	82% 27

Results indicate that only twelve percent of respondents are required to demonstrate proficiency in the use of classroom technologies. Twenty-nine of the thirty-three respondents report that they are not required to demonstrate proficiency. Survey results also revealed that technology integration and proficiency are not components of annual assessments for over eighty percent of respondents. Only six of the thirty-three faculty members indicate that these components are included in their annual evaluations.

Table 4.16 presents the overall findings for the component of technology integration. Technology integration is strongly supported in the areas of integration into the teaching and learning environment and incorporation into administrative processes. However, the area of incorporating technology proficiencies into classroom learning standards received limited support and the area of integration of technology proficiency into the faculty evaluation process received no support.

Table 4.16: Technology Integration Results

Technology Integration		
Component	**Method**	**Evidence**
Technology is integrated into the teaching/learning environment	Survey (1)	Strong Support
	Document Analysis	Adequate Support
	Survey(2)	Strong Support
Technology proficiencies and measures are incorporated into classroom learning standards	Survey(2)	Limited Support
	Document Analysis	Limited Support
Technology is incorporated into administrative processes	Focused Interview	Strong Support
Technology proficiency is integrated into faculty evaluation	Survey (1)	No Support

Chapter Summary

This chapter provided data from document analysis, direct observation, focused interviews, and survey research to assess classroom technology infrastructure at Texas State University. Classroom technology infrastructure was shown to meet or exceed goals in four of the six components. Two components, professional development and technology infrastructure, could use some work – mainly in the area of faculty and student technology training. The next chapter will offer conclusions and recommendations pertaining to the improvement of classroom technology infrastructure at Texas State University.

Chapter V: Conclusions and Recommendations

Chapter Purpose

The purpose of this research was threefold. First, was to establish a practical ideal model to assess current classroom technology infrastructure. The second purpose was to assess current classroom technology infrastructure at Texas State University. The third purpose is to provide recommendations for improving classroom technology infrastructure at Texas State University.

Chapter 2 presented the ideal components of a model assessment tool to gauge classroom technology infrastructure at Texas State University based on a review of the literature. **Chapter 3** outlined the methodology used to conduct research of classroom technology infrastructure at Texas State University. **Chapter 4** presented the results of the case study based on data from document analysis, direct observation, focused interviews, and survey research. The purpose of this chapter is to present conclusions for this research project and to make recommendations for improving classroom technology infrastructure at Texas State University.

Recommendations

The model assessment tool for this case study consists of six ideal components of classroom technology infrastructure. These concepts are developed through the literature and presented in the conceptual framework. **Table 5.1** identifies the six major components, pertinent elements within each component, whether or not the evidence supports each element, and recommendations.

Table 5.1: Recommendations

Technology Planning and Policies		
Component	**Evidence**	**Recommendations**
Clear technology plan and policies in place	**Adequate Support**	A clear technology plan was identified and in place but some employees could not identify plans. More focus should be given to providing plans and policies to staff members.
Implementation of plan	**Strong Support**	Continue with current implementation procedures.
Evaluation of plan	**Strong Support**	Continue with current plan evaluation process.
Equipment		
Presence of equipment in instructional settings	**Strong Support**	Continue to ensure that equipment is present in instructional settings.
Availability of equipment for student and faculty use	**Strong Support**	Continue to ensure that equipment is available for student use.
Technology Applications		
Instructional applications support teaching and learning	**Strong Support**	Continue using current instructional applications for teaching and learning
Software support in place for technology tool development	**Limited Support**	Texas State University does not currently have a classroom software support tool goal in place, although ITS offers many comprehensive courses. The University should institute a program where software support tools and resources are presented on a large scale, such as a large survey or university seminar class. Online training classes could also be used for students who do not have access to large survey classes.
Use of technology applications to improve communication	**Adequate Support**	The University has multiple applications in place that support communication. Attention should be given to following through with the plan requiring all students to activate and maintain a Texas State e-mail account or a personal e-mail account.
Evaluation of effectiveness for applications in place	**Strong Support**	Continue with current technology application evaluation plan.

Table 5.1: Recommendations

Maintenance and Support		
Component	**Evidence**	**Recommendations**
Resources and processes to maintain technology are in place	**Strong Support**	Continue to ensure that resources and processes to maintain technology are in place.
Personnel are available to provide technical support	**Adequate Support**	Continue to ensure that personnel are available to provide technical support.
Professional Development		
Faculty and staff receive technology related training and/or professional development	**Limited Support**	Staff is shown to receive adequate training. The issue lies with faculty members, where training and development seems to be non existent. Training programs should be introduced by all colleges who do not currently have a system in place.
Goals, methods, incentives, and content of technology related training and/or professional development for staff are clear	**Adequate Support**	Continue with current structure of technology training programs. More emphasis should be placed on providing incentives for faculty members who complete technology training classes.
Evaluation processes in place for training and/or professional development	**Adequate Support**	Again, strong evaluation systems are in place for staff and faculty members who took training courses. More emphasis must be given to each college strengthening their evaluation procedures for faculty members.
Technology Integration		
Technology is integrated into the teaching/learning environment	**Strong Support**	Continue to ensure that technology is integrated into the teaching and learning environment.
Technology proficiencies and measures are incorporated into classroom learning standards	**Limited Support**	The number of students who have received technology training in class or had been tested over technology proficiency were low. Also, only 5 of 7 individual colleges have technology proficiency standards in place. Emphasis should be given to increasing technology training and proficiency. Colleges that have not adopted technology standards must look to do so.
Technology is incorporated into administrative processes	**Strong Support**	Continue to ensure that technology is incorporated into administrative processes.
Technology proficiency is integrated into faculty evaluation	**No Support**	Most faculty members are not required to demonstrate proficiency in the classroom. Also, in many cases proficiency is not a part of the faculty evaluation process. Emphasis should be placed on integrating technology proficiency into faculty evaluations.

Technology Planning and Policy Recommendations

Technology plans and policies are important to the success of any classroom technology program. Texas State University is currently succeeding in this area. Clear plans and policies are in place, implementation strategies are clearly laid out, and plan evaluation is taking place. One area that could be strengthened within this component is employee knowledge of plans and procedures. Many staff members were able to identify major plans and policies, but some were not. However, in most cases the staff members who could not identify departmental plans and policies stated that they could easily find this information in department documents. It is recommended that staff members meet together on a regular basis, either monthly or bi-monthly, to discuss the current status of departmental plans and polices.

Equipment Recommendations

Equipment is one of the most essential components to the success of a classroom technology program. A university must have the proper equipment in place for learning with the use of technology to occur. Texas State University is also succeeding in this area. The University has outfitted all of its teaching theaters, and the bulk of its lecture halls and traditional classrooms, with computers, projection devices, and network connections. Texas State University has taken steps to provide faculty, staff, and students with access to technology. It is recommended that the University continue with current equipment practices. Texas State University should also focus on identifying future equipment needs in order to provide the best possible resources for teaching and learning in the classroom.

Technology Applications Recommendations

The component of technology applications is another vital area within the model assessment tool. Texas State University is successful in three of the four areas of the technology applications component, with the only deficiency coming in the area of software support for technology tool development. Applications such as SPSS, PowerPoint, BlackBoard, TRACS, My Math Lab, QuickTime media player, and multiple web-browsers are employed by Texas State University in the support of teaching and learning. The University also has effective technology applications evaluation processes in place. Communication using technology applications could be strengthened by following through with the current plan requiring all students to activate and maintain Texas State e-mail accounts.

The technology applications component is weak in the area of software support programs for technology tool development. Developing software support programs are critical. The benefits of classroom software can not be fully utilized if students and faculty members are not properly trained. Texas State University does not currently have a classroom software support tool goal in place, although the department of Instructional Technologies Support offers many comprehensive courses. It is recommended that Texas State University institute a program where software support tools and resources are presented on a large scale. For students, this could take place by devoting time in a large survey class or mandatory University seminar class to discuss the proper uses of technology applications such as BlackBoard or TRACS. Online training programs could be substituted for students who do not have access to large survey classes. Faculty members could be presented software support information during mandatory training days or be required to take software training classes.

Maintenance and Support Recommendations

Maintenance and support is another focal area for any classroom technology program. Texas State University is very successful in the area of maintenance and support. The University has identified key themes regarding maintenance and support and has provided the proper resources to keep this area strong. Resources and processes to maintain technology are clearly in place. An adequate amount of personnel are available to provide technical support. It is recommended that Texas State University continue to provide resources and support processes to maintain high levels of classroom technology maintenance and support. Texas State University should continue to keep knowledgeable support personnel in place to provide technical support.

Professional Development Recommendations

Professional development is crucial to classroom technology programs. Texas State University has some flaws in the component of professional development. Training programs are the first main issue. While staff members receive adequate classroom technology training faculty do not. Faculty training and development seems to be non existent. It is recommended that mandatory training programs be introduced by all colleges who do not currently have a system in place. While goals, methods, and content of technology programs are shown to be clear, there is an issue with incentives. In most cases faculty are not provided incentives for completing technology training. It is recommended that more emphasis be placed on providing incentives, such as monetary rewards or time off, for faculty members who complete technology training classes.

Providing incentives should entice faculty members into expanding their knowledge of classroom technology.

An issue also exists with current faculty evaluation procedures. Strong evaluation systems are in place for staff and faculty members who took training courses, but the number of faculty members taking training courses is quite low. As a result, a large amount of faculty members are not being evaluated over classroom technology. It is recommended that more emphasis be given to each college in strengthening their evaluation procedures for faculty members.

Technology Integration Recommendations

Technology integration is the final element of a classroom technology program. Texas State University showed weaknesses in this area when compared to the model assessment tool. Technology is shown to be integrated into the teaching and learning environment and is shown to be incorporated into administrative processes. It is recommended that Texas State University continue with its support in regards to both of these areas.

Issues do exist within two areas of the technology integration component. Technology proficiencies and measures are not incorporated into classroom learning standards. Also, technology proficiency is not integrated into the faculty evaluation process. The number of students who have received technology training in class or have been tested over technology proficiency were surprisingly low. Only five of seven individual colleges had technology proficiency standards in place. It is recommended that focus be given to increasing technology training. In addition, emphasis must be placed on establishing technology proficiency levels in individual colleges. In addition, colleges that have not adopted any type of technology standards must do so as soon as possible. This could be accomplished by establishing a basic test to evaluate technology proficiency.

Technology proficiency is not currently integrated into the faculty evaluation process. Most faculty members are not required to demonstrate proficiency in the classroom. It is recommended that attention should be focused on integrating technology proficiency into faculty evaluations. This could take place by simply adding technology proficiency to existing evaluation tools.

Conclusion

Classroom technologies are revitalizing teaching and learning in universities across the nation. Due to the heightened use of classroom technologies, it is vital that administrators have some tool to evaluate existing programs. Unfortunately, there is no single agreed upon assessment tool for higher education. This research is an attempt to fill this void. First, a model assessment tool was developed after a thorough review of the existing literature regarding classroom technology infrastructure. Next, classroom technology infrastructure at Texas State University was compared to the model assessment tool. Finally, results and recommendations were presented.

Overall, classroom technology infrastructure at Texas State University is strong in many areas. Texas State University is quite successful in the components of technology planning and policies, equipment, technology applications, and maintenance and support when compared to the model assessment tool. The University has clear technology plans and policies in place. Plans and policies have been properly implemented and evaluated. Equipment is present in a majority of instructional settings and is readily available for use by students, faculty, and staff. Texas State University is strong in the component of technology applications, but could improve this component even more with the establishment of a software support tool learning program for students and faculty members. Texas State University is also achieving success in the component of maintenance and support

The components of professional development and technology integration reveal success in some areas, but are clearly lacking in others. Training and development for staff members is adequate, but training for faculty is virtually non existent. Training in classroom technology is usually not mandatory for faculty members, with only those who are interested in the subject obtaining any type of training. Evaluation of technology training for faculty members is also lacking. While technology is successfully integrated into the classroom and administrative processes, this component is lacking in the areas of proficiency measurement and faculty integration evaluation. These areas should be addressed in order to strengthen overall classroom technology infrastructure at Texas State University.

Although the classroom technology infrastructure at Texas State University is quite strong as a whole, there are some areas that can be improved. Classroom technology infrastructure could be strengthened by implementing software support training programs, instituting mandatory faculty training programs, creating new faculty evaluation procedures, and ensuring that technology proficiencies and measures are incorporated into classroom learning standards. Texas State University can use the recommendations provided in this research to strengthen and develop classroom technology infrastructure in the future. Overall, this research has shown the importance of classroom technology, developed a model assessment tool to evaluate classroom technology infrastructure, presented results concerning Texas State University's classroom technology infrastructure, provided recommended solutions to problematic issues, and paved the way for future research on classroom technology infrastructure.

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Appendix A

Focused Interview Questions

1. Describe the current planning and policy making process at Texas State.

2. What processes are you using to determine whether the current plan is achieving its goals?

3. What tools are available to aid instructional staff in regards to support and communication issues?

4. How many hours do you spend, per academic year, on professional development (training)?

5. What type of training do you receive in regards to evaluating proficiency in support staff?

6. What types of technology are incorporated into administrative processes?

Appendix B

Faculty Survey Instrument

Please circle the best response to the following items:

1) How many years have you taught at Texas State University? (* control)

a) less than one year b) 1-3 c) 4-6 d) 7-9 e) 10 or more

2) How many courses are you teaching in the current semester? (* control)

1) 1 2) 2 3) 3 4) 4 5) 5 or more

3) How many hours of technology related training or professional development have you received in the past three academic years?

a) 0 b) 1-3 c) 4-6 d) 7-9 e) 10 or more

4) Do you feel that technology related content areas are adequately covered in training?

a) yes b) no

5) Are you provided incentives for completing technology related training programs?

a) yes b) no

6) Do you feel equipped to adequately incorporate technology into the classroom?

a) yes b) no

7) Are you required to demonstrate proficiency in the usage of technology in the classroom?

a) yes b) no

8) Are technology proficiency and technology integration components within your annual faculty assessment?

a) yes b) no

Appendix C

Student Survey Instrument

Please circle the best response to the following items:

1) What is your current classification? (* control)

a) Freshman b) Sophomore c) Junior d) Senior

2) Which category does you current estimated GPA fall into? (* control)

a) 0-.9 b) 1.0-1.9 c) 2.0-2.9 d) 3.0-4.0

3) How many courses have you taken at Texas State University that utilized some form of technology in the classroom? (ex. Computers, Projection Screens, Online courses, Blackboard, My Math Lab) (* control)

a) 0 b) 1-3 c) 4-6 d) 7-9 e) 10 or more

4) In how many of your classes at Texas State University have you been tested over technology proficiency?

a) 0 b) 1-3 c) 4-6 d) 7-9 e) 10 or more

5) How many courses have you taken at Texas State University that included training or instruction in the use classroom technology or computer based technology?

a) 0 b) 1-3 c) 4-6 d) 7-9 e) 10 or more

Appendix D

Faculty Survey Data
(N=33)

1) How many years have you taught at Texas State University?

a) less than one year	**(0):**	**0%**
b) 1-3	**(6):**	**18%**
c) 4-6	**(0):**	**0%**
d) 7-9	**(6):**	**18%**
e) 10 or more	**(21):**	**64%**

2) How many courses are you teaching in the current semester?

1) 1	**(6):**	**18%**
2) 2	**(15):**	**46%**
3) 3	**(2):**	**6%**
4) 4	**(4):**	**12%**
5) 5 or more	**(6):**	**18%**

3) How many hours of technology related training or professional development have you received in the past three academic years?

a) 0	**(11):**	**33%**
b) 1-3	**(10):**	**30%**
c) 4-6	**(5):**	**15%**
d) 7-9	**(1):**	**3%**
e) 10 or more	**(6):**	**18%**

4) Do you feel that technology related content areas are adequately covered in training?

a) yes	**(22):**	**67%**
b) no	**(11):**	**33%**

5) Are you provided incentives for completing technology related training programs?

a) yes	**(10):**	**30%**
b) no	**(23):**	**70%**

6) Do you feel equipped to adequately incorporate technology into the classroom?

a) yes	**(33):**	**100%**
b) no	**(0):**	**0%**

7) Are you required to demonstrate proficiency in the usage of technology in the classroom?

a) yes	**(4):**	**12%**
b) no	**(29):**	**88%**

8) Are technology proficiency and technology integration components within your annual faculty assessment?

a) yes	**(6):**	**18%**
b) no	**(27):**	**82%**

Appendix E
Student Survey Data
(N=302)

1) What is your current classification?

a) Freshman **(90): 30%**
b) Sophomore **(106): 35%**
c) Junior **(78): 26%**
d) Senior **(28): 9%**

2) Which category does you current estimated GPA fall into?

a) 0-.9 **(2): 0%**
b) 1.0-1.9 **(12): 4%**
c) 2.0-2.9 **(156): 52%**
d) 3.0-4.0 **(132): 44%**

3) How many courses have you taken at Texas State University that utilized some form of technology in the classroom? (ex. Computers, Projection Screens, Online courses, Blackboard, My Math Lab)

a) 0 **(22): 7%**
b) 1-3 **(74): 25%**
c) 4-6 **(56): 19%**
d) 7-9 **(46): 15%**
e) 10 or more **(104): 34%**

4) In how many of your classes at Texas State University have you been tested over technology proficiency?

a) 0 **(194): 64%**
b) 1-3 **(88): 29%**
c) 4-6 **(14): 5%**
d) 7-9 **(4): 1%**
e) 10 or more **(2): 1%**

5) How many courses have you taken at Texas State University that included training or instruction in the use classroom technology or computer based technology?

a) 0 **(178): 59%**
b) 1-3 **(96): 32%**
c) 4-6 **(22): 7%**
d) 7-9 **(2): 1%**
e) 10 or more **(4): 1%**