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SCHOOLS AS LEARNING ORGANIZATIONS: RELATIONSHIPS BETWEEN PROFESSIONAL LEARNING COMMUNITIES AND TECHNOLOGY-ENRICHED LEARNING ENVIRONMENTS

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TECHNOLOGY-ENRICHED LEARNING ENVIRONMENTS

A Dissertation APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY STUDIES

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ABSTRACT

During the last decade there has been a significant increase in the availability of technology in schools; unfortunately, research indicates the integration of technology in the teaching and learning process has been minimal (Becker, 2001). Cuban (2001) reports professional development is as crucial for technology integration as access to the equipment. Effecting change in schools as learning organizations involves developing collaborative relationships and a shared vision of the desired results. Research has identified that professional learning communities provide teachers collaborative and supportive environments for on-going learning (Hord, 1997; Kruse, Louis, & Byrk, 1995). Professionally engaged teachers are more likely to integrate constructivist computer applications (Becker & Riel, 2000) and are more likely to be supported in the learning environment of a professional learning community.

This quantitative study's purpose was to investigate the empirical relationship between professional learning communities and the integration of technology in the teaching and learning process. Data sources included two pre- and post- survey instruments for 218 teachers, cross-sectional survey instruments for 23 administrators, and grant documentation. These data were analyzed using correlational analysis to describe the nature of the relationships.

The findings of this study demonstrated a medium correlation between the characteristics of professional learning communities and the factors of technology integration. All five dimensions of professional learning communities exhibited significant positive relationships with six of the nine factors of technology integration. The dimension of peer review and feedback indicated significant positive relationships with four factors that influenced incorporating technology, including teachers' instructional use of technology, sharing best technology practices, students' use of technology, and positive beliefs towards technology use. Results illustrated the effect of combining professional learning communities and integrating technology to increase teachers' peer interactions. Relationships with the greatest correlation coefficients were between the technology integration factor of support teachers received for using technology and the five dimensions of professional learning communities, demonstrating effects of staff's interconnections on supportive conditions for technology integration. This study's findings provided valuable information for preparation programs and school leaders as they address the integration of technology in the teaching and learning process to impact student achievement.

CHAPTER ONE

Introduction to the Study

Research has documented the positive impact of technology on student achievement in the areas of content in academic subjects, development of higher-order thinking skills, and the application of a deeper knowledge of content and thinking processes to develop the skills necessary in the workforce and future careers (Cradler, McNabb, Freeman, & Burchett, 2002). To be most effective in increasing student performance, technology must be integrated in the articulated curriculum and assessments (CEO Forum, 2001; Cradler et al., 2002). Numerous studies provided evidence that when students utilize technology tools to apply content knowledge and problem-solving processes, higher-order thinking skills are developed and achievement increased (Cradler et al., 2002; Schacter, 1999). Technologies offer students a variety of ways to transfer their learning to contexts in the real world, thus beginning their preparation for the technological demands of the workforce (Cradler et al., 2002; Roschelle, Roy, Hoadley, Gordin, & Means, 2000).

The focus on the use of technology to impact learning accelerated when *A Nation at Risk* (1983) recommended computer science be a core subject in order that high school graduates would understand the potential role of computers to obtain information, facilitate communication, and support learning, as well as use the computer for personal study and work related purposes (Culp, Honey, & Mandinach, 2003). In the early 1980s, schools were not equipped to achieve these recommendations. Due to federal funding during the last decade, there has been significant progress in providing the infrastructure including hardware, software, and access to the Internet to the majority of schools

(National Center for Education Statistics [NCES], 2000; Roberts, 2000); however, research indicates the impact of technology on teaching and learning process has been minimal (Becker, 2001; Cuban, 2001). Though many teachers have developed technology skills, most of these teachers use technology for personal tasks but have not changed their teaching practices or integrated technology in their classrooms (Cuban, 2001). For technology to be used effectively in the teaching and learning process, the focus must be on promoting the integration of technology in content and pedagogy rather than learning technology skills in isolation (Ross, McGraw, & Burdette, 2003). Technology integration is using technology as a tool in a meaningful way to meet curriculum and assessment objectives to impact student success (Cradler et al., 2002).

Middleton and Murray (1999) found "the need for teacher inservice and staff development programs on the implementation of technology in the classroom is as crucial as the actual purchase of technology" (p. 4). Through collaborative processes and sharing instructional practices, teachers were more successful in using computers for student learning (Becker & Riel, 2000). Kruse, Louis and Bryk (1995) established that professional learning communities provided opportunities for teachers through collective reflection to develop standards and expectations and formulate action plans. Professional learning communities, as described by Hord (1997), involved stakeholders working in collaborative efforts to develop shared vision and supportive leadership while sharing their collective learning and its applications to inform their personal practices. Although literature supports the use of collaboration, a clear empirical link between professional learning communities and technology integration for teaching and learning has not been shown. The focus of this study was to investigate the relationship between professional learning communities and technology integration.

Background of the Problem

The importance of technology innovation in the economic, social, and political presence of the United States emphasized the necessity of increasing the technological literacy of today's workforce (Culp et al., 2003). This importance was supported by the estimate that "of the 54 jobs expected to experience the most significant growth between now and 2005, only eight do not require technological fluency" (U. S. Department of Labor, 2000). Technology supports the development of the necessary workforce skills, such as, adapting to change, decision-making, and problem-solving strategies through learning to apply content using word processing, spreadsheets, and drawing programs (Cradler et al., 2002).

Technology: National Perspective

Since the early 1980s, there has been a focus to increase the availability and access to hardware, software, and infrastructure in schools. The premise was that technology in schools would produce the same increase in productivity as technological advances made in businesses (Cuban, 2001). During the Clinton administration educational technology goals promoted connecting all classrooms to the Internet, providing modern computer access, developing engaging educational software, and training teachers to assist students (Cuban, 2001; Roberts, 2000). The assumption made by the policy makers was that computers and access to the Internet in classrooms would be effectively implemented (Cuban, 2001). One of the programs to accomplish these goals was Education-rate (e-rate). More than 80,000 schools and libraries have received subsidies for telecommunications services and Internet connectivity (Roberts, 2000). Internet access in classrooms increased rapidly going from three percent in 1993 to 98 percent in 2000 (Becker, 2001).

By 1999 computers were more available; 99 percent of teachers had access to computers somewhere in the school and 84 percent in the classroom (NCES, 2000). Teachers were more likely to use the computers located in their rooms (Becker, 2001). The number of computers in classrooms varied from 84 percent with at least one computer, 36 percent with only one computer, 38 percent with two to five computers, and 10 percent with more than five computers in their classrooms (NCES, 2000). Again, the use increased as teachers had more computers in their rooms and access to the Internet. In this report from 1999, the distribution of computers and access to the Internet was not equitable among (NCES, 2000). In schools with lower minority enrollments, teachers were more likely to have Internet access than teachers in schools with higher minority enrollment. In public schools, the ratio of students to instructional computers with Internet access was 5.4 to 1 with variation by school characteristic (NCES, 2000).

In a 1998 study of computer use in schools, only computer and business teachers reported students using computers at least 20 times in 30 weeks (Becker, 2001). This large-scale study provided data from teachers' perspectives of the factors influencing the integration of technology. In this study, a few secondary teachers were utilizing computers for word-processing, some provided lower-ability students content-related drills or computer games, and, even more rarely, a constructivist-type project using computer software was assigned. Becker (2001) and NCES (2000) reported teachers were more likely to use the computers when they were accessible in the classroom.

Only one-third of teachers reported in 1999 that they felt prepared to use computers for classroom instruction, and the less experienced teachers felt more confident than their more experienced peers (NCES, 2000). Increasing the amount of professional development teachers attended increased the feeling of preparedness to use computers and the Internet (Becker, 2001). In *Education Week's* Technology Counts 2001, three-fourths of teachers reported using technology in planning, teaching, or for emails. Currently, a majority of the states have Internet access for students, and students reported having computer assignments (Becker, 2001).

It has taken an investment of more than $40 billion in federal funds plus monies from the states and districts to provide computers and connect classrooms to the Internet, but has this investment created learning situations for students? The Benton Foundation report, *Edtech* (2003), identified strategies that successful districts used to implement technology. These schools have a clear vision of the role of technology and provided relevant professional development that transcended basic technology skills.

The Bill and Melinda Gates Foundation Leadership Grant initiative provided funding for each state to provide professional development for school leaders utilizing technology leadership to improve student achievement. A requirement of the initiative was that each school's principal and teachers take an on-line technology survey, *Taking a Good Look at Technology* (TAGLIT) (Cory, 2004). The primary focus of the instrument was to ask questions regarding the extent to which technology impacted the classroom (Fouts, 2003). The data informed the technology planning process. At the state level and school level, only 5.1 percent and 2.04 percent, respectively, of the technology expenditures were spent on professional development. Nationally, state-wide and within schools, the expenditures for technology hardware and software far exceeded the percentage spent for professional development (Cory, 2004). CEO Forum (2001) recommended 30 percent of technology funding should be used for professional development. Considering these discrepancies in funding between technology equipment and professional development, schools have been faced with identifying alternatives in preparing teachers to effectively integrate technology to impact student achievement.

Professional Development and Change

In the NCES report (2000), teachers reported that independent practice, professional development activities and the less experienced teachers helped them prepare to use technology. However, according to the NCES survey "only approximately 20 percent of teachers felt that they were adequately prepared to use educational technology in teaching" (NCES, 2000). Creighton (2003) expressed that professional development "efforts must address changing the way people think or what they believe about technology" (p. 44).

Sparks and Hirsh (1997) in *A New Vision for Staff Development* explained that staff development impacts the "knowledge, attitudes, and practices of individual teachers, administrators, and other school employees, but also must alter the cultures and structures of the organizations in which those individuals work" (p. 2). Professional development provided for on-going individual and collaborative processes that involved teachers and others in the education community in experiences to improve their content and pedagogical knowledge and skills with the focus on student learning. For staff development to be effective in changing schools, it should be results-driven, promote systems thinking, and be based on constructivism (Sparks & Hirsh, 1997). These ideas provided a means to address the research findings for effective technology integration. Results-driven professional development focused on the school's curriculum and clarified expectations for student learning. For technology integration to be the most effective in impacting student achievement, its use should be aligned with curricular objectives (CEO Forum, 2001; Cradler et al., 2002). Systems thinking professional development involves all stakeholders in considering the organization as a whole and the impact of isolated events and decisions. Technology should be integral to the teaching and learning processes as well as school and organizational capacity development (Creighton, 2003). The third idea, constructivism, was critical for staff development to change teaching practices by including learning experiences for teachers and students to construct their own knowledge. If teachers were not offered these learning experiences, their classrooms would most likely continue to reflect traditional strategies (Becker & Riel, 2000). Staff development should afford teachers opportunities to be active learners through discussing, sharing, and practicing new skills. Teachers involved in these processes engaged in inquiry and discourse to build a collaborative learning community that fostered professional growth (McKenzie, 2001; O'Hair, McLaughlin, & Reitzug, 2000).

Fullan (2001) suggested that creating an atmosphere conducive to change within a traditional school was not about adopting the latest innovation, but was about creating a culture for change that involved "the capacity to seek, critically assess, and selectively incorporate new ideas and practices – all the time, inside the organization as well as outside it" (p. 44). The journey of change as described by Brown and Duguid (2000) involved the practices of "collaborative problem solving and collective sharing " (p. 104). Newmann, King and Youngs (2000) described the findings from case studies of schools and the effects of professional development on developing school capacity as "teachers' knowledge, skills and dispositions; professional community; program coherence; technical resources; and principal leadership" (p. 259). An individual's development may create change in the classroom, but the organization must also change in a coordinated and focused effort (Fullan, 2001; Newmann et al., 2000; Sparks & Hirsh, 1997). Unless individuals and the organization were changing, an improvement in one area may have created a problem in another area (Sparks & Hirsh, 1997). For change to occur there was "an alteration of power relationships among those in the system and within the classroom" (Institute for Response Education, 2002, p. 1). Murphy (2001) envisioned leaders having strong beliefs and moral purpose, to be intellectual leaders, and building relationships that empower others. School leaders provided "a delicate balance between support and pressure, encouraging teachers to take on new roles while they themselves let go of old paradigms regarding the role of school administrator" as communities were developed (Morrissey, 2000, p. 37).

Professional Learning Community Supports Technology

Through the development of professional communities, school leaders increased the organizational capacity by focusing the faculty's collective efforts toward school improvement (Hord, 1997; Louis, Kruse, & Marks, 1996; Newmann & Associates, 1996). Hord (1997) described the processes involved in professional learning communities as "supportive and shared leadership, shared values and vision, collective learning and application of learning, peer review and feedback, and supportive conditions" (p. 1). Supportive and shared leadership (Hord, 1997) involved "the collegial and facilitative participation of the principal, who shares leadership (and power and authority) in decision-making with the staff" (p. 2).

Schools that function as professional learning communities are as Morrissey (2000) described "a meeting ground for learning-dedicated to the idea that all those involved with it, individually and together, will be continually enhancing and expanding their awareness and capabilities" (p. 22). Through the development of professional learning communities and integrating technology into the fundamental processes of teaching and learning, student success was the desired outcome. "Professional growth is accelerated in contexts where teachers work as teams and engage in reflective, collegial patterns of work focused on the development of new learning tasks, situations, interactions, tools, and assessments for their own classrooms" (Sandholtz, Ringstaff, & Dwyer, 1997, p. 184).

The processes of learning communities support the social context of integrating technology in teaching and learning. In schools, the decisions concerning the adoption of new technologies occurred in the social context of schools as learning organizations (Brown & Duguid, 2000). Interactions with peers and experts in the field provided support for the use of the new technologies and their applications.

Context

Oklahoma –Achievement through Collaboration and Technology Support (OK-ACTS) began as a Bill and Melinda Gates Leadership Grant with matching funds from Oklahoma Educational Technology Trust (OETT), National Science Foundation, and the University of Oklahoma. The year-long leadership professional development for Oklahoma school superintendents and principals involved the administrator in experiences to become familiar with the *10 Practices of High Achieving School*s, a systemic change framework (O'Hair et al., 2000). Through the year, the participants attended small-group cluster meetings and began working with their staffs using the systemic change framework. On completion of the leadership professional development project, school leaders had an option of applying for a grant to purchase technology equipment and deepen the professional development for their staffs. Through OETT Grants-to-Schools processes, districts or schools expanded the development of actions plans to include three of the *10 Practices of High Achieving Schools* (O'Hair et al., 2000) using technology to impact student achievement.

Problem

Research has documented the positive impact of technology on student achievement in the areas of content in academic subjects, development of higher-order thinking skills, and the application of a deeper knowledge of content and thinking processes to develop the skills necessary in the workforce and future careers (Cradler et al., 2002). Even though there has been a significant increase in the availability of technology in schools, "only a small percentage of students used computers frequently" (NCES, 2000). The integration of technology was encouraged through collaborative cultures with informal support systems, such as study groups and peer coaches (Kruse, Louis, & Bryk, 1995). Collaborative cultures in professional learning communities provided for learning; however, there was an absence of empirical data on the relationship of professional learning communities and technology integration.

Purpose

The purpose of this ex post facto study was to explain the nature of the relationship between the characteristics of school staffs as professional learning communities and the integration of technology in the teaching and learning process. The theoretical population was K-12 teachers and administrators, with the accessible population or case for this study identified as the Oklahoma Educational Technology Trust (OETT) Grants-to-Schools 2003 recipient schools or districts from across Oklahoma. The characteristics of professional learning communities (Hord, 1997) were defined as: supportive and shared leadership; shared values and vision; collective learning and application of learning; peer review and feedback; and, supportive conditions. Integration of technology was defined as the appropriate use of technology as a tool to enhance the teaching and learning process. Technology integration factors included: students' use of technology; support teachers received for technology use; teachers' beliefs regarding technology use; and, teachers' integration of technology. The factor of the teachers' use of technology divided into five constructs: teachers' use of technology for students' learning activities, planning and collaborating for technology use; using technology to communicate with others; using technology for decisions regarding students' learning; and, sharing best practices for integrating technology.

Implications

The national financial investment in technology equipment for the schools was $40 billion; however, much of the technology has not been successfully integrated into the experiences of students to impact their learning (Center for the Digital Divide, 2004). Research indicated teachers who have collaborative planning and sharing of instructional ideas were more likely to be successful using computers (Becker & Riel, 2000), but the empirical relationship between professional learning communities and the integration of technology had not been established. This study investigated the nature of the relationship between the characteristics of professional learning communities and technology integration. The findings of this study provided valuable information for school leaders as they address the need to increase the integration of technology into the core teaching and learning processes in a school. This study provided school leaders the structures and processes of professional learning communities that related to technology becoming an integral component of classroom instruction for increasing student achievement. The implication for preparation programs involves the development of a knowledge base for future leaders in the importance of the leader's role in modeling and sustaining the development of professional learning communities that integrate technology.

Significance

The study examined the nature of the relationship between professional learning communities and the integration of technology. If a relationship existed between professional learning communities and the integration of technology, the relationships were identified and these findings informed the practices in schools. These findings were important for several reasons. Students need to be technologically literate to be successful in the 21st century. In the last decade, there has been a significant increase in access to computers, but the percentage of student use has been relatively low. Teachers that were supported by sharing practices in a collaborative setting were more likely to move from traditional strategies to an innovation (Newmann et al., 2002). The principal was critical to the process of creating a culture in which a school has a shared vision for integrating technology into the teaching and learning process. The structures and processes involved in professional learning communities served to support and encourage teachers to use technology as an integral tool in their classroom instructional approach.

Assumptions

1. The majority of the school staff members supported the grant goals.
2. The majority of the school staff members were willing participants in the grant processes.
2. The majority of staff members had a similar understanding of professional learning communities.
3. The majority of staff members had a similar understanding of technology integration.

Summary

Schools must address the needs of students to be technologically literate in the 21st century. There have been great strides in equipping schools with hardware and Internet access during the last decade; however, the potential of technology to impact learning has not materialized. Professional development provided for continuous learning and support for creating change in practices of schools. This study, through a survey administrated to teacher and school leader participants, gathered data to determine the nature of the relationship between professional learning communities and the integration of technology in schools.

CHAPTER TWO

Theoretical Perspectives

Chapter two examines the theoretical perspectives that served as the framework for this study. Learning organization theory is described and its concepts are related to schools. Change dynamics in schools as learning organizations are discussed in relation to change theory, leadership, context for integrating technology, and aspects of professional development. Next, the research-based practices are applied to professional learning communities and the integration of technology in teaching and learning processes. The third perspective describes research-based practices for the dimensions of professional learning communities and factors of technology-enriched environments of learning. In summary, the research questions of the study are stated.

To study the nature of the relationship between the characteristics of a professional learning communities and integration of technology, the theoretical perspectives were drawn from learning organization and change theories. The overarching theories involved building organizations "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together" (Senge, 2000, p. 3). To impact the complex social dynamics of learning organizations involves redesigning the organization and our beliefs and assumptions must be challenged to change our mental models. Learning of this nature requires a community.

Theoretical Perspectives

Learning Organizations

In *The Social Psychology of Organizing*, Karl Weick (1979) articulated the idea that organizing involves processes that are the interlocked behaviors of at least two people. Senge (2000) used these ideas in describing a framework for understanding that organizations work the way they do because of the way people interact. Change in a system must consider the mental processing and the relationships of the people involved. The development of a new shared vision and capacity requires a change in thinking and interactions. In learning organizations, adaptive learning conforms to current norms and ensures survival, but generative learning develops new understanding and capacities that enhance “our capacity to create” (Senge, 1990, p. 14). Generative learning leads to a shared vision that increases an organization’s capacity to change and adjust system processes and structures. The dynamics of a learning organization involve understanding the influence of “systems, meanings, and relationships” (Fleener, 2002, p. 156). These understandings impact the communication in an organization and contribute to the capacity to change.

The disciplines of learning organizations address learning from individual, team and organizational perspectives. An individual increases his or her learning capacity through personal mastery, which provides an impetus for changing one’s mental models. Shared vision builds on personal vision. Senge (1990) states “when more people come to share a common vision, the vision may not change fundamentally. But it becomes more alive, more real in the sense of a mental reality that people can truly imagine achieving” (p. 212). As an organization works toward achieving the shared vision, the vision became “a vehicle for advancing the larger story” (Senge, 1990, p. 351) through the interrelationships of the organization as a whole. Team learning emphasizes inquiry into complex issues, coordinated action of team members, and fostered learning through dialogue and discussion. Through social processes, such as discourse and reflection, personal or collective assumptions may be challenged and result in generative learning (Senge, 1990; Sun & Scott, 2003). Resources for learning are provided by the social groups (Brown & Duguid, 2000).

System thinking considers the whole rather than the parts and considers overall goals rather than isolated events. It provides a framework “for seeing interrelationships rather than things, for seeing patterns of change rather than static ‘snapshots’” (Senge, 1990, p. 68). The focus is on relationships and structures of various parts in relation to the whole, consideration of the organization at different levels and between levels, and the context of its history and environmental relationships (Fleener, 2002).

Feedback is a concept of system thinking that refers to how actions can reinforce each other and “suggests everyone shares responsibility for problems generated by a system” (Senge, 1990, p. 78). As the feedback occurs repeatedly, patterns emerge and provide meaning in the language of the organization. Feedback provides opportunities to be involved in problem-solving, to reflect about other approaches, and to collectively share in the resulting actions (Brown & Duguid, 2000).

Schools as learning organizations. In the present atmosphere of accountability, many schools rushed to try the latest innovation, which created an atmosphere of fragmentation and a staff whose efforts were divided. Fullan (2001) discussed the need for building coherence in these complex systems rather than approaching the challenge from a linear mind set. Systems thinking has implications for changing our schools by offering “a language that begins by restructuring how we think” (Senge, 1990, p. 69) for seeing the whole and the underlying parts. Senge (1990) describes systemic structures as “the key interrelationships that influence behavior over time … these interrelationships are among the key variables,” such as, vision of results and current realities (p. 44). Through the processes of reinforcing feedback, even small changes can produce significant effects towards the shared vision (Senge, 1990). Seeing the organization as a whole, the structures that have strong influences on behavior and “thinking in terms of processes of change” are ideas from systems thinking that have profound implications for professional development and change in schools (Senge, 1990, p. 65).

Creating a culture that focuses on context changes for improving learning organizations requires experiences that are intense and “must constantly cultivate the capacity to hone one’s moral purpose and knowledge of nonlinear change processes, to build relationships with diverse groups, to build knowledge and to strive for coherence” (Fullan, 2001, p. 124). Schools should focus their work by addressing the ways we create knowledge, the relationships or interactions among people in the organization, providing relevant learning experiences for both teachers and students to construct knowledge, and pursuing a shared vision for improving the school (Fullan, 1993; Senge, 1990). Construction of knowledge requires assimilation and practice using the new information (Brown & Duguid, 2000).

Schools as learning organizations: Historical perspective. Since the early years of public education, the hierarchical organizational structures of governance and policy remained relatively constant until the standards-based reform movement. Elmore (2000) described the process of administrators and board members serving as the buffer between the teachers and any interference from the outside. Teachers were in charge of the technical core, making all the decisions about instruction and evaluation of learning. According to Elmore (2000), these procedures and processes created “a logic of confidence” that provided a buffer between the school and the public by sheltering the teachers from intrusions (p. 6). Therefore, administrators became managers of the structures and processes operating the school in a controlled and linear method, and teachers were responsible for decisions in their classrooms.

Within these parameters, most innovation occurred in the structures of teaching, rather than the processes of teaching and learning. “The theory of loose-coupling explains why schools continue to promote structures and to engage in practices that research and experience suggest are manifestly not productive for the learning of certain students” (Elmore, 2000, p. 6). Weick (1979) explains the effects of loose-coupling as the change in one variable that produces a limited disturbance in the other. Changes in instruction are made by teachers based on teacher’s personal values with no connection to collective goals and usually only by a small group of teachers. These historical perceptions of roles are present in today’s schools and provide a basis for the struggle to change our structures and processes for school improvement.

Systemic Change in Learning Organizations

Change in Learning Organizations

Considering the changes in society, school leaders need to focus on the system and understand the aspects of school cultures as complex, living organizations. “To understand things systematically literally means to put them into a context, to establish the nature of their relationships (Capra, 1996, p. 27). Systems thinkers are interested in the interconnections and relationships, rather than events, and understand focused actions can produce significant changes (Senge, 1990; Sparks & Hirsh, 1997). A paradigm shift was necessary to move from modernistic closed systems that are characterized by entropy to open, dynamic learning organizations. A responsive open system adapts to disturbances as positive feedback by recognizing the need for change (Wheatley, 1999). Fullan (2003) emphasizes that school leaders must realize the complexity of the change process and engage the collective capacity of the organization to achieve more coherence with a focus on learning.

Learning organizations exhibit self-organizing capacity; that is, they adapt and change through creating and reorganizing processes as needed for the work to be done. Self-reference is a fundamental process to all self-organizing systems. When there are changes in context or the environment and there is a need for change, it is through these changes that the system stays consistent. Wheatley (1999) describes this as "autopoiesis in action, a system focused on maintaining itself, producing itself. It will choose a path into the future that it believes is congruent with who it has been" (p. 85). As environmental conditions change, learning organizations shape responses to the demand through the lens of a shared vision.

Fullan (2003) stresses the importance of addressing the context or the conditions under which we operate, rather than accepting it as a given. To change the context refers to our understanding of words, environment, or circumstances that affect or influence the meaning of ideas or concepts. Senge (1990) discusses that even small changes in context can have large impacts. For example, "if you want more sharing of knowledge, name it as a value, create mechanisms that cause it to happen" (Fullan, 2003, p. 28). Changing the context is a powerful change agent and begins with changing the immediate environment and extends to policies that foster relationships.

For a system to begin changing, the exploration of language meaning provides a process by which to change our ideas and "fundamentally escape our social, cultural, and personal habit of meaning-making" (Fleener, 2000, p. 131). Language games explore the meaning of words and way of life in a culture. An organization using language games can clarify the meaning of their words. The process is not about the information, but rather the involvement in identifying the meaning of the information. This process creates "a force for change. Information is generated freely by the system and fed back on itself so that is continues to grow and change" (Wheatley, 1999, p. 106). Through this process, patterns emerge that provide a language through which our beliefs and assumptions are the focus of inquiry and reflection of our thinking (Senge, 1990).

Systems thinking is important for creating vision, shaping policy, and the development of solutions to address problems of the organization. As teams address these issues, team functioning and learning are limited unless a shared language for dealing with complexity is developed. "There is simply no more effective way to learn a language than through use, which is exactly what happens when a team starts to learn the language of systems thinking" (Senge, 1990, p. 269). As new language is developed and the subconscious begins to change from thinking of the world in a linear format, participants become systems thinkers.

Leadership for change. Learning organizations require a new type of leadership in which "leaders are designers, stewards, and teachers. They are responsible for *building organizations* where people continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models – that, they are responsible for learning" (Senge, 1990, p. 340, emphasis in original). To promote the integration of the disciplines, conditions must be supportive for teachers and school leaders to focus their time and energy in activities that provide practice in the disciplines. Systems thinking interweaves the learning throughout the organization to affect the interrelationships of the system as a whole.

The importance of the school leader is recognized in school improvement literature by the actions and development of intellectual leadership rather than authority of position (Murphy, 2001). "School leaders must learn to lead not from the apex of the organizational pyramid but from a web or interpersonal relationships – with people rather than through them" (Murphy, 2001). Change involves investing in the development of quality relationships, which strengthens the commitment to the shared vision. Research by Waters, Marzano and McNulty (2003) stresses the importance of the principal, as a leader of educational reform, understanding the changes that impact student achievement and what these changes require of the faculty. For substantive change to occur, collective and collaborative efforts must be focused on promoting cooperation, a sense of well-being and cohesion among the staff, before working on understanding shared purpose and vision (Waters et al., 2003).

Using the concept of distributed leadership, practices are "stretched over" (Spillane, Halverson, & Diamond, 1999) two or more leaders and are carried out by co-leaders. Through these tasks and the subsequent interactions, expertise is shared and leaders are developed (Elmore, 2000). The formal leadership of schools, the principal, establishes structures for sharing decision-making with teachers on substantive issues, building leadership capacity in individuals, and setting high expectations. Through a dynamic multidirectional model, school leaders link the processes of organizational change to school-level initiatives through allocating organizational resources for transforming teaching practices toward the ultimate goal of increasing student achievement (Gamoran, 2002). These processes provide a means of enhancing the coherence and capacity of the school as a learning organization.

According to Fullan (2003) conditions for building the capacity for continuous improvement within and across the school, district and state educational system are required to enhance reform efforts and sustainability. It is not the knowledge of an individual, but the conversations and learning that occur as the relationships change, that impact an organization (Fullan, 2003). To change the traditional role paradigms in schools, Senge (1990) describes a learning organization as a "shift of mind - from seeing ourselves as separate from the world to connected to the world, from seeing problems as caused by someone or something 'out there' to seeing how our own actions create the problems we experience" (p. 12). The theoretical perspectives of the disciplines build a school culture that supports the development of professional learning communities.

Professional development for change. For schools as learning organizations to grow professionally, both the individual and the organization in the collective sense must continue to learn and improve their skills in the teaching and learning processes. For whole school change, systems thinking provides a "conceptual framework, a body of knowledge and tools …. to make the full patterns clearer, and to help us see how to change them effectively" (Senge, 1990, p. 6). As one reflects about one's thinking, a new language evolves. Systems thinking involves the interconnections and relationships of all levels of the organization and is important for schools as the shared vision for teaching and learning is developed. The capacity of the organization is improved through the learning of individuals as well as the learning communities of the organization.

Another aspect of professional development is "results-driven education [that] represents a dramatic shift in thinking regarding the purpose of schools and what we expect of students; and, in a logical progression, results-driven education for students requires results-driven staff development for educators" (Sparks & Hirsh, 1997, p. 5). The focus is on what educators want students to learn and what they do when student learning doesn't occur (Eaker, Dufour, & Dufour, 2002). The implication for professional development follows the same thinking. Rather than measuring the impact of professional development by seat time, the measure is the impact on teaching practices and student learning (Sparks & Hirsh, 1997).

As the third focus of professional development, Sparks and Hirsh identify a focus on constructivism as the way knowledge is constructed or understanding is developed. Instructional practices that require the learner to use inquiry and higher-order thinking skills to develop their own understanding of the concepts are constructive. These constructivist ideas apply to adults as well as students, so traditional forms of professional development do not provide teachers the experiences that are needed to shift their instructional practices (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003).

Teachers more readily understand and practice constructivist methodologies when they have classroom support for altering their practices, such as peer coaching, scripting of lessons, and team teaching (Brooks & Brooks, 1993, p. 121). Collaborating processes of sharing knowledge and peer review of the ideas or strategies discussed contribute to a collective wisdom impacting teachers' practice (Brown & Duguid, 2000). In a study by Becker and Riel (2000), the findings indicate teachers who "differ pedagogically, demonstrate symmetry between the way in which they enact the role of a teacher and the way in which they structure their classroom for their students" (p. 33). For example, teachers who focus on traditional teaching strategies and have students working alone on externally driven curricula do not participate with peers in professional activities. In contrast, teachers who are engaged in the larger professional community and participate in collaborative exchanges provide the same type of interactions for students in the classroom.

Adult learning principles are an important consideration in preparing and conducting professional development (Elmore, 2000). Learning opportunities are most effective when the topic is relevant and is useful immediately, when learning is experiential, and when opportunities exist to apply learning through problem-solving (Loucks-Horsley et al., 2003). The integration of new knowledge and skills into instructional practices requires that a teacher must understand the information, process the new information into a form to teach, and then evaluate its effectiveness to impact students' learning (Loucks-Horsley et al., 2003). A process that informs the planning of professional development to meet the adult learners' needs is the Concerns Based Adoption Model (Hall & Hord, 2001). Through a series of questions, the teacher's level of concern regarding the concept or innovation of the professional developed is assessed. In the study by Hall and Hord (2001), some of the questions teachers or school leaders asked included: What is it?; How will it affect me?; and How can I best manage it? The responses to these questions provided information about the needs of the staff in order that school leaders and professional development providers could design appropriate professional development.

A study of the Eisenhower Professional Development program identifies the components of effective professional development for teachers. The findings indicate that effective professional development should deepen teachers' content knowledge, provide opportunities for active learning, and encourage coherence in teaching professional development experiences. Also, these goals should be pursued using activities that are of greater duration and involve collective participation (Porter, Garet, Desimone, & Birman, 2003).

A school's culture has significant impact on professional development. "Schools that improve and where professional development 'takes' have strong collaborative cultures and professional learning communities (Loucks-Horsley et al., 2003). Professional learning communities provide supportive conditions for the collaborative and collective knowledge building that enhances the capacity of the school (Brown & Duguid, 2000). Wheatley (1999) expresses that "nothing exists independent of its relationships. We are constantly creating the world – evoking it from many potentials – as we participate in all its many interactions" (p. 69). Through the process of developing relationships, connections are developed. This new culture of the learning organization provides opportunities for school administrators, teachers, and parents to develop new solutions and continue the questioning process toward sustained improvement. These processes facilitate the exchange of energies and the commitment of the passion of individuals and groups.

Research-Based Practice Perspectives

Practices Supporting Change

Schools as professional learning communities. Though most principals, superintendents, and teachers have a desire to do better and are working as hard as they can to provide a quality education to every student they serve, the road is rough and the going is slow. The lead villain in this frustrating drama is the loss of community in our schools and in society itself.… Community building must become the heart of any school improvement effort. (Sergiovanni, 1994, p. xi)

In *Schools That Work* (1993), George Wood provided stories of the successes and struggles of initiating collaborative learning organizations. Lessons learned from an examination of schools that moved away from the effects of loose-coupling and logic of confidence (Elmore, 2000) reveal ".... the goal was not to create a new structure. Instead, the goal was to create a new school ethic, a moral climate if you will, and the community came out of that intent" (Wood, 1993, p. 255). The leaders in these schools created a culture of involvement and collective responsibility for learning (O'Hair et al., 2000) and identified the importance of "constructing and selling an instructional vision and developing and managing a school culture conducive to conversations about the core technology of instruction" through developing norms of trust, collaboration and high expectations (Spillane et al., 1999, p. 17).

"The collective power of the full staff to improve student achievement schoolwide can be summarized as school capacity" (Newmann et al., 2000, p. 261). The focus must be on building the individual's capacity as well as the collective faculty to address increasing learning for all. An example of a school district that has developed its capacity is Community School District 2 in New York City. This school district established a history of successful school improvement in which superintendents and principals were instructional leaders rather than just managers of the traditional practices of a school. Their concept of "nested learning communities" refers to schools being learning organizations whose goals are continuous improvement for increased student achievement (Fink & Resnick, 2001; Newmann & Associates, 1996). These processes support Senge's (2000) view of learning organizations and the role of administrators, as he described, "The principals I know who have had great impact tend to see their job as creating an environment where teachers can continually learn" (O'Neil, 1995, p.1). In learning organizations, all levels of administrators are involved in the process of supporting conditions for learning.

Integration of technology in schools. In a longitudinal research project, Dwyer, Ringstaff, and Sandholtz (1991) established that integrating technology is an evolving process, and teachers exhibit attitudes and practices involving technology in distinct stages. Other researchers have identified that teachers go through similar processes as they begin using technology (Riel & Fulton, 2001; Ross et al., 2003). A comparison between technology adoption stages and the concerns-based model of change (Hall & Hord, 1987) illustrates that the models and the processes of change for technology integration are similar to those for any innovation. The beginning users of technology are seeking ways to replicate existing strategies and are more likely to use word-processing software or drill and practice applications. As teachers became more familiar with software applications and more experienced in utilizing technology, they move to strategies that involve learner-centered, project-based activities (Ross et al., 2003).

In a study of professional development for the integration of technology and learner-centered approaches, Burns (2002) identified technology as a catalyst for a community of practice, which serves "as a vehicle for 'learning about learning,' a mirror in which teachers could see reflected their best practices for learning and teaching" (p. 302). The teachers begin to alter their instructional strategies to include collaborative authentic tasks, since these are the type of activities that promotes their learning. The process of integrating technology impacts the way teachers relate to the course content, with colleagues, with their students, and within the school (Burns, 2002).

Dimensions of Professional Learning Communities

While studying the school improvement process, Hord (1997) conceptualized that professional learning communities involving the processes of leadership strategies, change processes and staff interactions for school improvement. The characteristics of professional learning communities include shared and supportive leadership; shared values and vision; collective learning and application of learning; peer review and feedback; and supportive conditions.

Shared values and vision. Organizations that have established a clear identity and purpose have a focus for their actions. As a foundation for purpose, Fleener (2002) discusses moral action as "a deliberation of possibilities and the consideration of others" (p. 93) and Fullan (2003) identifies moral purpose as the "critical motivator for addressing the sustained task of complex reform" (p. 18).

> It is larger, more collective where individuals are motivated to make their own day-to-day contribution, while at the same time seeing themselves connected to others, not just locally, but beyond. It is, in a word, "moral

purpose writ large" which as it turns out is both a goal in its own right, and equally importantly, a vital means to reach new horizons. (Fullan, 2003, p. 10)

A fundamental characteristic of professional learning communities is a shared vision that is developed by and has the commitment of the faculty. The importance of a shared vision in a professional learning community is its focus on student learning and using the vision as the standard for making decisions (Hord, 1997). Inquiry and Discourse are two of the *IDEALS* that serve as the framework for democratic education (O'Hair, et al., 2000) and provide an avenue for examining our values and beliefs. Developing a Shared Vision (O'Hair et al., 2000) requires reflection on one's values and beliefs about teaching and learning. Through discussion these values and beliefs are integrated into a collective vision for the school. Establishing core learning principles based on the collective shared vision (Glickman, 1993; Sergiovanni, 1989) for students and teachers provides program coherence (Fullan, 2001). The core learning principles are reflected in the daily practices of a school. A key to student success is the commitment of teachers to high expectations for student learning (Newmann & Wehlage, 1995; O'Hair et al., 2000).

In recognition that school leadership is vital to the effectiveness of schools, Printy (2004) investigated the social learning of communities of practice and the interactions of leaders and teachers working together on instructional issues. The findings from Printy's (2004) study suggest that "the principal can motivate teachers toward community of practice participation by shaping a commonly-held vision of where the school wants to go and by supporting the work of teachers to enact that vision" (p. 22) with other communities of practice which influence knowledge construction and educational practices led by strong department leaders.

Shared and supportive leadership. Halverson (2003) views the "professional community as a form of social capital that results, in part, from the work of school leaders to design and implement facilitating structural networks among teachers" (p. 1). Lambert (2002) stresses that "instructional leadership must be a shared, community undertaking" (p. 1). *Shared and supportive leadership* are two of the *Practices of High Achieving Schools* (O'Hair et al., 2000) and involve processes and structures that involve all members of the community in making the decisions regarding teaching and learning.

The practices of inquiry into substantive issues and the discourse that follows serve as the basis for decisions and building collective responsibility for the direction of the school (Glickman, 1993; Morrissey, 2002). Through thoughtful inquiry and engaging in discussions of the issues and traditions of the school, the leadership capacity of the faculty is increased (O'Hair, et al., 2000). Effective leadership involves sharing leadership, developing the individual's classroom practices, and facilitating supportive conditions for the collaborative and collective work of teachers toward implementing an innovation (Louis et al., 1996).

Collective learning. A collective commitment to inquiry and discourse regarding curriculum and instructional issues improves student learning. "Through such techniques as dialogue and skillful discussion, small groups of people transform their collective thinking, learning to mobilize their energies and actions to achieve common goals and drawing forth an intelligence and ability greater than the sum of individual members' talents" (Senge, 2000, p. 7). The benefits of participating in productive communities of practice include sharing member's knowledge to improve and change teaching practice (Printy, 2004). Capitalizing on the collective social responses to resources, such as text materials or social groups within the organization, provides opportunities to construct an understanding and knowledge about the issues (Brown & Duguid, 2000).

The collective shared vision provides a faculty purpose and passion for impacting student lives (Senge, 1990). Fullan (2003) identifies that all educators must focus on deceasing the gap in achievement so all students will be successful. In the past, equality in schools has been synonymous with equal. To close the gap between high and low achievers, a collective effort is needed among educators, parents, and communities. In professional learning communities, there is continuous dialogue and reflection concerning quality student work and effective teaching strategies. *Equity* of opportunities for all students to learn is integral to the values of a professional learning community and is reflected through the practices of offering students opportunities based on individual needs (O'Hair et al., 2000).

Students, who have opportunities for experiences in which they construct their own knowledge through challenging avenues that reflect meaningful, substantive tasks, learn more than students who are in traditional settings (Newmann & Wehlage, 1995; Yair, 2000). With the shared vision on student learning as a focus, professional learning communities work collaboratively to address students' needs. Schools with a shared and unified school vision have more favorable outcomes than schools with multiple programs with little coordination (Lee & Smith, 1994). Teacher collaboration builds collegial relationships that strengthen the collective focus on the shared purpose for learning

(O'Hair et al., 2000). Teachers that interact as a community positively impact student learning and social equity (Lee & Smith, 1994).

Peer observation and feedback. Schools that function as professional learning communities have an environment that is conducive to sharing personal practice. In a culture of mutual respect and understanding, teachers are open to sharing their successes and even their failures (Hord, 1997). One of the defining characteristics of a learning organization is the willingness to examine their practices and make changes if needed. Hord (1997) describes this dimension as "the visitation and review of each teacher's classroom practices by peers as a feedback and assistance activity to support individual and community improvement" (p. 5). O'Hair et al. (2000) describe a technique of having critical friends providing constructive dialogue about best practices.

Reflective dialogue provides consideration of current practices and possible strategies for improvement. Lambert (2002) shares suggestions for reflection strategies as "journaling, coaching, dialogue, networking, and their own thought processes" (p. 38). Senge (2000) describes personal mastery as the "practice of articulating a coherent image of your personal vision - the results you most want to create in your life alongside a realistic assessment of the current reality of our life today" (p. 7). An individual's capacity is enhanced by making better decisions and obtaining desired results. McLaughlin and Talbert (2001) stress the influence of departmental cultures on the classroom instructional settings, the expectations of students, and the professional interactions of the teachers. The implication for school leaders is to involve teachers in professional dialogue that encourages individual and collective responsibility for developing a productive school culture for student learning.

Supportive conditions. Supportive conditions involve two kinds of structures - conditions and collegial relationships (Hord, 1997). The structural conditions are those features of a school that are considered basic to schooling and that provide opportunities for sharing and support that are integral to professional learning communities. Hord lists these conditions as: use of time, communication procedures, size of the school, proximity of teachers, and staff development processes. These structures can be leveraged to provide time and opportunities for the collaborative and collegial relationships that include positive educator attitudes, widely shared vision or sense of purpose, norms of continuous critical inquiry and improvement, respect, trust, and positive, caring relationships (Hord, 1997). Kruse et al. (1995) suggest that, of the two kinds of structures, development of relationships is the most critical. In addition, Newmann, Rutter, and Smith's (1989) findings indicate the importance of responsive support from school leaders and teachers being connected to problems and application to current practice.

The characteristics of a professional learning community provide the structures and processes to engage the faculty in collaborative relationships, in which the collective focus is on individual as well as collective learning and sharing to impact student achievement. "The creation of a professional learning community is not an end in itself. It is, rather, an infrastructure for supporting school improvement so that, ultimately, the level and quality of student learning increases" (Huffman & Hipp, 2003, p. 81). A focus on student learning is a fundamental component of the vision in a professional learning community (Morrissey, 2000, p. 5).

Schools that are professional learning communities are as Morrissey (2000) describes "a meeting ground for learning - dedicated to the idea that all those involved with it, individually and together, will be continually enhancing and expanding their awareness and capabilities" (p. 22). Through these processes, the school's culture emerges.

Factors of Technology Integration

Leadership for technology integration. Leadership for supporting change in technology use is an essential area in today's society and schools. As the global nature of society increases, the need for students to develop technological literacy becomes imperative. Integrating technology into the core teaching practices of a school requires the same attention to effective change strategies as any innovation. Roschelle et al. (2000) state "the use of technology as an effective learning tool is more likely to take place when embedded in a broader education reform movement that includes improvements in teacher training, curriculum, student assessment, and a school's capacity for change" (p. 76).

To support school leaders in successful school reform, the Collaborative for Technology Standards for School Administrators (TSSA Collaborative) has established guidelines for effective technology program in schools (TSSA Collaborative, 2001). The standards provide guidelines in all aspects of technology implementation including: "leadership and vision; learning and teaching; productivity and professional practice; support management and operation; assessment and evaluation; and, social, legal, and ethical issues" (TSSA Collaborative, p. 2). (See Appendix A for Technology Standards for School Administrators.)

The dynamics of a professional learning community as described by Hord (1997) and the performance indicators for the TSSA standards for administrators (TSSA Collaborative, 2001) have many similarities. The development of a shared vision and cultivating a culture to support the vision are integral for school improvement. The vision for technology should be incorporated as an important component of the overall school improvement plan, rather than being a separate, isolated document (Brown, 2002). Ross et al.'s (2003) findings support the value of school leaders in creating this vision that includes technology in providing opportunities for "children to learn how to think critically, solve problems, and make informed decisions" (p. 76). Principals promote technology use through establishing policies that support the instructional, as well as technical, issues, provide professional development that involves integration of technology in the instructional program, and model its use (Creighton, 2003).

Technology integration for student learning. With the demands of accountability for student learning, the focus of any educational reform effort must be established on scientifically-based research and provide direction for curriculum, instruction, and assessment. Is there a research base for integrating technology into the teaching and learning goals of a school? In answer to this question, Chadler et al. (2002) explain "technology influences student achievement and academic performance in relation to three primary curricular goals: (1) achievement in content area learning, (2) higher-order thinking and problem-solving skill development, and (3) workforce preparation" (p. 2).

Additional research studies provide further evidence that technology does impact the development of students' thinking and learning. In a meta-analysis of studies that involve researching the effect of technology on student outcomes by Waxman, Meng-Fen and Michko (2003), findings indicate a modest, positive effect of instructional technology on teaching and learning. "The results can be generalized across a wide variety of conditions that have been investigated as well as across student, school and study characteristics" (Waxman et al., 2003, p. 13).

Concerning the impact of learning using technology on content areas, the findings of Mann, Shakeshaft, Becker, and Kottkamp (1999) indicate "significant gains in reading, writing, and math were achieved" (p.3). For the fifth grade students, eleven percent of the gains can be attributed to use of the computer based program. The findings of this study indicate there is a correlation between the use of constructivist ideas and the confidence of the teacher in his or her technology skills. For secondary students, Funkhouser (2002) reported computer software has significant positive impact on student performance on standardized geometry achievement tests. The significant difference in mathematics scores suggests the integration of computer-based methods in a traditional geometry course enhances student performance.

In a longitudinal study, students' use of higher-order thinking skills exceed grade-level expectations when students routinely use computers to write, analyze data, develop presentations, and do research (Sandholtz et al., 1997). Other findings indicated students' time on task increased as did their collaboration with peers on group assignments. The results of a study by Hopson, Simms, and Knezek (2001) indicate classroom computer use enhances student's higher-order thinking skills of analysis, synthesis, and evaluation and computers increase motivation, and creativity. The researchers discussed the implications of the study, suggesting that inclusion of technology as a tool created an environment that allowed “students to move beyond knowledge acquisition to knowledge application” (Hopson et al., 2001, p. 116).

Findings from the three-year Project CHILD (Computers Helping Instruction and Learning Development) indicates technology is effective for increasing student achievement in high and low achieving schools and suggests “that technology can be more effective when used in a transformed learning environment than when used in a traditional learning environment” (Butzin, 2001, p. 372). In this study, transformed learning environments involved multi-grade clusters, using activity-based learning centers with subject specific software that correlated with skills and benchmarks, and in which students had frequent and equitable access to computers. Traditional learning environments in this study were mostly teacher-directed seatwork, with one teacher for a single year (Butzin, 2001).

In a study of the Challenge 2000 Multimedia Project by Penuel, Means and Simkins (2000), the results indicated students participating in the project “consistently out-scored their peers in the non-project classrooms in the areas of understanding content, adapting their message to their intended audience, and applying principles of design in the format and layout of their brochures” (Barnett, 2003). An important aspect of this project involved using embedded assessment of students’ understanding of the concepts during the activities. These strategies fostered teachers’ awareness of students’ attainment of the desired outcomes.

Teachers’ effective use of technology. The studies by Butzin (2001), Funkhouser (2002), Hopkins et al. (2001), Penuel et al. (2001) and Sandholtz et al. (1997) compared constructivist to traditional learning environments. The findings support the use of a constructivist approach to increase knowledge of concepts and achievement on standardized test scores. Butzin (2001) suggests "the debate over educational technology should not focus on how many computers are in classrooms, but rather how they are used" (p. 372). From these studies, there are several significant differences between technology-enriched and traditional classrooms. Technology-enriched classrooms: are more student centered and less teacher/textbook driven (Butzin, 2001; Funkhouser, 2002; Hopkins et al., 2001; Penuel et al., 2001; & Sandholtz et al., 1997); facilitate the use of cooperative groups (Hopson et al., 2001; Penuel et al., 2001) and learning centers (Butzin, 2001); provide students opportunities to focus on construction or application rather than knowledge acquisition (Butzin, 2001; Funkhouser, 2002; Hopson et al., 2001; Penuel et al., 2001; & Sandholtz et al., 1997); and, create problem-solving environments (Hopson et al., 2001; & Penuel et al., 2001). Studies indicate technology integration is most effective when computer use "is tightly linked to content standards and integrated into ongoing classroom work, rather than taught as a separate or stand-alone subject" (Barnett, 2003).

Understanding the environment that promotes learning provides guidelines for effective technology use. Technologies include the traditional classroom items that only provide a direct transmission of information and new technologies that provide a variety of interactive learning environments. The new technologies enhance learning by bringing real-world problems into the classroom; provide scaffolds to enhance learning; include activities that involve feedback, reflection, and revision; and provide connections to the community, scientists and other experts (Bransford, Brown, & Cocking, 2000). When these characteristics are applied to traditional classrooms, the indications are that "the structures and resources of traditional classrooms often provide quite poor support for learning" (Roschelle et al., 2003, p. 79); however, new technologies provide interactions with the learning environment that correlate with the structures for learning (Barnett, 2003). Roschelle et al. (2003) created an analysis of the major studies of computer as learning tools. The studies indicate the achievement level of students is enhanced through computer-based applications that involve the students in the fundamental characteristics of learning. In general, the studies (Cradler et al., 2002; Roschelle et al., 2003) reveal that technology applications provide opportunities for students to explore, manipulate data, construct their own knowledge, visualize variations to situations, learn through the social context, be collaborative, take intellectual risks, ask questions, analyze and organize information, receive quick feedback, engage as an individual or in small groups, observe models of abstract concepts, observe, and create simulations. Applications in science and mathematics for upper elementary through high school students show strong positive gains for both boys and girls. Use of technology provides statistically significant gains in the critical mathematics and science skill of graph interpretation and, in a different study, shows significant gain in explaining graph inaccuracies (Roschelle et al., 2003).

In summary, technology-enriched classrooms can provide avenues for students to "enhance thinking, decision-making, and problem-solving skills ....that will translate into higher scores on demanding new state tests" (McKenzie, 2000, p. 21). A key factor for implementing these ideas is professional development for teachers and developing curriculum connections and appropriate teaching strategies.

Authentic learning with technology. Research demonstrates that authentic teaching increases student achievement over traditional methods. Brooks and Brooks (1993) explain that in traditional classrooms, students study a narrow focus of issues, respond in short answers, and complex ideas are reduced to categorized information, such as historical eras or formulas. They assert

> schooling doesn't have to be this way. Schools can better reflect the complexities and possibilities of the world. They can be structured in ways that honor and facilitate the construction of knowledge. And they can become settings in which teachers invite students to search for understanding, appreciate uncertainty, and inquire responsibly. They can become constructivist schools. (Brooks & Brooks, 1993, p. 6)

Using technology as a tool, students are able to be involved in constructivist and authentic projects, which allow students to apply their knowledge and use higher-order thinking skills in new situations. In a study of instruction and its effect on students' learning, Yair (2000) declares "authenticity, choice and skills significantly and substantively affect students' learning experiences" (p. 205). These findings indicate that by changing instructional practices to include challenging, voluntary, and engaging tasks, students' learning environments can be enriched. As a result of these learning experiences, "students create significant learning projects, exhibitions, and portfolios" (Yair, 2000, p. 207). Yair's (2000) measurement for authenticity was the importance of the task to the student for immediate aims and the value for the student's future goals. Learning experiences in which students are academically stimulated, provide for student autonomy through choice, and demand the use of higher-order thinking, which increases students' motivation and sense of accomplishment (Yair, 2000).

Wehlage, Newmann and Secada (1996) describe authentic achievement as "intellectual accomplishments that are worthwhile, significant and meaningful, such as those undertaken by successful adults: scientists, musicians, business entrepreneurs, politicians, crafts people, attorneys, novelists, physicians, singers, and so on" (p. 23). Another description of authentic teaching and learning "characterizes knowledge as process as well as content, and engages students in long-range and complex projects that have meaning for them in the world beyond school" (Lee & Smith, 1994, p. 151). For high quality student learning, experiences should involve the following elements: construction of knowledge, disciplined inquiry, and value beyond school (Newmann & Wehlage, 1995; Wehlage et al., 1996). Research by Newmann and Wehlage (1995) demonstrates that students who receive more authentic pedagogy learn more by being challenged to use the higher-order thinking skills, to develop an in-depth understanding by exploring issues and relationships, and to apply their learning to real-world problems for an audience outside of the classroom. "These effects on authentic achievement are equal across students of different social background" (Newmann & Wehlage, 1995, p. 287). Newmann and Associates' (1996) findings indicated when students were taught authentically, they consistently out-performed students taught in more conventional ways. The research by Yair (2000) and Newmann and Wehlage (1995) supported Brooks and Brooks' guiding principles of constructivism. Brook and Brooks (1993) guiding principles of constructivism are "posing problems of emerging relevance to students; structuring learning around primary concepts; seeking and valuing students' points of view; adapting curriculum to address students suppositions; and assessing student learning in the context of teaching" (p. 35).

In a study of the relationship between professional engagement and teaching practice utilized in classrooms, Becker and Riel (2000) reveal that teachers who are extensively engaged in professional activities are more likely to teach using constructivist ideas involving informal substantive communications, professional interactions with colleagues from other schools, and peer leadership activities, such as, presentations at workshops or conferences or writing. Teachers who participate extensively in professional engagement activities are "more likely than other teachers to see good teaching in terms of facilitating student inquiry rather than directly transmitting knowledge"...[and] "to emphasize student engagement in learning and the 'meaningfulness' of content" rather than the traditional approaches of teacher-directed activities to cover the curriculum (Becker & Riel, 2000, p. 14). The challenge for these teachers, as school leaders, and for the principal is to provide professional development or school processes or structures that motivate their less professionally engaged colleagues.

Professional Learning Communities and Technology Integration

Professional learning communities support teachers as they collaborate and collectively seek strategies and "technology-enriched learning environments" to improve teaching and learning (TSSA Collaborative, 2001). Technology provides many avenues for data collection and analysis to inform decision-making processes toward improved student achievement. Teachers increase their capacity and their own learning through "interactions with other professionals who offer ideas and evidence of effective practice, provide feedback and suggestions for improvement, and give them moral support essential to the improvement process" (Knapp et al., 2003, p. 15). Technology serves as a catalyst for teachers to be learners as they examine ways to integrate technology effectively into their classroom practices (Burns, 2002).

King and Newmann's (2002) study found teachers are more likely to make standards-based changes in their instructional strategies and move away from traditional teaching practices when they are involved in a community of practice. Findings from these studies provide strategies for principals to begin the complex process of integrating technology into the core beliefs of teaching and learning in their school. McKenzie (2001) stresses a focus on using technology to enhance students' thinking skills, decision-making, and problem-solving strategies. Also, an emphasis must be placed on providing professional development and a culture of support for teachers to integrate technology in their classrooms.

The dynamics of a learning organization are evident in schools that develop the characteristics of professional learning communities. The focus is student learning as well as individual and collective learning for teachers, school leaders, and the community. School leaders significantly impact the integration of technology in meaningful learning experiences by developing a culture that has a focus on professional development of all stakeholders, providing supportive conditions for technology use, and sharing leadership throughout the organization (Hughes & Zachariah, 2001). Through increased professional engagement, teachers are more likely to integrate constructivist computer opportunities for students in their instruction (Becker & Riel, 2000). The theoretical perspectives of learning organizations and change support the development of the dimensions of both of the variables, professional learning community and integration of technology.

Research Questions

To accomplish this purpose, the study investigated the following questions.

Question One: Is there a relationship between professional learning communities and the integration of technology in the teaching and learning process?

Question Two: Is there a relationship between the dimensions of professional learning communities and factors for integration of technology for teaching and learning?

Summary

School leaders provide “a delicate balance between support and pressure, encouraging teachers to take on new roles while they themselves let go of old paradigms regarding the role of school administrator” as communities are developed (Morrissey, 2000, p. 52). Through the development of professional communities, school leaders can increase the organizational capacity by focusing the staff’s collective efforts toward school improvement (Hord, 1997; Louis et al., 1996; Newmann & Associates, 1996).

This study examined the nature of the relationship between the overall characteristics of schools’ staffs as professional learning communities and the integration of technology in the teaching and learning process. In addition, the nature of the relationship between the schools’ status of the dimensions of professional learning communities and the factors of impacting technology integration were investigated. Through the development of professional learning communities and integrating technology into the fundamental processes of teaching and learning, the school can become an organization of learning for students, teachers, and school leaders.

CHAPTER THREE

Context

Chapter 2 provided the theoretical perspectives that served as the foundation for Oklahoma – Achievement through Collaboration and Technology Support's (OK-ACTS) work with school administrators and, ultimately, with the teachers and the school communities. This chapter's emphasis was the application of the theoretical framework to OK-ACTS programs and its role in this research study.

Historical Perspectives

During the 1990's, there was an effort to base educational reform efforts on research and the identified effective practices (Fullan, 2003). Research studies had established the benefits of collaborative teacher networks and the impact on teachers' self-efficacy to meet student needs (Lieberman, 1996; Lieberman & Grolnick, 1996; Rosenholtz, 1989). Newman and Wehlage (1995) established a link between restructured schools in which teachers collaborated and provided authentic experiences and increased student achievement. To provide opportunities for application of these ideas in local school districts, in 1995, the Oklahoma Network for Excellence (O.N.E.) was established. Through this network, teachers and administrators in local schools began to work collaboratively, share best practices, and develop an understanding about school renewal and strategies to improve student and teacher learning. From work with other networks, Carl Glickman's (1993) League of Professional Schools, Theodore Sizer's (1985, 1996) Coalition of Essential Schools, and the Oklahoma schools, a theoretical framework that promoted democratic practices in school communities began to emerge. This framework involved a focus on learning principles referred to as the *IDEALS*: *Inquiry, Discourse, Equity, Authenticity, Leadership and Service* (O'Hair et al., 2000) (see Figure 1).

Figure 1

Common Beliefs of the Center for Educational and
Community Renewal

All work at the CECR is based around the IDEALS framework. This framework sets the stage for the ten research-based practices linked directly to high student achievement. IDEALS is an acronym for Inquiry, Discourse, Equity, Authenticity, Leadership, and Service:

I. INQUIRY is the critical study of our practice by gathering and considering data, new knowledge and other's perspectives. The primary purpose of inquiry is the improvement of our individual practice and our school's practice.

D. DISCOURSE refers to conversations, discussions and debates focused on teaching and learning issues. Discourse nurtures professional growth, builds relationships, results in more informed practice and improves student achievement.

E. EQUITY refers to seeking fair and just practices both within the school and outside the school.

A. AUTHENTICITY (AUTHENTIC ACHIEVEMENT) refers to learning that is genuine and connected rather than something that is fake and fragmented. Teachers who practice authenticity help students connect learning to life.

L. LEADERSHIP (SHARED LEADERSHIP) in schools is the development of shared understandings that lead to a common focus and improve the school experience for all members of the school community.

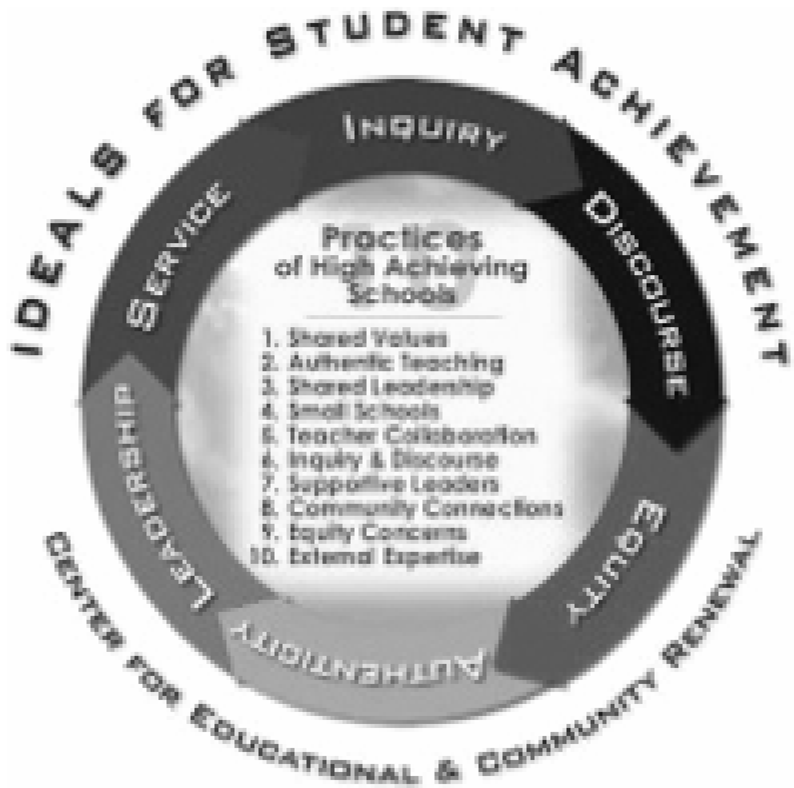
S. SERVICE refers to the belief that making a difference in the lives of children and families requires serving the needs of the community as well as the school.

(O'Hair et al., 2000).

These *IDEALS* were put into action through a series of practices, *10 Practices of High Achieving Schools* (O'Hair et al., 2000), that were effective in developing democratic schools (see Figure 2).

Figure 2

K20 Center's 10 Practices of High Achieving Schools



Leadership Development

Through O.N.E., which was focused on developing collaborative networking among teachers and administrators in six schools, the significance of the administrators' role as the leader of the school improvement efforts was identified. To provide support for school administrators, a leadership grant was written and received through the Bill and Melinda Gates Foundation to establish O.N.E.'s successor, OK-ACTS. The grant funds were matched through National Science Foundation, Oklahoma Educational Technology Trust (OETT), and the University of Oklahoma.

Between 2001 and 2004, OK-ACTS Phase I provided professional development to 800 school superintendents and head principals, training them to lead systemic change and technology integration in their schools and districts. The year-long professional development provided meaningful opportunities for school administrators to develop an understanding of the IDEALS and *10 Practices of High Achieving Schools* (O'Hair et al., 2000) systemic change framework. School leaders received a laptop during the first session of the leadership seminar. Funding from OETT provided $750,000 for purchase of laptops for 800 superintendents and principals. Technology and its applications served as an integral component of the professional development, which models the use of technology in school renewal processes.

The leadership experience began with a two-day leadership seminar during which the school leaders learned about the IDEALS and the *10 Practices of High Achieving Schools* (O'Hair et al., 2000). Sessions involved the participants in activities that illustrated the impact of the practices for school improvement, such as, sharing leadership through the work of Glickman (1993) and Lambert (1998), using authentic experiences in teaching and learning (Newmann & Wehlage, 1995), leading technology integration using the *Technology Standards for School Administrators* (*TSSA*) (TSSA Collaborative, 2001), and using effective technology activities such as *Active Learning with Technology* modules (Adams et al., 2000).

The processes of the year-long leadership experience centered on research-based practices associated with effective professional development. Adult learning principles were considered while organizing the experiences to include sessions and information on topics that were relevant for school improvement; active processes were used, and social interaction for reflection about their learning was included (Darling-Hammond & McLaughlin, 1995). In addition, opportunities for applications of their learning were available when returning to their schools (Loucks-Horsley et al., 2003). Acting superintendents or principals who had completed OK-ACTS Phase I served as cluster coaches for a group of approximately 15 participants. Cluster coaches served as mentors, assisting the participant during the two-day leadership seminar, conducting periodic meetings, and communicating by phone and email to assist in implementing school renewal, leadership, or technology integration (Joyce & Showers, 2002). Two cluster meetings were held during other professional meeting times, which provided the school leaders opportunities to begin working on one of the *10 Practices of High Achieving Schools* in their schools and to reflect with colleagues about its effectiveness, receiving suggestions of other possible strategies.

Throughout the year, school leaders were implementing the practices and leading technology integration in their schools. OK-ACTS Phase I principals assessed the status of technology in their schools using the online assessment, *Taking a Good Look at Instructional Technology* (TAGLIT) (Cory, 2000). Through this assessment process and other assessment measures of their schools, administrators worked collaboratively with their school community to develop a plan of action for incorporating one of the *10 Practices of High Achieving Schools*. The action plan involved the staff in providing evidence of the practice in their school, obstacles that must be addressed, and plans to move forward with this practice (Reitzug & O'Hair, 2002). The actions plans were assessed by OK-ACTS staff members utilizing the STARRS-LS (structures, technology, authenticity, research, staff development, leadership, and service) instrument (Cate, 2002) that identified the evidence of the practices in the school, and OK-ACTS staff provided suggestions for further actions. (See Appendix B for the action plan feedback form.) These action plan reviews were returned to the administrators and utilized as feedback as they reflected on their plans for improvement.

Many of the superintendents and principals who have been OK-ACTS Phase I participants admitted attending the leadership seminar to receive the free laptop; however, after the year-long learning experiences, they expressed the most valuable aspect of the leadership development was the networking with other administrators and learning about the *IDEALS* and the *10 Practices of High Achieving Schools* (O'Hair et al., 2000; OETT/OK-ACTS Report, 2003). Although the Bill and Melinda Gates Foundation funding expired in 2004, OETT has agreed to continue funding a smaller, but similar project of school leadership development.

Deepening the Work

In order to sustain the leadership development in OK-ACTS Phase I, school leaders must build the capacity of their school communities to implement the systemic change framework. One of OK-ACTS Phase I funding partners, Oklahoma Educational Technology Trust (OETT), was interested in a long-term commitment to enhancing student learning through technology in Oklahoma public and career technology schools. Through a partnership between OETT and OK-ACTS, the Grants-to-Schools program began to assist OK-ACTS Phase I leaders in developing professional learning communities in their schools and districts. During Phase II, OETT funded $5,250,000 through individual school site and / or district competitive grants for a three year period with the first award given in August of 2003. Each grant award consisted of $50,000 in technology equipment, $25,000 in professional development through K20 Center's OK-ACTS program, and $4,000 in staff release time to participate in professional development. To be eligible to apply for a grant, the administrators must have completed the requirements of OK-ACTS Phase I (see Appendix C).

Applying for the Grant Project

The grant application process required schools to extend their experiences from Phase I to collaboratively develop a plan to incorporate 3 of the *10 Practices of High Achieving Schools* (O'Hair et al., 2000) and integrate technology into the teaching and learning processes of their school. Acknowledging the importance of a common vision and focus for schools, practice one – shared vision – was required of all applicants. Applicants chose the other two practices based on the TAGLIT (Cory, 2000) and other assessments of their school culture and the needs that were unique to their site. The grant application was extensive, requiring a narrative explaining the overall plan to incorporate the three practices and technology to increase the capacity of their school. Additionally, a description of the use of technology to facilitate the grant goals, the technology equipment that had been selected for purchase, an outline of the three action plans for selected practices, a description of the superintendent's and community's support for the proposal, and evidence of the staffs' support were requested as part of the grant application.

After the applications were received, there were two review processes. The first involved the application being reviewed for compliance with the submission requirements; i.e., all components of the application were included, the grant application was blind [there were not any identifying names or labels], and the submitting administrator had completed OK-ACTS Phase I.

The second review of the grant application involved the narrative and budget for the grant application. The review process was modeled after the National Science Foundation grant review process. An orientation was held for the grant reviewers, during which the grant application was discussed, the review criteria were explained, and reviewers had an opportunity to apply the review criteria to a sample action plan. The review criteria utilized the STARRS-LS rubric (Cate, 2002) and added criteria that were specific to the grant application (see Appendix D for review criteria). Next, there was an individual review for each grant, followed by a team review. The teams consisted of four people representing different experiences and expertise, OETT, technology, business or community, and OK-ACTS. Each team of four reviewed the same four to five grants. Finally, the teams met to share their individual reviews and discuss the attributes and concerns about each grant. Utilizing the input of team members, an agreement was reached for each grant's overall score based on a Likert scale of one (do not fund) to five (definitely fund). The team and the individual reviewer's scores were recorded. Finally, the team wrote a summary of the strengths of the grant and the areas for improvement. These summaries were sent to the applicants who did not receive a grant, and they were encouraged to reapply the following year. The results of the reviews were tallied, and the list of 2003 OETT Grants-to-Schools recipients was generated.

Implementing the Practices in Schools

Grant awards were announced during a reception at an administrative conference in August of 2003. However, even before the public announcement, the OK-ACTS staff and the recipient schools' planning teams had begun the process of implementing grant goals. An initial planning meeting was held, during which the OK-ACTS staff and the grant schools' teams began planning professional development and reviewing plans for purchasing of the equipment. (See Appendix E for professional development planning form.) The purpose of the professional development was to support the administrators in creating professional learning communities that use technology to enhance student achievement. Six full days of professional development targeted grant goals and the three practices chosen as a focus by the schools. The OK-ACTS staff facilitated professional development that utilized processes and activities through which the knowledge, skills, and dispositions of teachers and administrators were developed and the learning community was strengthened and coordinated with the whole school focus (King & Newmann, 2000). Through this process, the professional development modeled use of technology for teaching and learning rather than focusing solely on the technology.

The OK-ACTS professional development sessions provided opportunities for the staff to learn about the *10 Practices of High Achieving Schools* (O'Hair et al., 2000) and integrate technology into the curriculum and into learning tasks for students. The content focus of the sessions began with an overview of the *IDEALS* and the three practices identified in their grant, followed by discussing their vision for teaching and learning. During each of the sessions, new technology skills were introduced and utilized during the session to indicate how technology was a tool for learning and not the end product.

Strategies were generated as to how these same activities could be used in their classroom activities. The IDEALS (O'Hair et al., 2000) of inquiry and discourse were modeled as the school's core learning principles were examined. Staffs reflected about their beliefs concerning teaching and learning and discussed strategies to incorporate technology. Next, the concept of authenticity was introduced through an activity from *Active Learning with Technology* (Adams et al., 2000; Newmann & Wehlage, 1995). In many cases, schools had digital cameras that had not been used until after completing this activity. The professional development continued with a focus of involving the staff in collaborative sharing around teaching strategies and students' learning needs. These sessions included shared decision-making, cooperative processing, and using Excel to examine student assessment data. These processes promoted a collaborative culture focused on building the capacity of all stakeholders.

After the professional development that provided opportunities for staffs to develop an understanding of the *IDEALS* and the *10 Practices of High Achieving Schools* (O'Hair et al., 2000), the focus became more targeted to the needs of the individuals in the schools and the schools' grant goals. For example, a school may have chosen practice eight that involves strengthening home, school, and community connections. The school's planning team and OK-ACTS designed activities specifically addressing their grant goals.

The primary goal of the OETT/OK-ACTS Grants-to-School project was to integrate technology into learning activities to increase student achievement. The OK-ACTS staff strived to provide technology professional development that utilized equipment purchased through the grant, was appropriate for the level of the students, and was timely for teachers. Emphasis was placed on providing opportunities for teachers to learn at least the minimal technology skills embedded in appropriate curriculum activities. Teachers were supported in developing lesson plans that integrated technology into student learning experiences. Another aspect of support provided by OK-ACTS staff was in technical assistance, such as assembling equipment or dealing with network issues.

In working with the administrators and teachers in the schools, a variety of presentation formats were utilized. In most schools, the introductory sessions involved the whole staff of the school. Other session formats included grade-level or department teams during planning periods, release time for two or three hours, or after school sessions with individuals or small groups of teachers and/or administrators. The administrators were encouraged to attend all professional development sessions and model the use of technology in their interactions with the staff. Training was provided for specific technology competencies, such as word processing, use of database or spreadsheet programs, SmartBoard training, presentation stations, and in some cases, basic use of computers. Teachers and administrators were encouraged to examine the research and build their collective knowledge of best practices using technology for student learning. To facilitate this process, many schools participated in book studies about integrating technology or the processes involved in developing professional learning communities.

The activities described to this point have been at the individual school sites. Other activities involved networking with OETT/OK-ACTS 2003 Grants-to-Schools recipients and other educators for an external perspective. Networking opportunities involved quarterly meetings, site visits, focus groups, and University of Oklahoma's Seventh Annual Winter Institute of High Achieving Schools. Winter Institute afforded opportunities for administrators, teachers, business people, and community members to attend breakout sessions that featured examples of classroom applications of technology or strategies for promoting professional learning communities. The 2003 grantees brought teams of administrators and teachers to a pre-institute during which Jamie McKenzie, a nationally-recognized expert on using technology effectively in schools, worked with the teams, discussing applications of technology that lead to significant changes in teaching and learning. As a means of extending the learning from these interactions to other teachers in the schools, the school teams were given one of McKenzie's books, *How Teachers Use Technology Best* (1999); *Beyond Technology: Questioning, Research and the Information Literate School* (2000); or *Planning Good Change with Technology and Literacy* (2001). Also, Phase II schools attended site visits at other Phase II grant schools that showcased their best technology practices as well as allowed the visiting teams to observe the regular routines of the school. Discussions of these visits provided time to reflect about these practices and their application in their schools. Participants discussed strategies for integrating technology in their curriculum, shared equipment and software ideas, and brainstormed solutions to challenges that were expressed. Video conferencing was utilized for quarterly meetings and focus groups, allowing participants whose schools were a greater distance from Norman or schools that had the equipment to participate without leaving their schools.

During the fourth and final quarterly meeting of the year, teachers and administrators shared their successes and implementation of grant goals. This was the second opportunity for teachers and administrators from all twenty-one schools to collaborate with colleagues from other schools. School teams finalized the assessments of their grant goals, providing data about the extent to which the grant goals were implemented. To conclude, school teams discussed plans to sustain the accomplishments attained during the grant year and deepen their development as a professional learning community that integrates technology in teaching and learning.

Summary

The focus of the K20 Center for Educational and Community Renewal has been to support school leaders in developing and sustaining professional learning communities and integrating technology. OETT/OK-ACTS Phase II deepens the work to include the school community processes and activities that contribute to the knowledge, skills, and attitudes of educators to enhance teaching and learning in the school. These schools served as model schools for OK-ACTS Phase I participants to visit and from which to learn.

CHAPTER FOUR

Methodology

This study investigated the nature of the relationship between the characteristics of professional learning communities and the integration of technology in teaching and learning of grant schools' staffs. Data sources included pre- and post- survey instruments to gather information from teachers and cross-sectional survey instruments for administrators in participating schools. Additional information about the sample was obtained from grant application documents, grant schools' quarterly reports, field notes, state accountability report cards, and professional development modules. The research questions examined the relationships between the two overall variables of professional learning communities and technology integration as well as the relationship of the different dimensions of professional learning communities and factors of technology integration. The relationships were analyzed using correlational analysis that focused on "how scores of one measure are associated with scores on another measure" (Shavelson, 1996, p. 145). The relationships of the variables were described using correlation coefficients that indicated the strength of the relationship as well as the direction.

Design of the Study

The study employed an ex post facto research design; that is, the research was conducted after completion of the grant year. The research perspective was quantitative, utilizing the one-group pre-test and post-test design (Cook & Campbell, 1979). The variables were assessed utilizing pre- and post-survey instruments with the intervention of professional development. In notational form, the design description was: R O X O, where R = the accessible population, O = the pre-survey and the post-survey instruments, and X = the intervention of professional development. The accessible population consisted of teachers and administrators of the grants schools who participated in the intervention during the school year of 2003-2004 and were administered the pre-survey instrument in the fall of 2003 and, following the intervention, the post-survey instrument in the spring of 2004.

Population and Sample

The study's theoretical population for generalizability purposes was K-12 teachers and administrators; however, the accessible population or case for this study was comprised of teachers and administrators in the 21 districts or schools in Oklahoma who were recipients of an Oklahoma Educational Technology Trust/Oklahoma –Achievement through Collaboration and Technology Support (OETT/OK-ACTS) 2003 Grants-to-Schools award. The school levels represented by the 21 awards included: three districts, five high schools, one middle school, and 12 elementary schools. There were 676 teachers in the grant districts or schools and 30 administrators. The sample frame was the completion of the pre-surveys and post-surveys for the two instruments utilized in the study, resulting in a purposive sample of n = 218 teachers. The sample frame for administrators was the completion of each of the cross-sectional instruments resulting in the administrative sample, n = 23. To be eligible to apply for the OETT/OK-ACTS 2003 Grants-to-Schools program, the district superintendent or principal of the school had completed the requirements of OK-ACTS Phase I Leadership Development (see Appendix C for completion requirements).

Response Rate to Surveys

Two pre- and post-survey instruments, *School Professional Staff as a Learning Community* (*SPSLC*) (Hord, Meehan, Orletsky, & Sattes, 1999) and *Technology Integration* (*TI*) (SEDL, 2003) were distributed to all teachers ($N = 676$) and administrators ($N = 30$) in the 2003 Grants-to-School program. (See Appendices F through I for survey instruments.) The teachers' response rate for the surveys varied from 48 percent to 72 percent, showing an increase from pre- to post-surveys as shown in Table 1.

Table 1

Survey Response Rate

	Responses			
Instrument	Teacher	Percent	Administrator	Percent
School Professional Staff as a Learning Community (*SPSLC*) (Hord et al, 1999)				
Pre-	324	48		
Post-	461	68	29	97
Pre- & post- pairs	246	36		
Technology Integration (*TI*) (SEDL, 2003)				
Pre-	458	68		
Post-	490	72	27	90
Pre- & post- pairs	358	53		
SPSLC and *TI*				
Pre- & post- pairs	218	32	26	87

Each teacher and administrator labeled their surveys with the last four digits of their social security number. These numbers were matched to identify the pre- and post- pairs of the *SPSLC* (Hord et al., 1999) and the *TI* (SEDL, 2003) instruments to determine the sample. The number of paired responses to the pre-and post-surveys for the *SPSLC* (Hord et al., 1999) and the *TI* (SEDL, 2003) surveys has been included in Table 1. For data analysis purposes, the sample for this study consisted of teachers (n = 218) who completed the *SPSLC* (Hord et al., 1999) and the *TI* (SEDL, 2003) longitudinal instruments. Four of the 21 grant schools did not have paired responses of teachers for both instruments. The administrative sample (n = 23) included the paired *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) responses for administrators of the schools which were represented in the teacher sample. Both principals and assistant principals responded to the survey instruments.

Descriptive Statistics of the Sample

Descriptive information gathered by the survey instruments and the grant application provided demographic data about the sample. Of the 218 teachers, 90 percent (n =197) were female and 10 percent (n = 21) were male. Three levels of school organizations were represented, with 21 percent (n = 46) of teachers at the secondary school level, 71 percent (n =154) at the elementary level, and 8 percent (n = 18) representing districts. Teaching assignments varied from self-contained or subject-specific at one grade level to pre-kindergarten through twelfth grade as illustrated in Table 2.

Table 2

Percent of Teaching Assignment by School Level

	School level		
Assignments	Elementary	Middle school	High school
Teacher assignments	72.2	10.5	16.1
Teach one grade level	27.1	6.4	9.2
Multi-grades or subject areas	7	2.3	3.2
Multi-grades or special classes	17.9	1.8	1.8
Teaching assignment unclear	20.2		1.4
pK through 12 assignments			1.9

Note. Percents of teaching assignments do not total 100% per level due to rounding errors and assignments across categories.

The majority of the teachers (75.6 percent) had been employed as teachers for a mean of 13.57 years with the range of 41 (*SD* = 9.304). Data indicated that 25.8 percent of the teachers were in the first five years of teaching. This percentage decreased steadily in five year increments until reaching over 25 years in the profession. Teachers had been teaching in the current school from 1 to 33 years (*M* = 8.78, *SD* = 7.34); however, nearly half of the teachers (48.8 percent) had been teaching in the current school between one and five years.

Instrumentation

Data sources included two pre- and post-surveys for teachers and two cross-sectional surveys for administrators in participating schools (Creswell, 2003). The survey instruments were the *School Professional Staff as a Learning Community*

(*SPSLC*) (Hord et al., 1999) and the *Technology Integration* (*TI*) (SEDL, 2003). The instruments were administered to teachers of OETT/OK-ACTS 2003 Grant-to-Schools as pre- and post-surveys and to administrators only after the intervention. The surveys gathered information regarding how well the schools' staffs functioned as a team (Hord, 1997) and assessed the factors of technology integration (SEDL, 2003). (See Appendices E through H for instruments.)

Administrators completed two cross-sectional surveys, that is, the surveys were administered one time after the intervention of professional development. *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) assessed their perceptions of their staff's status on the characteristics of professional learning communities. The second instrument was the *Technology Integration* (SEDL, 2004) survey that assessed their views of the teachers' use of technology for instructional purposes and the extent of the teachers' technology use for other purposes prior to and after receiving the OK-ACTS professional development. (See Appendices E and H for survey instruments.)

Professional Learning Communities Instrument

Instrument one. The *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) assessed the school's team work (administrators and teachers) in the following five areas:

- the collegial and facilitative participation of the principal, who shares leadership (and power and authority) in decision-making with the staff (with two descriptors);

- a shared vision that is developed from the staff's unswerving commitment to students' learning and that is consistently articulated and referenced for the staff's work (with three descriptors).
- learning that is collectively pursued to create solutions that address students' need (with five descriptors)
- the visitation and review of each teachers' classroom practices by peers including feedback and assistance that actively supports individual and community improvement (with two descriptors); and,
- physical conditions and human capacities that support such an operation (with five descriptors) (p 1).

See Appendix F for the *SPSLC* (Hord et al., 1999) instrument. The design of this instrument consisted of a series of three statements for each of the descriptors to place the assessment from "most desirable" in the practice to "least desirable" on a five-point scale. The Likert-type format with descriptors required respondents to do more mental processing than other surveys of similar format (Hord et al., 1999). Each district or school receiving a grant participated in professional development through OETT/OK-ACTS. The OETT/OK-ACTS staff incorporated strategies and processes for developing professional learning communities in each school. The survey instrument, *School Staff as a Learning Community* (Hord et al., 1999) assessed the readiness level of each school staff on the indicators of professional learning communities.

Instrument one: Reliability and validity. The validity and reliability of survey instruments were measured. Reliability referred to the stability of scores from different administrations of the instrument. Validity allowed interpretations of the data to be made based on the degree to which the instrument measured what it was supposed to measure (Airasian & Gay, 2000). The validity and reliability analyses were conducted by Appalachia Education Laboratory (AEL) (Meehan, Orletsky, & Sattes, 1997). Three types of validity analyses were conducted - content validity, concurrent validity, and construct validity. For content validity, three stages of review were conducted with minor changes in wording that met the original intent and the author's approval. It was determined the instrument had "sufficient content validity for its original intention of measuring the concept of a community of learners within the professional staff of K-12 schools" (Hord et al., 1999, p. 7). A school climate instrument was administered to assess concurrent validity of the instrument. *The School Professional Staff as a Learning Community* (Hord et al., 1999) has concurrent validity with the school climate instrument with a correlation of .75, $p < .001$. For construct validity a t-test compared a known group of teachers with the teachers in the field test ($n = 690$). The results indicated the known group of teachers, who were known to function as a professional learning community, differed significantly ($p = .0001$) from teachers in the field test (Hord et al., 1999). Lastly, a factor analysis using an unconstrained principal components analysis followed by a varimax and oblique rotations was conducted. "Based on factor analysis results, it appears that the 17-item instrument represents a unitary construct of a professional learning community within schools" (Hord et al., 1999, p. 4).

Descriptive statistics were computed for the full sample of n = 690, followed by computations for the school level, elementary, middle/junior high, and high school; and finally, these results were compared to the mean scores of the 21 schools in the field test. These results indicated that the instrument did differentiate among all schools and within the subgroups of schools (Hord et al., 1999). Internal consistency reliability coefficient was computed using the Cronbach's Alpha formula and indicated satisfactory Cronbach's Alpha reliabilities for the full group (n = 690) was .94. The Alphas for the individual school levels ranged from .62 - .95. The stability test reliability coefficient was computed, using test-retest, on a small sample (n = 23) and was marginally satisfactory (.61). The small sample size was due to problems with matching identification numbers.

Integration of Technology

Instrument two: Use of technology. The second instrument for teachers was the *Technology Integration* (SEDL, 2003) survey. The primary focus of the instrument was to explore teachers' and students' use of technology and the extent to which technology was integrated into the classroom. The *Technology Integration* (SEDL, 2003) survey assessed the following factors of integrating technology in teaching and learning:

- Teachers' use of technology (five factors: teachers' use of technology for instructional purposes, planning and collaborating for technology, using technology to communicate with others, using technology for decisions about students' learning needs, and sharing practices for technology integration)
- Students' use of technology
- Support received by teachers for using technology
- Teachers' beliefs regarding use of technology (two factors: positive and negative (see Appendices F and G for instruments).

The *Technology Integration* instrument served as a pre- and post- survey with slight variations. The pre-survey instrument consisted of 14 questions, of which 10 were structured questions; the remaining four questions were open-ended. The open-ended questions were not included in the post-survey; therefore, the responses were not used in the data analysis. Six of the structured questions had from one to 31 items with response choices having descriptors for the possible ratings and were scaled from one to four or five. The choice descriptors varied from one (never) to five (daily or always); one (not at all) to five (expert); one (none) to five (total support); and one (strongly disagree) to four (strongly agree). Two of the structured questions regarding software and hardware availability provided response choices of yes or no. Only the pre-survey instrument gathered background information about the teachers regarding teaching assignments by grade and subject, gender, years as a teacher, and years in the school. Those data were analyzed for descriptions of the sample.

Instrument two: Reliability and validity. An exploratory factor analysis was performed on questions five through eight of the *Technology Integration* (SEDL, 2004) post-survey to investigate the constructs being measured by the items included under each question. The questions contained items focusing on teachers' use of technology in their work (question five), students' technology use in learning tasks (question six), the support received by teachers for using technology in their work (question seven), and teachers' general beliefs regarding technology use (question eight).

Using principle component analysis and varimax rotation, eigenvalues of one or greater constituted the criteria for factor extraction. For the first analysis, no factor solution was requested, resulting in an eleven factor solution. This structure was not easily interpretable, especially for items within question five. The items in a factor had to meet the .50/.30 strength and purity standard for factor loadings. Many of these items formed singular categories, others combined with some of the items in questions six through eight. (See Appendix J for Full Scale Rotated Factor Component Matrix.)

After considering the results of the initial factor analysis and looking more closely at the items in question five, a separate factor analysis was performed on this question. The result was a five factor solution suggesting subscales within this question measuring (1) providing technology-based learning activities for students, (2) planning and collaborating for technology integration, (3) using technology to communicate with others, (4) using technology for decisions about student's learning needs, and (5) sharing practices for technology integration.

Table 3

Question 5 Rotated Component Matrix

		Component				
Item	Description	1	2	3	4	5
5.a	Incorporate tech in lessons	0.373	0.535	0.08	0.139	0.552
5.b	Collaborate	0.308	0.253	0.276	0.122	0.681
5.c	Technology basic skills	0.248	0.309	0.072	0.137	0.726
5.d	Problem-solving	0.481	0.294	0.083	0.076	0.622
5.e	Observe	0.208	-0.017	0.311	0.067	0.665
5.f	Gather information lessons	0.206	0.76	0.135	0.154	0.178
5.g	Create lesson plans	0.199	0.631	0.211	0.069	0.264
5.h	Encourage student use	0.594	0.486	0.143	0.088	0.372
5.i	Require tech resources	0.646	0.452	0.064	0.153	0.286
5.j	Encourage creativity	0.692	0.376	0.125	0.105	0.329

5.k	Use technology to collaborate	0.782	0.131	0.183	0.167	0.18
5.l	Reflection	0.79	0.163	0.159	0.112	0.273
5.m	Data	0.706	0.054	0.184	0.132	0.161
5.n	Gather information-students	0.75	0.301	0.096	0.218	0.066
5.o	Presentations	0.822	0.151	0.152	0.142	0.144
5.p	Accuracy/bias of information	0.783	0.108	0.075	0.192	0.121
5.q	Classroom instruction	0.497	0.442	0.137	0.184	0.430
5.r	Communication/colleagues	-0.079	0.348	0.607	0.05	0.234
5.s	Communication/students	0.46	0.048	0.638	0.151	0.056
5.t	Communication/parents	0.096	0.16	0.781	0.116	0.045
5.u	Communication/community	0.187	0.168	0.735	0.065	0.077
5.v	Collaborate/colleagues	0.123	0.303	0.682	0.107	0.194
5.w	Analyze student data	0.177	0.213	0.28	0.606	0.268
5.x	Assess student learning	0.236	0.22	0.214	0.588	0.338
5.y	Grade information to students	0.179	0.114	0.081	0.883	0.005
5.z	Grade information to parents/school	0.165	0.084	0.1	0.881	0.004
5.aa	Attendance	0.17	0.14	0.056	0.707	0.07
5.bb	Post homework	0.262	-0.072	0.519	0.186	0.192
5.cc	Problem-based learning	0.553	0.157	0.271	0.27	0.245
5.dd	Search web	0.175	0.745	0.248	0.245	0.053
5.ee	Authentic learning activities	0.286	0.615	0.211	0.195	0.097

Note. Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 7 iterations.

Cronbach's Alpha is the preferred measure of the internal consistency of an instrument (Gable & Wolf, 1993) and was calculated on these factors. This is an important aspect of the reliability of an instrument in measuring what it purports to measure. Alpha coefficients based on standardized items for the five factors of question five were .95, .83, .82, .87, and .87, respectively, indicating good instrument reliability. Table 3 illustrated the reliability and scale statistics for question five's subscales a through e of the *Technology Integration* (SEDL, 2003) instrument. (See Appendix K for scales five a through e item statistics.)

Table 4

Questions 6 – 8 Rotated Component Matrix(a)

		Component			
Item	Description	1	2	3	4
6.a	Class presentations	0.791	0.139	0.117	0.200
6.b	Collaborate	0.784		0.111	-0.142
6.c	Assignments/papers	0.760	0.115		0.225
6.d	Analyze data	0.757			
6.e	Research	0.738	0.153		0.226
6.f	Learning aids	0.705		0.134	
6.g	Communications	0.702		0.188	-0.198
6.h	Study for tests	0.698	0.159		
6.i	Virtual trips	0.514	0.122	0.273	
6.j	Practice/learn skills	0.481	0.247		0.159
7.a	Parents	0.160	0.829		

7.b	Teachers		0.779	0.191	
7.c	Organizations	0.163	0.753	0.122	
7.d	Students	0.308	0.721	0.175	0.131
7.e	Professional development providers	0.128	0.712	0.270	0.105
7.f	principal		0.707	0.225	
8.a	Want to learn more		0.141	0.726	0.135
8.b	Exciting		0.246	0.715	0.184
8.c	Student interest	0.154	0.227	0.711	
8.d	Better teacher	0.249	0.178	0.672	0.191
8.e	Student understanding	0.229	0.167	0.656	0.107
8.f	Confident	0.365	0.181	0.496	0.285
8.g	Time consuming	0.116	0.106	0.365	0.726
8.h	Work more complicated			0.265	0.712
8.i	Talent				0.703
8.j	Not appealing			0.399	0.649

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 6 iterations.

Table 5

Subscales 5 a – 3. Reliability and Scale Statistics

Subscale	Cronbach's Alpha	N of items	Mean	Variance	Std. deviation
5.a	0.95	11	29.05	84.29	9.18
5.b	0.83	4	13.95	11.19	3.35
5.c	0.82	6	16.52	24.96	5.00
5.d	0.86	5	16.19	30.26	5.50
5.e	0.87	5	15.26	16.43	4.05

Note. Cronbach's Alpha is based on standardized scores.

The next three questions elicited responses concerning students' use of technology (question six), level of support for teachers' use of technology (question seven), and teachers' beliefs about technology use in instructional practices (question eight). A further factor analysis of these questions resulted in four factors.

Question six reflected one factor with a reliability coefficient of .89. Also, the analysis showed question seven as one factor, with a reliability coefficient of .88. Question eight divided into two factors, reflecting teachers' beliefs regarding the use of technology, positive and negative, with reliability coefficients of .83 and .76, respectively. The reliability and scale statistics for question six through eight were illustrated in Table 4. (See Appendix L for questions six through eight item statistics.)

Table 6

Question 6 - 8 Reliability and Scale Statistics

Question	Cronbach's Alpha	N of items	Mean	Variance	Std deviation
6	0.89	10	22.91	66.13	8.13
7	0.8792	6	20.74	28.4	5.33
8.a	0.8311	6	19.2	7.06	2.66
8.b	0.7644	4	11.17	4.67	2.16

Note. Cronbach's Alpha is based on standardized scores.

These factor analyses reflected that the *Technology Integration* (SEDL, 2003) survey encompasses nine constructs – the five constructs from question five (1) providing technology-based learning activities for students, (2) planning and collaborating for technology integration, (3) using technology to communicate with others, (4) using technology for decisions about student's learning needs, and (5) sharing practices for technology integration; the construct for question six – students' use of technology; the construct for question seven – level of support for teachers' use of technology; and the constructs for the two factors for question eight – teachers' beliefs about technology use in instructional practices – positive and negative. Cronbach's Alpha for the total scale reliability is .96.

Table 7

Full Scale Reliability

Cronbach's Alpha	Mean	Variance	Std. deviation	N of items
0.96	165.31	1166.26	34.15	57

Note. Cronbach's Alpha is based on standardized scores.

Table 8 summarized the reliability statistics for the *Technology Integration* (SEDL, 2003) survey.

Table 8

Technology Integration Instrument Scale Reliability

Instrument	Scale reliability coefficient alpha
Full scale: Questions five, six, seven, and eight	.96
Question five subscales: teachers' use of technology	.95, .83, .82, .87,.87
Question six: students' use of technology	.89
Question seven: support received to incorporate technology	.88
Question eight subscales: beliefs about technology use	.83, .76

Note: Cronbach's Alpha based on standardized items.

The construct validity of the survey was supported by the literature cited in Chapter 2. Teachers engaged in professional development were found to be more likely to integrate technology into the teaching and learning processes for their students (Becker & Riel, 2000; Burns, 2002). During the development of the survey, items were written and checked by experts to see if the items reflected their understanding of technology integration. The initial survey was piloted with teachers to establish item relevance and clarity. As these processes were conducted and feedback was received, items were refined (SEDL, 2003).

Descriptive Data Sources

Throughout the year, several documents were collected that provided narrative descriptions of the grant schools. These documents included demographic information from the grant application, narrative quarterly reports of grant progress, field notes, and professional development modules. The demographic data included location of the school by county and city, school level, the district or school's state accountability measures of Academic Performance Index for the previous year, and the number of participating staff members. These data provided statistics regarding the schools and participants assisting in the development of an understanding of the sample. (See Appendix M for grant demographic page from grant application.) The quarterly reports consisted of open response questions that included the status of equipment purchased through the grant, a brief description of the implementation of the technology, and the school's progress towards grant goals. These qualitative data were reviewed for anecdotal information to enrich or clarify data obtained through the survey instruments. A member check was conducted by others involved in the process to confirm findings from grant documents. Finally, as described in Chapter Three, professional development modules provided information regarding the content and processes of the sessions that were conducted in all the grant recipient districts and schools.

Procedures

Pre- and post-survey instruments were distributed to grant schools by the method of their choice, either by access online through the school's Internet or as a hard copy through the mail service to the school's principal. In a study of web-based and traditional paper-based survey methodologies, Ladner (2001) found the only significant difference between the research methodologies was the response rate. The instruments were identified by district or school and by a number only identifiable by the teacher so the researcher was able to match pre- and post-survey responses. The confidentiality of all participants was maintained. Permission was obtained from the Institutional Review Board (see Appendix N) and from the authors of both instruments. A window of time was given for teachers to respond and return the instruments. Administrators described the data collection process to their teachers and a note of explanation accompanied the instruments.

Data Analysis

The survey data were examined for completeness and paired by participant number for pre- and post-surveys for each of the instruments. The data were summarized using descriptive statistics including the mean, a measure of central tendency representing the average of the scores, and the standard deviation. The standard deviation illustrated the variability of the scores by indicating "the deviation between individual scores in a distribution and the mean for the distribution" (Urdan, 2001, p. 8). The statistical software, *Statistical Package for the Social Sciences* (*SPSS*) (Green & Salkind, 2005), was utilized to compute the descriptive and inferential statistics of the study. Correlational analysis was computed to describe the relationships between the two variables of the study: the dimensions of professional learning communities and the factors of technology integration. This relationship was described in terms of correlation coefficients that indicated the magnitude of the relation between two variables and the direction of the relation (Shavelson, 1996). Correlation coefficients were expressed in numerical terms from negative one to positive one indicating strong relationships and a value of zero being an indication of no relationship. The data were displayed in correlation matrices.

The data analysis began with an examination of the overall relationships between the variables of the study: the dimensions of professional learning communities and the factors that contribute to integrating technology. The sample included only responses of the teachers that completed the pre-and post-surveys of the *School Staff as a Community of Professional Learners* (*SPSLC*) (Hord et al., 1999) and the *Technology Integration* (*TI*) (SEDL, 2003) survey. The full scale comparison was analyzed using three different combinations of the data: the pre-to post-survey change or difference scores means, the paired *SPSLC* and *TI* pre-surveys, and the paired *SPSLC* and *TI* post-surveys. A correlation matrix was constructed and analyzed for relationships between the dimensions of professional learning communities and the factors of technology integration. From the *School Staff as a Community of Professional Learners* survey (Hord et al., 1999), the dimensions of shared leadership, shared vision, collective learning, peer observation and feedback, and supportive conditions were identified for analysis. The *Technology Integration* (SEDL, 2003) survey factors were teachers' use of technology, students' use of technology, support received by teachers to use technology, and teachers' beliefs about the use of technology. The factor of teachers' use of technology measured five constructs: teachers' use of technology, planning and collaborating for integrating technology, using technology to communicate with others, using technology for decisions about students' learning needs, and sharing practices about technology integration. The factor of teachers' beliefs about technology use divided into two constructs: teachers' positive beliefs regarding the use of technology and teachers' negative beliefs about the use of technology. (See Appendix O for table of variables.)

The administrators' data from the two cross-sectional surveys, *School Staff as a Community of Learners* (Hord et al., 1999) and the *Technology Integration* (SEDL, 2004) survey were analyzed using descriptive statistics and grant documents. The descriptive data provided information about the administrators as technology users. Correlation coefficients described the administrators' perceptions of the relationship between the dimensions of professional learning communities and the factors of technology integration.

Narrative data were analyzed for examples of the items that demonstrated significant differences to assist us in understanding what processes and structures were active in the schools. These data afforded a broader context for understanding the relationships between the professional learning community indicators and technology integration.

Summary

The study investigated the relationships between the variables of technology integration in teaching and learning and the extent of the staffs' interactions as professional learning communities. Teachers and administrators responded to survey instruments that assessed the five dimensions of professional learning communities and the nine factors of integrating technology. Correlation coefficients were calculated to determine if relationships existed. The descriptive data from documents provided examples from the school setting of the relationships that were significant.

CHAPTER FIVE

Results of the Study

This chapter presented the analysis and interpretation of the data collected in this study. The study examined the relationship between professional learning communities and the integration of technology in the teaching and learning process. Secondly, the data were examined further for relationships between the dimensions of professional learning communities and the factors of technology integration. The research questions served as the organizational structure for the chapter. Demographic data from the survey instruments provided descriptions of the sample. Descriptive and inferential statistical analyses described the nature of the relationships between the dimensions of professional learning communities and the factors that contribute to the integration of technology.

Population and Sample of the Study

The accessible population of this study involved the 2003 Oklahoma Educational Technology Trust (OETT) Grants-to-Schools recipients. The population was comprised of 21 districts or schools with 676 teachers and 30 administrators. Chapter Three described the Oklahoma Achievement through Collaboration and Technology Support (OK-ACTS) Phase I leadership professional development that was an eligibility requirement for administrators to be an applicant for the granting process. The Oklahoma Educational Technology Trust (OETT)/OK-ACTS Grants-to-Schools program offered support for the administrator to integrate 3 of the *10 Practices of High Achieving Schools* (O'Hair et al., 2000) in their schools. Also, the grant review process, the procedures for the selection of schools to receive grants, and the professional development sessions were described.

Technology Background of Sample

The *Technology Integration* (SEDL, 2003) instrument provided descriptive data regarding the teachers' computer expertise, frequency of technology use, and proficiency using computer applications and tools. The frequency of computer use was estimated by the teachers on a scale of never, rarely, monthly, weekly, and daily. Teachers were asked to self-report their level of expertise using a computer with the descriptors: beginner, intermediate, advanced, or expert. Descriptive statistics for computer use and expertise from the pre- and post-surveys were displayed in Table 9.

Table 9

Teachers' Technology Use Descriptive Statistics

		Descriptive statistics	
Technology use	N	Mean	Std. deviation
Computer Use			
Pre-	218	4.94	0.31
Post-	217	4.98	0.13
Computer expertise			
Pre-	218	2.10	0.69
Post-	217	2.26	0.69

One-tailed paired sample t-tests were conducted to determine the areas that resulted in significant change. Setting the alpha level at .05 minimized the probability of making a Type I error or rejecting the null hypothesis when there really was not a difference. To determine practical significance, Cohen's *d* statistic was computed as a measure of the effect size. The effect size values were interpreted as a small effect with values from .00 to .2, a moderate effect had values from .33 to .55, and large effects were indicated by values > .56 (Lipsey, 1990). A power analysis of the study considered the alpha level of *p* = .05. The statistical procedures utilized were directional, one-tailed t-test and correlational analysis.

Paired sample t-tests were conducted to determine if the change in computer use and expertise were significantly different following the professional development.

Table 10

Paired Samples Test: Expertise and Use of Technology

	Paired differences								
				95% Confidence interval of the difference					
	M	*SD*	Std. error mean	Lower	Upper	*t*	*df*	Sig (1-tailed)	*d*
Computer Use	-0.05	0.32	0.02	-0.09	0.00	-2.15	216	0.025	-0.15
Computer Expertise	-0.15	0.44	0.03	-0.21	-0.09	-5.08	214	0.001	-0.35

The results indicated significant change in the frequency of computer use and demonstrated a small effect size. As the data in Table 5 illustrated, the teachers' change in the level of general expertise in using computers was statistically significant. With the significance level at $p < .001$ and the magnitude of the effect size, $d = .35$, the results of this one-tailed test indicated a medium effect size.

The survey provided a series of common types of technology use. Descriptive statistics are provided in Table 11.

Table 11

Teachers' Technology Use Descriptive Statistics

	n	Mean	Standard deviation
Personal use			
Pre-	216	4.44	1.01
Post-	218	4.51	0.98
Record-keeping			
Pre-	217	3.59	1.67
Post-	218	3.93	1.51
Instruction			
Pre-	217	3.39	1.31
Post-	218	3.62	1.12
School communication			
Pre-	216	4.06	1.26
Post-	218	4.25	1.07

Teachers responded to questions regarding the frequency of computer use for school and personal tasks, such as taking attendance and recording of grades. The results of a paired sample t-tests indicated there was a significant difference in the frequency of computer use for these tasks. Email and other uses of technology for school communication and classroom instructional strategies, for example, making class presentations or students using technology for activities had results that were significant at $p < .001$, but the breadth of the effect was small at $d = .20$ and .18 respectively. Personal use for correspondence was the only type of use that did not indicate a significant difference from pre- to post-surveys. (See Table 12 for paired sample t-tests for types of computer use.)

Table 12

Paired Samples Test: Types of Computer Use

	Paired differences								
				95% Confidence interval of the difference					
	M	*SD*	Std. error mean	Lower	Upper	*t*	*df*	Sig (1-tailed)	*D*
Record-keeping	-0.35	1.22	0.08	-0.51	-0.18	-4.18	216	0.001	-0.28
Instruction	-0.24	1.31	0.09	-0.41	-0.06	-2.65	216	0.005	-0.18
School communications	-0.20	1.01	0.07	-0.34	-0.07	-2.95	215	0.005	-0.20
Personal Use	-0.07	1.02	0.07	-0.21	0.06	-1.06	215	NS	-0.07

The fourth and final area of technology use assessed was the proficiency of teachers in using a variety of software applications and technology tools. The responses were given using a Likert scale that ranged from 5 (expert) to 1 (not at all). For proficiency using technology applications and tools, teachers reported greater proficiency on the post-survey and demonstrated a strong medium effect size (M = -0.25, SD = .41), t (217) = -9.0, $p < .001$, d = .61. Examples of technology software applications that teachers had increased skills in using were spreadsheets, graphics, and presentation software. The effect sizes for these specific items ranged from .2 - .33 indicating small to moderate practical significance. The largest effect sizes were realized for the significant changes in the proficiency in using technology tools, such as SmartBoards and LCD projectors. (See Appendix P for item statistics for teachers' proficiency using technology software applications and tools.)

Research Questions

This study examined the nature of the relationship between professional learning communities and technology integration. There were two questions guiding this investigation.

Question One: Is there a relationship between professional learning communities and the integration of technology in the teaching and learning process?

Question Two: Is there a relationship between the dimensions of professional learning communities and factors for integration of technology for teaching and learning?

Conceptual Framework

Chapter 2 provided the literature base supporting the dimensions of the professional learning communities' and technology integration's positive impact on teaching and learning processes. These overarching models (ideals) served as the variables of the study. Hord (1997) conceptualized professional learning communities as involving staffs in the following characteristics: 1) shared leadership and decision-making; 2) shared vision for student learning; 3) collective learning and applications of learning; 4) peer review and feedback; and, 5) school conditions and capacities support. The survey instrument, *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) was utilized as an assessment of these dimensions.

Using technology as an integral learning tool was targeted towards increasing the individual and organizational capacities in the following factors: 1) teachers' use of technology in their work [a. providing technology-based learning activities for students; b. planning and collaborating for integrating technology; c. communicating with others using technology; d. decisions about students' learning needs; and, e. sharing practices for technology integration]; 2) students' use of technology in learning tasks; 3) support provided to teachers for using technology; and, 4) teachers' beliefs or attitudes regarding the use of technology and its impact on teaching and learning, [a. positive beliefs about the impact of technology and b. negative beliefs about the impact of technology]. The factors contributing to using technology for teachers' and students' learning were measured with the *Technology Integration* (*TI*) (SEDL, 2003) instrument.

Statistical Data Analysis

Using the data from the *School Professional Staff as a Learning Community* (*SPSCL*) (Hord et al., 1999) and the *Technology Integration* (*TI*) (SEDL, 2003) instruments, Pearson's product moment correlation coefficients (*r*) were calculated to determine the relationship between professional learning communities and technology integration. Correlation coefficients ranged from negative one to positive one and indicated the strength and direction of the relationship. That is, a positive correlation demonstrated as one variable increased in strength, the other variable also increased.

The *SPSCL* (Hord et al., 1999) instrument contained 17 items that provided a continuum of characteristics to assess for each dimension. The responses were given on a five-point Likert scale from low (1) to high (5). A factor analysis of the *Technology Integration* (*TI*) (SEDL, 2003) revealed the items that contributed to the constructs measured by each question or subscales within a question. (See Table 13 for *TI* factors and items.) The *TI* (SEDL, 2003) survey instrument measured four major constructs or factors with seven subscales. The correlation coefficients were computed utilizing these factors. The responses to these items were given on Likert scales with responses ranging from one to four or five. To standardize the metric scales of all survey instrument items, z scores were computed and utilized for the correlation procedures. To minimize the chance of making Type I errors by computing multiple correlations, corrected significance levels were computed by dividing $p = .05$ by the number of correlations calculated.

Table 13

Items in Technology Integration Factors

Factor	Subscale	Items
Instructional uses of technology		
	Integration of technology	5h, 5i, 5j, 5k, 5l, 5m, 5n, 5o, 5p, 5q, 5cc
	Planning for technology	5f, 5g, 5dd, 5ee
	Communicating with technology	5r, 5s, 5t, 5u, 5v, 5bb
	Using data for data driven decisions	5w, 5x, 5y, 5z, 5aa
	Shared practices for technology integration	5a, 5b, 5c, 5d, 5e
Student use of technology		6a, 6b, 6c, 6d, 6e, 6f, 6g, 6h, 6i, 6j
Support provided for technology use		7a, 7b, 7c, 7d, 7e, 7f
Teachers' beliefs regarding use of technology		
	Positive	8a, 8b, 8d, 8g, 8h, 8j
	Negative	8c, 8e, 8f, 8i

Relationship Between Professional Learning Communities

and Technology Integration

Question one explored the nature of the relationship between professional learning communities and the integration of technology. Pearson product moment correlation coefficients were utilized to determine if there was a relationship between the two variables and, if a relationship was found, examined the characteristics of the relationship. An overall correlation coefficient was calculated using the change score means of the pre- and post-survey results. Additionally, correlation coefficients were computed for the paired *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) and the *Technology Integration* (*TI*) (SEDL, 2003) pre-surveys and the paired *SPSLC* (Hord et al., 1999) and the *TI* (SEDL, 2003) post-surveys of professional learning communities' dimensions and the technology integration factors. Coefficients of determinations (R^2) were computed to assess the practical significance of the correlation coefficients. The values were interpreted using Cohen's scale of .1, .3 and .5 as small, medium, and large correlations respectively (Cohen, 1988).

Overall Relationship Between Professional Learning Communities

and Technology Integration

Correlation coefficients were computed for the overall means of the change scores for the dimensions of professional learning communities and the technology integration factors. The correlation between professional learning communities and technology integration scales was significant, $r(216) = .33$, $p <.000$, $R^2 = .11$. These results demonstrated a medium correlation coefficient indicating a positive relationship between professional learning communities and integrating technology. The coefficient of determination or shared variance ($R^2 = .11$) accounts for 11 percent of the variance in the relationship between professional learning communities and the integration of technology. The results of the correlations between these variables demonstrated the positive effects of the staffs' interactions as professional learning communities and the influence on the integration of technology into the culture of learning for teachers and students.

Using the paired *SPSLC* (Hord et al, 1999) and *TI* (SEDL, 2003) pre-survey results, the overall relationship between professional learning communities and technology integration demonstrated a small positive, statistically significant correlation ($r = .23$) with a small practical significance of .05. For the *SPSLC* (Hord et al, 1999) and *TI* (SEDL, 2003) paired post-survey responses, the correlation coefficient was $r = .32$, $p < .05$, $R^2 = .12$ exhibiting a small correlation coefficient with a small practical significance accounting for 12 percent of the variance between the variables of professional learning communities and technology integration.

Relationships Between the Dimensions of Professional Learning Communities and the Factors of Technology Integration

Pearson's product moment correlation coefficients (r) were computed to assess the relationships between the variables of the dimensions of professional learning communities and the factors of technology integration. The statistical analyses were conducted using the mean scores for the dimensions of professional learning communities and the factors for technology integration. Correlation coefficients were calculated for three sets of data; i.e., change scores from the *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) pre- to post-surveys, the paired *SPSLC* (Hord et al., 1999) and *TI*

(SEDL, 2003) pre-surveys; and finally, the paired *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) post-surveys. For each of the analyses, a correlation matrix was structured using the dimensions of professional learning communities and factors of technology integration. The dimensions of professional learning communities measured by the *School Professional Staff as a Learning Community* (*SPSCL*) (Hord et al., 1999) included: 1) shared leadership and decision-making; 2) shared vision and values; 3) collective learning through sharing information about teaching and students' learning; 4) staff observes others' classrooms and provides feedback; and, 5) school conditions and capacity support learning. The factors assessed by the *Technology Integration* (*TI*) (SEDL, 2003) instrument included: 1) teachers' use of technology in their work [a. integrating technology in learning activities for students; b. planning and collaborating for integrating technology; c. using technology to communicate with others; d. using technology for decisions about students' learning needs; and, e. sharing practices for integrating technology]; 2) students' use of technology in learning activities; 3) support received by teachers for technology use; 4) teachers' proficiency using technology applications and tools; and, 5) teachers' beliefs regarding use of technology [a. positive and b. negative]. The results of the analysis of each set of data of the Pearson product moment correlations illustrated the relationships between each dimension of professional learning communities and the factors impacting technology integration. (See Appendices Q through S for correlation matrices.)

Analysis of Change Scores from Pre-survey to Post-survey

Shared leadership and decision-making. Correlations coefficients were calculated between the dimension of shared leadership and the factors that contribute to integrating technology. Shared leadership positively correlated to the technology factor of teachers' use of technology for providing instructional activities for students, $r(215) = .21$, indicating a small correlation with a small shared variance of $R^2 = .04$. The results illustrated teachers were involved in decisions for designing lessons and tasks for students utilizing technology in a variety of ways, i.e., gathering information and evaluating its accuracy, utilizing data, facilitating discussions, sharing work, and presenting their products.

Collective learning and technology integration factors. The dimension of professional learning communities called collective learning involved the staff in addressing issues during meaningful discussions to create challenging learning opportunities that address student needs (Hord et al., 1999). The data indicated a small correlation, $r(216) = .24$, $p < .01$, $R^2 = .06$, between these communications and the use of technology. The measures for collective learning involved the frequency of discourse and quality of their teaching and students' learning. Technology served as a tool in communicating about these educational issues with colleagues and administrators, as well as students, parents, and community members.

Peer review and feedback. Professional learning communities enhanced individual and organizational capacities through observing of colleagues' classrooms and providing feedback to each other (Hord, 1997). The teachers' technology use was enhanced through exchange of information through this peer review process. (See Table 14 for correlation coefficients of peer review and feedback and the factors of technology integration.) This was illustrated by the teachers collaboratively creating classroom activities for students that utilized technology for instructional purposes ($r = .31$). The activities provided students opportunities to create products demonstrating their understanding, collaborate with peers, use technology to manipulate data, and evaluate information gathered from the Internet. Survey responses demonstrated participants were observing others' use of technology in class activities and working collaboratively to incorporate technology into students' learning activities ($r = .27$). The correlation coefficient, $r = .20$, illustrated students' use of technology was related to opportunities for peer observation and feedback. Preparing written assignments, analyzing data, researching information from the web, learning new skills, studying for tests, collaborating with others on lessons were examples of technology use by students. The final technology factor correlated to peer observations and feedback was teachers' general belief about the use of technology ($r = .24$). The responses demonstrated the belief that using technology had a positive impact for teachers and students.

Table 14

Intercorrelations of Peer Review and Feedback and the Factors of Technology Integration

	Instructional activities using technology	Sharing best practices	Students' use of technology	Positive beliefs about using technology
Professional learning communities: Peer review and feedback	.31*	.27*	.20*	.24*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

Support provided through school conditions and capacities. The *SPSLC* assessed the physical conditions and the school's organizational capacities that provided support for learning. In professional learning communities, there was a commitment to maximize the physical conditions to promote collaborative processes and procedures that provided communication between and among the stakeholders of a school, $r(215) = .20$, $p < .05$, $R^2 = .04$. Through these processes and procedures, relationships developed among staff that provided support for teachers' creating instructional activities that use technology, $r(216) = .28$, $p < .005$, $R^2 = .08$. Support for incorporating technology into the classroom activities was gained from interactions with a variety of stakeholders, such as, colleagues, administrators, students, parents, and community members. The results of the data analyses provided small correlations with the factors of support for technology integration, $r(216) = .26$, $p < .05$, $R^2 = .07$. The correlation coefficients demonstrated evidence of small relationships between the dimension of supportive school conditions and the factors of technology integration; however, the practical significance accounts for a small percentage of the variance between the variables. (See Table 15 for correlation coefficients of supportive conditions and factors of technology integration.)

Table 15

Intercorrelations of Supportive Conditions and Factors of Technology Integration

	Instructional activities using technology	Using technology to communicate with others	Support for using technology
Professional learning communities: Supportive conditions	0.28*	0.20*	0.26*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

Analysis of Paired Responses to Pre-surveys

Shared leadership. In professional learning communities, leadership is shared through involving the staff and other stakeholders in inquiry and discourse around making decisions about integrating technology in learning opportunities for students. The analysis of the pre-surveys demonstrated a positive correlation, $r(216) = .31$, $p < .05$, $R^2 = .10$. These results indicated the teachers were receiving support for using technology from various stakeholders, i.e., other teachers, administrators, students, parents, and community members. Teachers confirmed being involved in small committees as well as full staff dialogue focused on sharing information and participating in decision-making. The factor of support for integrating technology was the only factor with a significant correlation using the pre-survey data.

Shared vision. The correlations between the dimension of vision and shared values and the factors for technology integration resulted in three positive correlations utilizing the pre-survey data as illustrated in Table 16.

Table 16

Intercorrelations of Shared Vision and Factors of Technology Integration

	Using technology to communicate with others	Sharing best practices for integrating technology	Support for using technology
Professional learning communities: Shared vision	0.20*	0.25*	0.34*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

The teachers' responses to the pre-survey demonstrated the use of technology to communicate with others (*M* = 2.62, *SD* = 0.92) regarding the shared vision for teaching and learning. Through these discussions, staff members received support (*M* = 2.96, *SD* = 0.96) and shared ideas for incorporating technology (*M* = 2.79, *SD* = .92) into students' learning activities and other areas of classroom instruction.

Collective learning. Three factors of integrating technology correlated positively with the dimension of collective learning utilizing the pre-survey data. The three factors of technology integration that demonstrated statistically significant results were communicating with others using technology; sharing practices of using technology; and, support received for using technology in teaching and learning. (See Table 17 for correlation coefficients for collective learning and factors of technology integration.)

Table 17

Intercorrelations of Collective Learning and Factors of Technology Integration

	Using technology to communicate with others	Sharing best practices for integrating technology	Support for using technology
Professional learning communities: Collective learning	0.24*	0.23*	0.30*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

Peer review and feedback. For the analysis of the pre-survey data, teachers' use of technology was the only technology integration factor that exhibited a significant correlation coefficient, $r(216) = .22$, $p < .05$, $R^2 = .05$. The positive correlation demonstrated teachers were observing other teachers' practices and working collaboratively to plan and review lessons using technology.

Supportive conditions and capacities. The *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) assessed the supportive conditions and capacities that impact individual and organizational capacities as a learning organization. Also, one of the factors evaluated by the *Technology Integration* (*TI*) (SEDL, 2003) instrument was the support teachers received to use technology. The data analysis of the supportive conditions in the schools and the support teachers received to use technology resulted in a positive correlation coefficient (r = .38) demonstrating a practical significance, R^2 = .14.

Analysis of Paired Responses to Post-surveys

Shared leadership. Leadership, as a dimension of professional learning communities, involved processes that include the staff in discourse and shared decision-making. In the analysis of the post-surveys, five of the factors that contribute to technology integration had statistically significant positive correlations. These results are displayed in Table 18.

Table 18

Intercorrelations of Leadership and Factors of Technology Integration

	Using technology		Integrating technology		
	For instructional purposes	To communicate with others	Sharing practices	Support received	Positive beliefs
Professional learning communities: Leadership	.20*	.20*	.22*	.47*	.20*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

The factor of support received by teachers for using technology was the only factor that exhibited a small positive correlation with leadership using the pre-survey results (r = .31). The strength of the correlation coefficient for the post-survey had increased to a moderate relationship, r = .47. The interactions between teachers in professional learning communities engaged in discussions and shared decision-making in regard to integrating technology created support for teachers to work collaboratively about using technology. Teachers' responses demonstrated that they were working with other teachers in designing learning activities that promote students' use of technology (r = .20). Additionally, the results illustrated sharing practices through observations (r = .22) and using technology to communicate with others (r = .20). The involvement experienced by the teachers created positive beliefs regarding the impact of using technology for students' and teachers' learning. (See Table 19 for post-survey intercorrelations between leadership and factors of technology integration.)

Shared vision. Of the nine factors that promoted the use of technology for school improvement, seven factors resulted in positive correlation coefficients with the dimension of vision in professional learning communities as displayed in Table 19.

Table 19

Post-survey Intercorrelations of Vision and Factors of Technology Integration

	Using technology		Integrating technology			
	For instructional purposes	To communicate with others	Sharing practices	For student use	Support received	Positive beliefs
Professional learning communities: Vision	.24*	.26*	.28*	.20*	.43*	.20*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

Hord (1997) identified the interactions between the staff members in a professional learning community that focused discourse and actions toward efforts to improve student learning. The data analysis between the dimension of vision and the factors of integrating technology illustrated a statistically significant correlation (r = .20) for students' use of technology in learning tasks. The staffs' communications (r = .26) with others regarding the shared vision for using technology for instructional purposes (r = .24) demonstrated small correlations with small practical significances of .07 and .06 respectively. These discussions and sharing of best practices utilizing technology (r = .28) in classroom learning activities for students, teachers indicated support for using technology (r = .43) and the teachers' beliefs became more positive about the potential of using technology to enhance the educational process (r = .20). (See Table 20 for post-survey intercorrelations between shared vision and factors of technology integration.)

Collective learning. The data analysis of the post-survey data provided a description of the interactions between the dimension of collective learning in professional learning communities and the factors that impact using technology for teaching and learning. There were two technology integration factors that resulted in statistically significant correlation coefficients with the dimension of collective learning using the post-survey data that had not demonstrated significant correlations in either the overall correlations, using the data from the change means, or the pre-survey data. These technology factors were teachers' use of technology for instructional purposes (r = .20) and students' use of technology applications and tools for learning (r = .24) with practical significance of .04 and .06 respectively. Additionally, teachers indicated observing other teachers' classrooms and sharing ideas for integrating technology (r = .25). The teachers were using technology to communicate with colleagues, administrators, students, parents and community members (r = .27). For the correlations between the dimension of collective learning and the factors of technology integration, the correlation of the greatest strength was the support teachers received to build technology into their teaching and learning activities (r = .42). (See Table 19 for post-survey intercorrelations between collective learning and factors of technology integration.)

Table 20

Post-survey Intercorrelations of Collective Learning and Factors of Technology Integration

	Using technology		Integrating technology		
	For instructional purposes	To communicate with others	By sharing practices	For student use	Support received
Professional learning communities: Collective learning	.20*	.27*	.25*	.24*	.42*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

Peer review and feedback. The results of the correlation coefficients between the dimension of peer review and feedback with the factors that contribute to integrating technology demonstrated four positive, statistically significant relationships. The teachers' responses illustrated that as opportunities to observe others using technology arose, there was an increase in the students' applications of technology for classroom assignments (r = .26). Also, peer review and feedback correlated with sharing classroom technology practices (r = .29) and teachers' use of technology for learning tasks for students (r = .27). Finally, for the correlations with the dimension of peer review and feedback, the results indicated teachers received support for using technology in activities for students (r = .38). (See Table 21 for intercorrelations of peer review and factors of technology integration.)

Table 21

Post-survey Intercorrelations of Peer Review and Factors of Technology Integration

	Using technology	Integrating technology		
	For instructional purposes	By sharing practices	For student use	Support received
Professional learning communities: Peer review	.27*	.25*	.27*	.40*

*Correlation is significant at the corrected level of $p < 0.05$ (2-tailed).

Supportive conditions. The results of the post-surveys demonstrated positive correlations between the supportive conditions that exist in professional learning communities and two of the factors contributing to integrating of technology. The teachers' responses indicated supportive conditions for a collaborative environment in which teachers contributed ideas about their practices with the staff, $r(216) = .28$, $p < .05$, $R^2 = .07$, and received support for using technology in teaching strategies , $r(216) = .49$, $p < .05$, $R^2 = .24$ indicating a practical significance of .24 or 24 percent of the variance between the variables.

Summary of Overall Correlations, Paired Pre-surveys, and Paired Post-surveys

Table 22 displayed the overall, paired pre-surveys, and the post-surveys' correlations coefficients.

Table 22

Intercorrelations of Dimensions of Professional Learning Communities and Factors of Technology Integration

Factors of *Technology Integration*	Shared leadership	Shared vision	Collective learning	Peer feedback	Support
Instructional	0.214*			.315*	.283*
Pre-				.216*	
Post-	.201*	.236*	.201*	.265*	
Planning					
Pre-					
Post-					
Communicating			.238*		.203*
Pre-		.199*	.242*		
Post-	.204*	.262*	.268*		
Data for decisions					
Pre-					
Post-					
Shared practices				.269*	
Pre-		.249*	.226*		
Post-	.224*	.284*	.250*	.289*	.276*
Students' use				.198*	
Pre-					
Post-		.197*	.241*	.256*	
Support					.262*
Pre-	.308*	.340*	.300*		.379*
Post-	.474*	.426*	.424*	.397*	.492*
Positive beliefs				.236*	
Pre-					
Post-	.237*	.202*			
Negative beliefs					
Pre-					
Post-					

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

In summary, there were nine correlations found between the dimensions of professional learning communities and factors of technology integration change score means that were statistically significant at the corrected significance level of $p = .05$. The dimensions of peer review and feedback was correlated with the largest number of technology integration factors for this set of data. The factor of teachers' use of technology for instructional purposes correlated with three dimensions of professional learning communities.

For the paired *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) pre-survey data results, there were correlations found in all five dimensions of professional learning communities, for a total of nine correlations between these dimensions and the technology integration factors. The factor of indicating the support received for technology use correlated with four dimensions.

Lastly, the paired *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) post-survey results demonstrated 22 correlation coefficients that were statistically significant at the corrected significance level of $p = .05$ level. The significant relationships between the interactions in professional learning communities and integrating technology into the teaching and learning processes were distributed across the dimensions. Six of the nine technology integration factors were involved in the 22 correlations.

Administrators' Data Analysis

The administrators responded to cross-sectional survey instruments in the same time frame as the teachers completed the post-surveys. The instrument, *School Professional Staff as a Learning Community* (Hord et al., 1999), was the same instrument administered to teachers. The technology integration instrument provided administrators opportunities to state their use and expertise using computers and their perceptions of teachers' use of technology using a 'now and prior' response format for each question. The responses to the *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) and the *Technology Integration* (*TI*) (SEDL, 2003) were paired. The administrative sample (n = 23) represented 16 of the grant recipient schools.

Administrators provided self-reported information regarding their frequency of technology use, expertise in using technology, and the ways they use computers. Twenty-two (95.7 percent) of the administrators reported using computers daily. The majority (60.9 percent) of the administrators reported being at the advanced level in computer expertise, 34.8 percent at the intermediate level, and 4.3 percent at the beginner level. Administrators reported using a computer for school communication and personal use on a daily basis (87 percent). The frequency of computer use for school record-keeping was daily for 78.3 percent of the sample's administrators.

Administrators were asked to describe their level of proficiency using a variety of computer applications and tools. The response options ranged from not at all (1) to expert (5). In general, the administrators' responses to their level of expertise ranged from moderate (3) to well (4). (See Table 23 for the descriptive statistics of technology proficiency levels.)

Table 23

Administrative Descriptive Data of Computer Use

Use of computers (*n* = 23)	*M*	*SD*
Computer use	4.96	0.21
Computer expertise	2.57	0.59
Types of use	4.50	0.77
Technology proficiency	3.21	0.77

For the variable of professional learning communities, the administrators viewed the dimensions of professional learning communities as an integral component of the interactions of their schools. Table 24 displayed the descriptive statistics for the five dimensions.

Table 24

Administrative Descriptive Statistics for the Dimensions of Professional Learning Communities

Dimensions	N = 23	*M*	*SD*
Shared leadership		4.30	0.54
Shared vision		4.49	0..51
Collective learning		4.09	0.57
Peer review		3.04	1.09
Supportive conditions		4.08	0.54

The *Technology Integration* (*TI*) (SEDL, 2003) included items to assess the administrators' perceptions of teachers' use of technology for instructional purposes and the teachers' understanding of computers, technology applications, tools, and overall technological skills. The descriptive statistics for these factors are listed in Table 25.

Table 25

Administrative Descriptive Statistics for Technology Integration Factors

Technology Factors (*n* = 23)	*M*	*SD*
Instructional purposes	2.83	0.49
Plan for technology	3.26	0.64
Communicating	2.70	0.72
Data for decisions	2.99	0.74
Shared practices	3.09	0.55
Technology understanding	3.18	0.58
Support received	3.62	0.67

In summary, using the self-reported data, the teachers and administrators indicated daily computer use. Teachers expressed their computer expertise was slightly less than the administrators demonstrated through their responses. Administrators use technology more frequently for school communications and record keeping than the teachers, and the two groups were approximately equal in personal use of computers. The administrators viewed the dimensions of professional learning communities to be slightly more advanced in the schools than did the teachers. In contrast, the administrators' perceptions of technology integration were slightly lower in three of the seven factors as compared to the teachers.

Grant Document Analysis

The final quarterly reports and field notes (collective referred to as grant documents) were analyzed for evidence of the dimensions of professional learning communities and the factors of technology integration. The data presentation was organized using descriptions from the grant documents as well as quotes that targeted specific evidence from the reports.

Professional Learning Communities

Shared leadership. A school described the staffs' participation in shared leadership in areas such as class offerings and technology integration. A leadership team had developed benchmarks for authentic teaching with technology, teacher web pages, and student products. The leadership team reviewed teacher surveys and other school data to assess the school's progress on goals, and they used this data to revise the goals and design professional development for the upcoming year.

Shared vision. In a continuing assessment of progress towards school improvement goals, a school's data demonstrated a new awareness of the school's shared vision and goals that seemed to create a feeling of discontent with the current status and a desire to plan and work together. One principal described the grant's impact on the site team as creating "a new meaning …. Prior to the grant we met three or four times per year. Currently, we are meeting two times per month, collaborating and sharing teaching strategies, curriculum ideas and management skills" for the goal of improving student achievement (Grant Documents, 2003).

Collective learning. The narrative description portrayed the interactions of a staff involved in collective learning.

> As staff members come together to collaborate, share and discuss authentic teaching and learning, intense back-and-forth dialogues and discussion of instructional topics, ideas, and issues assisted teachers in becoming more efficient and effective in the classroom.. Grade level teams meet … to bring together complementary skills and experiences that exceed those of any individual on the team (Grant Documents, 2003).

Peer review and feedback. A structure that several schools have implemented provided support for individuals and small groups through an identified coach or lead teacher. Their role was to assist staff members in technology integration needs or provide feedback on strategies used. One site's "train the teachers" coaches received additional professional development to deliver sessions for fellow staff members and to be available as a resource. Individual teachers highlighted the excitement of being involved with their fellow staff members in discussions centered on implementing the technology equipment in ways that involved their students.

Supportive conditions. The reports enumerated a list of support systems that were demonstrated in the grant schools. Supportive administrators provided capacity-building professional development, access to equipment, and time for teachers to begin utilizing the equipment using appropriate curriculum. Communities expressed support through matching grant funds so schools could purchase more equipment. Also, as instructional leaders, principals observed teachers' classrooms to support and, in some cases, provide technical assistance for the teachers' integration of technology.

Factors of Technology Integration

Teachers' use of technology for creating learning activities for students. "When the teachers integrated technology with required curriculum, the results demonstrated dramatic, powerful teaching and learning…. Teachers utilized the equipment and software to enhance their teaching style [and] they modeled the use of technology for students" (Grant Documents, 2003). Teachers described classroom activities that had been created including lesson presentations, activities using digital cameras, illustrating books using drawing programs, science lab experiences, graphing calculators, producing videos, writing assignments, and many others.

Planning and collaborating for integrating technology. As a part of the grant, schools developed an assessment plan and collected data throughout the year. The data have been analyzed and utilized to review goals and establish professional development opportunities for the next school year. Other schools provided evidence of teachers sharing ideas and collaborating about strategies to integrate technology into the curriculum.

Using technology to communicate with others. Creating web pages, newsletters, and monthly calendars that shared information about the school's learning environment were strategies reported by the 2003 grant recipients to communicate with parents and the community. One school described the process of developing instructional resources for posting on their web page. Others utilized technology as a theme for parent nights to share the work products of students and to involve the parents in the use of technology.

Using technology to make decisions for student learning. One report described a benefit of the OK-ACTS professional development.

> We received technology templates to enter assessment data so that we could effectively evaluate strengths and weaknesses on an ongoing basis. This visual representation has been so valuable and eases the understanding of an otherwise overwhelming source of data. This benefit alone has been a priceless addition for us (Grant documents, 2003).

Sharing best practices for integrating technology. Scheduled meeting times as well as informal gatherings provided staff members opportunities to collaborate and share ideas for integrating technology into their curriculum. In one school district, a resource book of technology applications was made available to all teachers.

Students' use of technology. Students were organizing their work and using technology to present their final products. Teachers shared that, in some cases, it was the students that were providing the technology support for the teachers. Students were involved in more authentic learning experiences that utilized the technology purchased through the grant and were "encouraged and were held responsible for their individual learning" (Grant Documents, 2003). The students seemed to be more attentive and involved in the lessons. The views expressed in a report described the students' view of technology "as a powerful resource to be integrated through their lifestyles rather than a means to an end in an isolated event … They [the students] were engaged in meaningful, relevant work based on individual interests and framed around essential questions" (Grant documents, 2003).

Support received for the use of technology. As one principal shared, "The training process was the heart of OETT/OK-ACTS" (Grant Documents, 2003). Grant recipients acknowledged that the professional development provided support for administrators and teachers in technology integration. Teachers expressed the feeling of support from OK-ACTS, principals, parents, businesses, and students. Throughout the reports, there seemed to be an appreciation for the equipment purchased through the grant funds that specifically targeted their established goals. In addition to the equipment and support of professional development, the commitment of providing time for interactions among the staff members to practice their new skills and to have discourse were mentioned as important to the process.

Beliefs regarding the use of technology. One principal stated that in today's atmosphere of accountability, the norm has been to measure change in a school through the assessments of students' achievement, "but the real measure of the importance of using technology in the classroom came from the intrinsic values gained by the teachers themselves" (Grant documents, 2003). This principal continued by describing when the school received the grant, the "thought of using a computer and other technology in the classroom on a regular basis was not comprehensible for most of this staff" (Grant Documents, 2003). This school's assessment data indicated the students, in fact, did demonstrate gains in their achievement scores on the state's criterion referenced tests.

Analysis of School Performance Index

One measure of a school's progress toward its educational goals is the State of Oklahoma's accountability measure, Academic Performance Index (API), a formula for determining Adequate Yearly Progress as required by NCLB. The API index formula

varies by school level. For elementary schools, the API is based on student achievement data (90 percent) and attendance (10 percent). For secondary schools, the formula includes other factors, such as, graduation rate and dropout rate, with 80 percent based on student achievement data. As a part of the grant application, the schools provided their 2002-2003 score. The 2003-2004 API scores were obtained from the School Report Card (Education Oversight Board, 2003, 2004) and compared to the 2002-2003 scores.
All but one of the study's grant schools were included in the analysis. One grant school was a subdivision of another school and did not receive a separate school API score.

Table 26

Study Schools' Academic Performance Index

Sample	2002-2003	2003-2004	Increase
Schools in study	1086	1161	6.45
State of Oklahoma	1046	1086	3.68

Table 21 displays the State of Oklahoma's average API scores and the study schools' API scores for two years. The schools involved in the study had a 75 percent larger increase in API than the state average.

Summary

The results of the study were analyzed and interpreted in this chapter. A brief review of the instrumentation was given with the response rates for the surveys. Demographic data from the surveys provided a description of the teachers in the study. Information shared included: gender, school level, teaching assignments, years employed as a teacher, and years of teaching in the current school. Additionally, the teachers provided the frequency of their computer use and their level of expertise using technology.

The relationship between the variables of professional learning communities and technology integration were examined by calculating correlation coefficients. The first question investigated was if a relationship exists between the overall ideas of professional learning communities and integrating technology into teaching and learning. The overall relationship was a moderate correlation between the variables of $r = .33$, indicating a small practical significance. Following this analysis, the intercorrelations between each of the dimensions of professional learning community with each of the factors for technology integration were computed. The results were examined in three different combinations of the data, including the change means from the pre-survey to post-survey responses, the paired pre-survey data, and finally, the paired post-survey data. The significant relationships were reported by describing the characteristics of the dimensions of professional learning communities and the specific factors that impact technology integration. There were nine statistically significant correlations using the data from the pre-survey to post-survey change means. The data analysis of the pre-survey results demonstrated nine positive correlations and 22 correlation coefficients indicating small to medium relationships and small practical significance. The correlations involved all the dimensions of professional learning communities and six of the nine factors of technology integration.

Grant documents including the final quarterly reports and field notes were analyzed for evidence of the dimensions of professional learning communities and the factors that contribute to integrating technology. Summaries, as well as quotes from the documents, were utilized to add descriptive illustrations from the schools.

An analysis of the study schools' Academic Performance Index (API) was conducted to determine the average increase in scores over the grant school year. A comparison was made between the state's average increase and the increase by grant schools.

CHAPTER SIX

Summary and Discussions

In conclusion, this chapter reviewed the problem, research questions, and the design of the study. The emphasis of the chapter was to summarize the major findings of the study; draw conclusions about the meaning of the findings; discuss the implications for practice, preparation programs, future research; and, study limitations.

Statement of the Problem

Technology has changed the world and the way we live and work. The global nature of today's economy requires technological skills to compete for jobs in the current and future workforce. Preparing students to enter society with technologically literacy has added another dimension to the demands on our schools. Research has documented the impact of technology on student achievement to positively impact learning in content subjects, the development of thinking skills, and the application of deeper knowledge of content and thinking processes to develop the skills necessary in the workforce and future careers (Cradler et al., 2002). The availability of technology in schools has increased significantly over the past decade (NCES, 2000); however, there has not been a paralleled increase in the use of technology in teaching and learning processes (Becker, 2001; Cuban, 2001). Becker and Riel (2000) found that teachers' successful use of technology for student learning was promoted by collaborating and sharing instructional practices. A collaborative culture is one of the criteria for the existence of professional learning communities. Yet there was not empirical data regarding the relationship between the professional learning communities and technology integration.

Research Questions

Two questions guided this investigation. Question One: Is there a relationship between professional learning communities and the integration of technology in the teaching and learning process? Question Two: Is there a relationship between the dimensions of professional learning communities and factors for integration of technology for teaching and learning?

Review of the Study's Methodology

As described in Chapter 4, this was a quantitative study of an accessible population of schools that were involved in the Oklahoma Educational Technology Trust (OETT)/ Oklahoma – Achievement and Collaboration through Technology Support (OK-ACTS) Grants-to-Schools project. Twenty-one schools in eighteen districts received a grant in the fall of 2003. The schools had selected 3 of the *10 Practices of High-Achieving Schools* (O'Hair et al., 2000) to integrate technology to impact teaching strategies for student learning. Professional development was provided by OK-ACTS in the schools to facilitate the development of professional learning communities and the integration of technology in students' learning activities.

The primary data sources were two pre- and post-survey instruments, *School Professional Staff as a Learning Community* (*SPSLC*) (Hord et al., 1999) and *Technology Integration* (*TI*) (SEDL, 2003), that gathered data about the status of the characteristics of professional learning communities in the schools and the technology used in the work of the school. The teachers' surveys were longitudinal instruments, while the administrators' instruments were cross-sectional. The sample was determined by pairing the responses from the pre- and post-surveys and consisted of 218 teachers and

23 administrators. Correlation coefficients were calculated for analysis of the relationships between the dimensions of the professional learning communities and the factors of technology integration. These relationships were examined using the data in the following three combinations: the change score means from pre-surveys to post-surveys; the paired pre-surveys, and the paired post-surveys.

Summary of the Results

Overall Relationships

The overall correlation between professional learning communities and technology integration demonstrated a medium correlation with a small practical significance. A positive correlation coefficient signified that as one measure increased, there was a corresponding increase in the other measure; therefore, as teachers' and administrators were involved in the practices that exemplified professional learning communities, there was an equal implementation of technology integration.

Change Scores from Pre-surveys to Post-surveys

For the data set of the change scores means from *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) pre-surveys to *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) post-surveys, there were nine statistically significant correlations listed in Table 27.

Table 27

Change Scores from SPSLC and TI Pre-surveys to SPSLC and TI Post-surveys

Dimensions of *Professional Learning Communities*	Factors of *Technology Integration*
• Peer review and feedback	• Teachers' use of technology
	• Sharing best technology practices
	• Student' use of technology
	• Teachers' positive beliefs about use
• Supportive conditions	• Teachers' use of technology
	• Using technology to communicate
	• Support teachers received
• Shared leadership	• Teachers' use of technology
• Collective learning	• Using technology to communicate

These correlations seemed to demonstrate the significance of the interactions between two of the professional learning communities characteristics, namely, peer teacher interactions and the schools' physical and capacity-building supportive conditions with the positive relationships of teachers' beliefs, sharing best practices, and use of technology to impact student learning. Supportive conditions, such as common planning times, provided opportunities for teachers to observe others use of technology and to collaboratively create students' learning activities. Also, the results illustrated that sharing with others in decision-making processes and learning collectively has a positive relationship with the teachers' use of technology for students' learning activities and using technology for communication with others, respectively.

Paired SPSLC (Hord et al., 1999) and TI (SEDL, 2003) Pre-survey results

Using the paired *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) pre-surveys results, the correlational analysis revealed nine significant correlation coefficients. These results are displayed in Table 28.

Table 28

Paired SPSLC (Hord et al., 1999) and TI (SEDL, 2003) Pre-survey Results

Dimensions of *Professional Learning Communities*	Factors of *Technology Integration*
• Shared vision	• Using technology to communicate
	• Sharing best technology practices
	• Support received by teachers
• Collective learning	• Using technology to communicate
	• Sharing best technology practices
	• Support received by teachers
• Shared leadership	• Support teachers received
• Peer review and feedback	• Teachers' use of technology
• Supportive conditions	• Support teachers' received

These correlations illustrated relationships between the learning community dimensions of interactions in creating a shared vision and in participating in practices of collective learning and the technology integration factors of teachers using technology to communicate with others, teachers sharing best technology practices, and the support the teachers received for using technology. Teachers observing other teachers and having discourse about their observations was positively associated with teachers' use of technology for designing students' learning activities. The support teachers received for using technology had positive correlations with four dimensions of professional learning communities.

Paired SPSLC (Hord et al., 1999) and TI (SEDL, 2003) Post-survey Results

The paired *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) post-surveys analyses resulted in 22 positive correlations demonstrating relationships between the factors contributing to the use of technology in schools and the interactions of the staffs to improve student learning. Relationships were exhibited in all five of the dimensions of professional learning communities, with six of the nine technology integrations factors, as illustrated in Table 29.

Table 29

Paired SPSLC (Hord et al., 1999) and TI (SEDL, 2003) Post-survey Results

Dimensions of *Professional Learning Communities*	Factors of *Technology Integration*
• Shared vision	• Teachers' use for student learning
	• Using technology to communicate
	• Sharing best technology practices
	• Students' use of technology
	• Support received by teachers
	• Teachers' positive beliefs

• Shared leadership	• Teachers' use for student learning
	• Using technology to communicate
	• Sharing best technology practices
	• Support received by teachers
	• Teachers' positive beliefs
• Collective learning	• Teachers' use for student learning
	• Using technology to communicate
	• Sharing best technology practices
	• Students' use of technology
	• Support received by teachers
• Peer review and feedback	• Teachers' use for student learning
	• Sharing best technology practices
	• Students' use of technology
	• Support received by teachers
• Supportive conditions	• Sharing best technology practices
	• Support teachers received

The most statistically significant correlations were relationships between the support teachers received for using technology and each of the five dimensions of professional learning communities. Also, the technology factor of sharing best practices for using technology was correlated with all five dimensions of professional learning communities.

The factors of technology use that involved teachers using technology to create learning activities for students or students' use of technology for learning tasks were positively correlated with four of the dimensions of professional learning communities, including shared leadership, shared vision, collective learning, and peer review and feedback. Finally, the technology factor of using technology to communicate with others was associated with the dimensions of shared leadership, shared vision, and collective learning.

Administrative Data

The administrators' data indicated their perceptions of the status of the characteristics of professional learning communities in their schools were higher than the teachers' perceptions. Additionally, the administrators seemed to indicate the level of technology implementation was lower than the teachers had reported.

Academic Performance

As an indicator of the schools' progress toward achieving their educational goals, a comparison was calculated between the previous year's and the current year's Academic Performance Index (API), which is an indicator of adequate yearly progress as required by the No Child Left Behind legislation. The grant schools in the *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) pre- and post-survey sample (n = 218) demonstrated an API greater than the state average.

Discussion of the Results

Interpretation of the Findings

Overall correlations. The overall relationship of the dimensions of professional learning communities and the factors of technology integration demonstrated a medium correlation ($r = .33$) with small practical significance. The correlation coefficient increased from the overall pre-survey results ($r = .23$) to the post-survey results ($r = .32$), demonstrating as the schools' staffs became more involved in the characteristics of professional learning communities, there was a similar involvement in integrating technology into the school experiences. Conversely, the relationship demonstrated as technology was integrated into the teaching and learning processes of the school, there was a corresponding involvement in the characteristics of professional learning communities. That is, the correlation coefficients established a positive relationship between the dimensions of professional learning communities and the factors of technology integration, but correlations do not indicate causal or directional determination. In a study of professional engagement and teaching practice, Becker and Riel (2000) found a strong association between teachers' involvement in being leaders among peers, mentoring and providing professional development and their effective use of computers with students. This study's results provided empirical data to support their findings.

Change score means from pre-surveys to post-surveys. Through an examination of the correlations between the separate dimensions of professional learning communities and the factors contributing to technology integration, the dimension of peer review and feedback correlated with four of the nine factors that influenced incorporating technology: teachers' use of technology for students' learning activities, sharing best technology practices, students' use of technology, and positive beliefs towards the use of technology. These findings add empirical data to support the study by Burns (2002) that found professional development that integrated technology with learner-centered approaches resulted in teachers having inquiry and discourse about best practices for the classroom, followed by changing their instructional practices to reflect lessons that incorporated activities that promoted student learning. Peer review and feedback involved teachers in observing others' classrooms and having inquiry and discourse centered on practices or strategies observed in these classrooms. These interactions demonstrated an atmosphere of mutual respect, provided ideas for them to use in their classrooms, and promoted the adoption of new practices (Hord, 2004). Teachers' learning was enhanced through the receiving of constructive feedback on specific innovations (King & Newmann, 2001). Knapp et al. (2003) identified interactions of professionals contributing ideas of effective practices and providing feedback as the most valuable form of professional learning to improve practice. Findings from this study enhanced the empirical data supporting the contribution of these shared practices.

Another dimension of professional learning communities that contributed to positive associations with integrating technology was supportive conditions. Supportive conditions correlated with teachers' use of technology for instructional purposes, use of technology for communicating with others, and the support teachers received for using technology. Supportive conditions included both the physical and structural factors, such as time and space for meetings, as well as the conditions which support the development of individual and organizational capacities. Supportive administrators nurture the development of human capacities through promoting social processes within a caring environment. Findings from a study by Newmann, Rutter, and Smith (1989) indicated the importance of school leaders and teachers being connected to problems and their application to current practice. This study empirically supported the relationship between supportive conditions, both physical and the conditions for human capacity development, and the use of the innovation of technology for instructional purposes.

Pre-survey relationships. The paired pre-surveys demonstrated teachers received support to use technology through shared leadership, shared vision, collective learning, and supportive conditions. Other relationships that existed prior to the intervention of professional development provided by OK-ACTS were between the factors of using technology to communicate with others and the dimensions of shared vision and collective learning. Also, there were positive correlations between the dimensions of shared vision and collective learning and the technology factor of sharing best practices. These results seemed to confirm similar processes in the grant schools. One possible explanation was that the administrators had participated in the OK-ACTS Phase I Leadership Development. As described in Chapter 3, Phase I involved the head superintendent and principals in professional development based on building professional learning communities that use technology as a tool for increasing student achievement. The professional development was based on the *10 Practice of High Achieving Schools* (O'Hair et al., 2000); therefore, many of the schools had begun the processes involved in becoming a professional learning community. Also, the grant application process was directed towards the implementation of these practices of high achieving schools.

Post-survey relationships. In all cases of pre-survey correlations, the post-survey data resulted in higher correlations, which demonstrated growth or an increase in the actions exemplifying each of these areas during the professional development or treatment phase. Based on the findings from this study, the evidence emphasized the interconnections between the dimensions of professional learning communities and the factors that contributed to integrating technology. Using the post-survey data, there were

22 statistically significant correlations. These relationships were divided across the five dimensions of professional learning communities with six factors of technology integration. The relationships with the greatest correlation coefficients were between the five dimensions of professional learning communities and the technology integration factor of support teachers received for using technology. This was followed by the factor of sharing best practices for technology use with all the professional learning communities' dimensions. Administrators had a significant influence on integrating technology and learning experiences through the development of a culture that emphasized professional development opportunities, provided supportive conditions for using technology, and shared leadership (Hughes & Zachariah, 2001). Next, four dimensions of professional learning communities were correlated with teachers' use of technology for students' learning tasks. Teachers involved in a community of learners, providing support and assistance to each other, incorporated activities for students through active learning strategies more often than teachers who used traditional teaching practices (Becker & Riel, 2000; Burns, 2002). This study's results provided empirical data that supported these studies.

Other correlations that resulted from the post-survey data involved the technology factors of using technology to communicate with others and shared leadership, shared vision, and collective learning. Also, the data indicated relationships between the professional learning community's characteristics of shared leadership and shared vision and the teacher's positive beliefs about the use of technology. The data confirmed studies by O'Dwyer, Russell, and Bebell (2004) that positive teachers beliefs about the use of technology's impact on student learning were positively related to technology uses. Finally, technology served as a catalyst (Burns, 2002) for staffs to become involved in the processes of professional learning communities. The study's results seemed to demonstrate that integrating technology significantly impacted the growth of the interactions among the staffs, which is a characteristic of professional learning communities. An elementary principal illustrated these findings by the statement, "The grant has provided a jump start for our staff in becoming a community. What should have taken at least three years has been accomplished in what, three months" (Grant Documents, 2003).

Relationship of Current Study to Previous Research

Research by Murphy (2001) and Waters et al. (2003) emphasized the administrator's role in leading educational reform efforts. As the administrator and school's staff developed a shared vision for teaching and learning, the process of identifying the school's values was an important step in the course of changing teaching behaviors (Fullan, 2003; Senge, 1990). To move the school toward the shared vision of developing professional learning communities and integrating technology into the teaching and learning processes, administrators, as the leaders of learning organizations, focused on the interactions and relationships among the staff (Senge, 1990; Sparks & Hirsh, 1997).

This study's findings provided empirical evidence that opposed the findings of research by Hord (2004) that the dimension of peer review and feedback was the last dimension of professional learning communities to develop. The relationships between the processes of professional learning communities and the factors that contributed to integration of technology seemed to have involved teachers in the development of peer interactions earlier in the development of the professional learning communities. The results of this study illustrated the interactions involved in peer review and feedback as well as sharing best practices using technology provided support for teachers to use technology for learning tasks of students.

Additionally, the supportive conditions created through the processes of being professional learning communities provided involvement in shared decision-making and establishing the shared vision for student learning. Teachers participating in communities of practice felt supported by administrators who established the common vision and held that vision as the focus for the school (Printy, 2004). The collective learning of the staffs was associated with teachers' use of technology for designing student activities that utilized technology. These findings demonstrated an increase in teachers' confidence to provide appropriate instruction for student learning, thus creating an increased sense of self efficacy (Frase, 2001). The findings indicated that, as the grant schools journeyed through the processes of developing professional learning communities and integrating technology into teaching and learning, individuals and the organizations were growing and adjusting to new paradigms of schooling.

Implications for Practice

With the *No Child Left Behind* legislation that has increased accountability measures for student learning and the increased demand for technology literacy, schools are faced with the dilemma of meeting these demands while facing the various pressures that exist in today's schools. This quantitative study's results provided evidence of a model that addressed these demanding and daunting mandates. The variables in this study were the dimensions of professional learning communities and the factors of technology integration. A link has been established between schools that exhibited the characteristics of professional learning communities and improved student achievement (Lee & Smith, 1994; Morrissey, 2000; Newmann & Wehlage, 1995). In a corresponding fashion, a meta-analysis of research studies investigated the impact of technology use on student achievement with findings that indicated small to modest, positive effects of using technology for teaching and learning (Waxman et al., 2003). Yet, the overwhelming evidence provided by numerous studies and reports (Becker, 2001; Cuban, 2001; NCES, 2000) was that the actual use of technology in teaching and learning has not kept pace with the availability of technology in the classroom. The findings from this study demonstrated a moderate, positive association between the characteristics of professional learning communities and the factors contributing to the integration of technology in the teaching and learning process.

The role of the school administrator was vital to this process. Senge (1990) described school leaders as being responsible for creating an environment for learning so people can continue to learn. The formal role of school leaders established structures for shared decision-making and the development of a shared vision for the school and built a commitment towards accomplishing the shared vision. Further study results indicated that schools staffs' involvement with the characteristics of professional learning communities around the factors of technology integration produced changes in the dimensions and factors. In practical terms, as teachers and administrators were learning about professional learning community processes and the uses of technology for teaching and learning, inquiry and discourse about one variable lead to the other variable and in the opposite direction. Consequently, school administrators should move their staffs toward implementing the practices of professional learning communities and technology that are focused on accomplishing the school's vision.

Learning opportunities for teachers and administrators must address adult learning principles (Elmore, 2000). Loucks-Horsley et al. (2003) found for adult learning to be effective, the topic should be relevant, useful immediately, experiential, and have opportunities for application of learning. The *Concerns Based Adoption Model* (*CBAM*) (Hall & Hord, 2001) provided a process of accessing the concerns the teachers or administrators had about the innovation being adopted. From these assessments appropriate professional development can be planned and acknowledge individual's level of concern about the innovation. Following the *CBAM* model, a similar model was developed for technology integration (Dwyer et al., 1991). The change process moves from learning about the basic aspects of the technology, to the use of technology for traditional instruction and student production of existing classroom activities, to beginning to create new learning experiences, and finally, after over 80 hours of training and 4-5 years, teachers reflect about their fundamental perceptions of instruction. School leaders should be aware of the progression of change characteristics for planning and supporting the change efforts.

Middleton and Murray (1999) found that to implement technology in the classroom, professional development was as important as purchasing the equipment. Professional development can provide the skills and knowledge for the change process. To support teachers in learning and address increasing the capacity of the organization, "professional development should address three dimensions of school capacity – teachers' knowledge, skills, and dispositions; the strength of the schoolwide professional community; and the coherence of the school program" (King & Newmann, 2000, p. 576). Through this development of not only the individual, but of the capacity and relationships within the organization, schools promoted change. As teachers and administrators developed new knowledge, skills, and dispositions about the role of technology or the dimensions of professional learning communities, the capacity of the organization increased.

Implications for Preparation Programs

During the last decade, the availability of technology equipment as well as access to the Internet has increased significantly at the university level; however, the impact on teaching strategies has been minimal (Cuban, 2001). Professors and students utilize computers for lesson preparation and research, but the basic structures of class interactions have not changed significantly. Also, the development of professional learning communities is a trend at the university level. Learning from other teacher educators or colleagues from across universities offers opportunities for peer review and feedback that contributes to collective learning for participants in the process. These interactions could involve sharing the results of one's research or having discourse on effective teaching strategies. From the findings of this study, the faculty at the university level would benefit from the interactions between university faculty members centered on strategies to integrate technology in teaching courses and modeling the effective use of technology. Technologies provide multiple avenues for the presentation of the concepts of a course as well as students' manipulation of data and presentation of their learning. Through these processes that are similar to peer review, which is an accepted practice for publishing, a collective understanding builds the capacity of the community.

As described in the *Implications for Practice*, preparation programs must prepare future school administrators to have an understanding of schools as learning organizations and the processes involved in the school community to become learners. Effective school leaders should recognize the influence of the collective capacity of the organization to address the complexity of the change process and focus the efforts of stakeholders on achieving learning for all (Fullan, 1991). The processes involved in developing professional learning communities provide school leaders with structures for sharing decisions with teachers, developing leadership capacities, and enhancing the coherence of the school as a learning organization.

Administrative preparation programs should model the development of professional learning communities and integrating technology so that future school leaders have the experience of the interactions and support provided in such an environment. Field experience in schools would provide administrative interns opportunities to assess the characteristics of professional learning communities and the factors contributing to technology integration present in the schools to consider the implications of the practices. Future administrators need to become familiar with the research regarding professional learning communities and technology integration and the impact of these theoretical perspectives on the learning environment of the school.

Recommendations for Future Research

The findings of this study suggested areas for further study to develop a more thorough understanding of the interactions that were demonstrated by these data. The literature regarding whole school reform established the timeframe for change to occur was from three to five years (Fullan, 2001, 2003). This study found areas of teachers' behaviors and classroom practices changing within a few months after the beginning of the intervention of professional development. Further research about the relationship between the impact of technology and the rate of change occurring in the characteristics of professional learning communities would be helpful. Research investigating the impact of changing the focus to another innovation would contribute to the knowledge base for sustaining reform measures.

This study established the association of the process of peer review and feedback with the use of technology. Possible research questions are: How did administrators establish the processes that allowed for and promoted peer review and feedback around the practices of integrating technology? What other innovations, i.e., is the association of peer review and feedback selective to technology or will other innovations promote it as well? Was the type of long-term professional development the key factor in promoting the practice of peer review and feedback? Are there other innovations that create the conditions for peer review that would show stronger relationships?

The major focus of school reform efforts has been to have a positive impact on student achievement and school performance. With data from the Oklahoma Academic Performance Index (API), there were indications of an impact on student learning by integrating technology and professional learning communities. Research of other student achievement data and its relationship to technology integration and professional learning communities would provide validity to the comparison of the API results for the 2003 Grants-to-Schools program.

Study Limitations

The pre-and post-survey instruments utilized in this study relied on self-reported data from the participating teachers and administrators. The surveys' response formats utilized a five-point Likert scale producing nominal data. In the data analysis procedures, the data were treated as continuous, interval data (Punch, 2003). As the scores on the five-point Likert scale aggregated toward the higher scores on the post-surveys, there was less variation in the scores. (Regression towards the mean or the tendency of extremes to revert toward averages)

Some teacher and administrators did not complete the pre- and/or post-surveys, *School Professional Staff as a Learning Community* (Hord et al., 1999), or the *Technology Integration* (*TI*) (SEDL, 2003) survey, so the data were not included in the sample. The administrators were given cross-sectional instruments which created a difference in the data collected between the teachers and the administrators.

The participants were a purposive sample from the accessible population of 2003 Oklahoma Educational Technology Trust (OETT)/Oklahoma - Achievement through Collaboration and Technology Support (OK-ACTS) grant recipient schools and/or districts. This fact may limit the generalizability of the findings of the study. The schools investigated in this study had variability in school size, length of time principal or superintendent had served in the school, varied career and professional development experiences, community and school demographics, and community support; however, all administrators of the districts or schools had the common experience of the OK-ACTS Phase I Leadership Development.

The literature indicated change in school culture takes from three to five years (Fullan, 1991). The timeframe between the pre-survey and the post-survey instruments being administrated was less than one school year. This may have impacted the strength of the correlations.

Summary

This study investigated the relationships between the dimensions of professional learning communities and the factors which influence the integration of technology in a purposive sample of Oklahoma schools. The intervention consisted of professional development that facilitated the interactions that characterize professional learning communities and the factors that contribute to teachers' and students' use of technology. The findings of this study demonstrated a medium, positive correlation indicating as the practices that exemplified professional learning communities increased, there was an equal implementation of technology integration.

The relationships with the greatest correlation coefficients were between the five dimensions of professional learning communities and the technology integration factor of support teachers received for using technology. These findings illustrated the administrator's influence on the learning environment of their school and the integration of technology through the development of a culture that provided supportive conditions for the development of human capacities through promoting peer interactions that result in collective learning.

The dimension of peer review and feedback was correlated with the factors that influenced teachers' use of technology and sharing of their best practices for using technology to impact students' learning activities. Results demonstrated the effect of combining professional learning communities and integrating technology to increase teachers' peer interactions. The significant relationships between the professional learning communities and integrating technology in the teaching and learning processes were distributed across the five dimensions of professional learning communities and with six of the nine technology integration factors.

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APPENDICES

APPENDIX A

Appendix A

Technology Standards for School Administrators

I. Leadership and Vision:

Educational leaders inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.

Educational leaders:
A. facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision.
B. maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long-range, and systemic technology plan to achieve the vision.
C. foster and nurture a culture of responsible risk-taking and advocate policies promoting continuous innovation with technology.
D. use data in making leadership decisions.
E. advocate for research-based effective practices in use of technology.
F. advocate, on the state and national levels, for policies, programs, and funding opportunities that support implementation of the district technology plan.

II. Learning and Teaching:

Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.

Educational leaders:
A. identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement.
B. facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning.
C. provide for learner-centered environments that use technology to meet the individual and diverse needs of learners.
D. facilitate the use of technologies to support and enhance instructional methods that develop higher-level thinking, decision-making, and problem-solving skills.
E. provide for and ensure that faculty and staff take advantage of quality professional learning opportunities for improved learning and teaching with technology.

III. Productivity and Professional Practice:

Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.

Educational leaders:

A. model the routine, intentional, and effective use of technology.
B. employ technology for communication and collaboration among colleagues, staff, parents, students, and the larger community.
C. create and participate in learning communities that stimulate, nurture, and support faculty and staff in using technology for improved productivity.
D. engage in sustained, job-related professional learning using technology resources.
E. maintain awareness of emerging technologies and their potential uses in education.
F. use technology to advance organizational improvement.

IV. Support, Management, and Operations:

Educational leaders ensure the integration of technology to support productive systems for learning and administration.

Educational leaders:

A. develop, implement, and monitor policies and guidelines to ensure compatibility of technologies.
B. implement and use integrated technology-based management and operations systems.
C. allocate financial and human resources to ensure complete and sustained implementation of the technology plan.
D. integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources.
E. implement procedures to drive continuous improvements of technology systems and to support technology replacement cycles.

V. Assessment and Evaluation:

Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.

Educational leaders:

A. use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity.
B. use technology to collect and analyze data, interpret results, and communicate findings to improve instructional practice and student learning.
C. assess staff knowledge, skills, and performance in using technology and use results to facilitate quality professional development and to inform personnel decisions.
D. use technology to assess, evaluate, and manage administrative and operational systems.

VI. Social, Legal, and Ethical Issues:

Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision-making related to these issues.

Educational leaders:

A. ensure equity of access to technology resources that enable and empower all learners and educators.
B. identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology.
C. promote and enforce privacy, security, and online safety related to the use of technology.
D. promote and enforce environmentally safe and healthy practices in the use of technology.
E. participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with district resources.

APPENDIX B

Appendix B

ACTION PLAN FEEDBACK

The following major indicators were reviewed: **STRUCTURES**: Facilitating communication, input and information flow **TECHNOLOGY**: Implementing for integration of authentic teaching and learning **ASSESSMENT:** Guiding decisions and providing feedback for improvement **RESEARCH:** Reviewing for guidance and data in decision-making **STAKEHOLDERS**: inclusion for differing perspectives and ideas **STAFF DEVELOPMENT**: on-going learning processes **LEADERSHIP & SERVICE:** guiding and serving a common good These **STARSS-LS** list serves as a guide and each plan may demonstrate different combinations of these. In reviewing each action plan, the focus is on strengthening, clarifying and focusing your plans. The feedback the participants receive may enhance your action for Phase II grants. The bottom line questions are: Is what you are doing impacting student achievement and what evidence do you have to show the impact?

School/District:
Practice #:
Feedback:

STRUCTURES:	Facilitating communication, input and information flow
TECHNOLOGY:	Implementing for integration of authentic teaching and learning
ASSESSMENT:	Guiding decisions and providing feedback for improvement
RESEARCH:	Reviewing for guidance and data in decision-making
STAKEHOLDERS:	Inclusion for differing perspectives and ideas
STAFF DEVELOPMENT:	On-going learning processes
LEADERSHIP & SERVICE:	Guiding and serving a common good

SUMMARY:

APPENDIX C

Appendix C

Completion Requirements for OK-ACTS Phase I

- Attended two-day leadership seminar
- Attended two cluster meetings
- Completed the TAGLIT assessment (principals only)
- Submitted one action plan

APPENDIX D

Appendix D

GRANT EVALUATION CRITERIA EXPLANATION

The following major indicators reviewed:

STRUCTURES: Facilitating communication, input and information flow
TECHNOLOGY: Implementing for integration of authentic teaching and learning
ASSESSMENT: Guiding decisions and providing feedback for improvement
RESEARCH: Reviewing for guidance and data in decision-making
STAKEHOLDERS: inclusion for differing perspectives and ideas
STAFF DEVELOPMENT: on-going learning processes
LEADERSHIP & SERVICE: guiding and serving a common good

The **STARSS-LS** list serves as a guide and each action plan may demonstrate different combinations of these and may be included in what they have done or what they plan to do. The bottom line questions are: *Is what they are doing or planning to do impacting student achievement and what evidence is there (or will there be) to show the impact?* In addition, the **GRANT NARRATIVE, TECHNOLOGY, BUDGET, AND SYSTEMIC SUPPORT** facilitate the grant work.

A. STRUCTURES: Are these in place or planned for facilitating communication, input and information flow?
Examples may include committees, vertical and/or grade, planning committees, common planning times, focus groups, advisory boards or councils, review teams or leadership council. Processes may include planning, goal-setting, review, consensus building, North Central Association (NCA), Comprehensive Local Educational Plan (CLEP), Southwest Educational Development Laboratory (SEDL), Comprehensive School Reform Demonstration (CSRD), High Schools That Work, and/or school site-based teams.

B. TECHNOLOGY: Are there ways or plans to implement ways to begin to integrate of authentic teaching and learning?
Technology planning; use of Taking a Good Look At Technology (TAGLIT is a Gates grant requirement; reviewing survey data; accessing or planning to access spreadsheets, word processing, digital cameras; Marco Polo or PassPort on-line resources; commitment to training of staff; and/or sharing of technology learning.

C. ASSESSMENT: Are decisions being or planned to be guided by data and are there mechanisms for providing feedback for improvement?
Use of TAGLIT data to inform decisions, mechanisms for review of student data, including test scores, strategies to share the data with all stakeholders; and/or use of data from software programs, such as Accelerated Reader, STAR, CCC or ABACUS; disaggregating data.

D. RESEARCH: Is there ongoing review of research or outside expertise for guidance and use of data in decision-making?

Mention of specific research; use of data from their own study or using data for decisions; bringing in outside expertise, using standards, such as International Society for Technology Education (ISTE) or Priority Academic Student Skills (PASS); and/or attending staff development conferences and sharing the learning.

E. STAKEHOLDERS: inclusion for differing perspectives and ideas
Consideration of staff, students, and community members in planning; sharing information with the community, making connections with the community for student learning; surveying stakeholders; and/or including these groups in meaningful ways.

F. STAFF DEVELOPMENT: What ways are there to support on-going learning processes for staff and how are others included?
Strategies exist or are planned for sharing best practices, staff training staff, networks, ways to share learning from conferences, technology training strategies, on-going study and outside research and feedback being reviewed, reflective time and discussions, and/or regular vertical/grade level/department meetings.

G. LEADERSHIP & SERVICE: How are the stakeholders being developed as learners and leaders and is there a guiding strategy for serving a common good?
As committee chairs, members of leadership or advisory councils, representative boards, or other skill and knowledge building organizational strategies, staff and other stakeholders develop their leadership capacity. Through reaching out to parents and community or to other schools, offering service learning opportunities, and connecting to learning with the real world, students and staff serve a common good.

H. GRANT NARRATIVE: How well is the plan developed, whether the school/district is at a beginning stage or and advanced stage in the process of renewal?
A firm rationale for the practices and processes to accomplish the goals of the grant are in place or planned; the narrative shows thought and understanding of the practices and how technology can facilitate school renewal and teacher growth, and impact student achievement.

I TECHNOLOGY ADEQUACY AND APPROPRIATENESS: How does the technology facilitate the grant goals?
Technology requests have a purpose and are tied to the grant goals.

J. GRANT BUDGET PROPOSAL: How does the budget reflect the narrative goals and action plans?
The technology funding is reasonable and details are adequate.

K. SYSTEMIC SUPPORT: What kind of support is there for school renewal and technology integration?
Planning processes for the grant and/or technology were inclusive of stakeholders and support from staff, district, community and others is indicated in some way. Support is demonstrated for both the technology equipment and the professional development.

APPPENDIX E

Appendix E

2003 OETT: OK-ACTS Staff Development Planning				
Proposed Time/Day	**Scheduled Length/Day**	**Title**	**Focus**	**School's Goal**
.25		The Big Picture	Introduction & overview	
.25		P 1-10: PLC-IDEALS	PLC examples	
.30/.50		P 1: Core Learning	Vision into Learning	
.20		P 3: Shared Decisions	Planning Team & their charge	
.5		P 2: Authenticity	Lessons with technology	
.5/1.0		Planning Team	Develop Plans for Integration	
.25/.5/1.0		P 6: Data-driven Decisions	Reviewing Data	
1.0/2.0/3.0		P 2: Lesson Integration	Classrooms & articulation	
0		P 1-10: Winter Institute		
.5		P 2: Skills for Integration	Learning to support	
.5		Selected Practice	Specific practice	
.5		Selected Practice	Specific practice	
.5/1.0		Study Group, Specific practice, or technology	Topic: ________	
.25		Technology & Student Achievement		
	6	TOTAL		

APPENDIX F

Appendix F

School Professional Staff as a Learning Community

Directions: This questionnaire concerns your perceptions about your school staff as a learning organization. There is no right or wrong response. Please consider where you believe your school is in its development of each of the categories below, and check the box next to the statement that best describes your school.

Please provide the following background information:

Last 4 Digits of Your Social Security Number: _______________

Gender: Female ❒ Male ❒

Name of Your School: __________________________________

Name of Your District: __________________________________

Grade(s) You Teach: ___________________________________

Subject(s) You Teach:___________________________________

Self-Contained? ❒ Yes ❒ No

Years Employed as a Teacher: ____________

Years Employed at Your School: ____________

****

1. School administrators participate democratically with teachers sharing power, authority, and decision making.

A. On a Scale of 5 to 1, where is your school?

❒ 5. Although there are some legal and fiscal decisions required of the principal, school administrators consistently involve the staff in discussing and making decisions about most school issues.

❒ 4.

❒ 3. Administrators invite advice and counsel from the staff and then make decisions themselves.

❒ 2.

❒ 1. Administrators never share information with the staff nor provide opportunities to be involved in decision making

B. On a Scale of 5 to 1, where is your school?

❒ 5. Administrators involve the entire staff.

❒ 4.

❒ 3. Administrators involve a small committee, council, or team of staff.

❒ 2.

❒ 1. Administrators do not involve staff.

2. Staff shares visions for school improvement that have an undeviating focus on student learning, and are consistently referenced for the staff's work.

A. On a Scale of 5 to 1, where is your school?

❒ 5. Visions for improvement are discussed by the entire staff such that consensus and a shared vision results.

❒ 4.

❒ 3. Visions for improvement are not thoroughly explored; some staff agree and others do not.

❒ 2.

❒ 1. Visions for improvement held by the staff are widely divergent.

B. On a Scale of 5 to 1, where is your school?

❒ 5. Visions for improvement are always focused on students and learning and teaching.

❒ 4.

❒ 3. Visions for improvement are sometimes focused on students and teaching and learning.

❒ 2.

❒ 1. Visions for improvement do not target students and teaching and learning.

C. On a Scale of 5 to 1, where is your school?

❒ 5. Visions for improvement target high quality learning experiences for all students.

❒ 4.

❒ 3. Visions for improvement address quality learning experiences in terms of students' abilities.

❒ 2.

❒ 1. Visions for improvement do not include concerns about the quality of learning experiences.

3. Staff's collective learning and application of the learnings (taking action) create high intellectual learning tasks and solutions to address student needs.

A. On a Scale of 5 to 1, where is your school?

- ❒ 5. The entire staff meets to discuss issues, share information, and learn with and from each other.
- ❒ 4.
- ❒ 3. Subgroups of the staff meet to discuss issues, share information, and learn with and from each other.
- ❒ 2.
- ❒ 1. Individuals randomly discuss issues, share information, and learn with and from each other.

B. On a Scale of 5 to 1, where is your school?

- ❒ 5. The staff meets regularly and frequently on substantive student-centered educational issues.
- ❒ 4.
- ❒ 3. The staff meets occasionally on substantive student-centered educational issues.
- ❒ 2.
- ❒ 1. The staff never meets to consider substantive educational issues.

C. On a Scale of 5 to 1, where is your school?

- ❒ 5. The staff discusses the quality of their teaching and students' learning.
- ❒ 4.
- ❒ 3. The staff does not often discuss their instructional practices nor its influence on student learning.
- ❒ 2.
- ❒ 1. The staff basically discusses non-teaching and non-learning issues.

D. On a Scale of 5 to 1, where is your school?

- ❒ 5. The staff, based on their learnings, makes and implements plans that address students' needs, more effective teaching, and more successful student learning.
- ❒ 4.
- ❒ 3. The staff occasionally acts on their learning and makes and implements plans to improve teaching and learning.
- ❒ 2.
- ❒ 1. The staff does not act on their learning.

E. On a Scale of 5 to 1, where is your school?

❐ 5. The staff debriefs and assesses the impact of their actions and makes revisions.
❐ 4.
❐ 3. The staff infrequently assesses their actions and seldom makes revisions based on the results.
❐ 2.
❐ 1. The staff does not assess their work.

4. Peers review and give feedback based on observing each other's classroom behaviors in order to increase individual and organizational capacity.

A. On a Scale of 5 to 1, where is your school?

❐ 5. Staff regularly and frequently visit and observe each other's classroom teaching.
❐ 4.
❐ 3. Staff occasionally visit and observe each other's teaching.
❐ 2.
❐ 1. Staff never visit their peer's classrooms.

B. On a Scale of 5 to 1, where is your school?

❐ 5. Staff provide feedback to each other about teaching and learning based on their classroom observations.
❐ 4.
❐ 3. Staff discuss non-teaching issues after classroom observations.
❐ 2.
❐ 1. Staff do not interact after classroom observations.

5. School conditions and capacities support the staff's arrangement as a professional learning organization.

A. On a Scale of 5 to 1, where is your school?

❐ 5. Time is arranged and committed for whole staff interactions.
❐ 4.
❐ 3. Time is arranged but frequently the staff fails to meet.
❐ 2.
❐ 1. Staff cannot arrange time for interacting.

B. On a Scale of 5 to 1, where is your school?

❒ 5. The size, structure, and arrangements of the school facilitate staff proximity and interaction.

❒ 4.

❒ 3. Considering the size, structure, and arrangements of the school, the staff is working to maximize their interaction.

❒ 2.

❒ 1. The staff takes no action to manage the facility and personnel for interaction.

C. On a Scale of 5 to 1, where is your school?

❒ 5. A variety of processes and procedures are used to encourage staff communication.

❒ 4.

❒ 3. A single communication method exists and is sometimes used to share information.

❒ 2.

❒ 1. Communication devices are not given attention.

D. On a Scale of 5 to 1, where is your school?

❒ 5. Trust and openness characterize all the staff.

❒ 4.

❒ 3. Some of the staff are trusting and open.

❒ 2.

❒ 1. Trust and openness do not exist among the staff.

E. On a Scale of 5 to 1, where is your school?

❒ 5. Caring, collaborative, and productive relationships exist among all the staff.

❒ 4.

❒ 3. Caring and collaboration are inconsistently demonstrated among the staff.

❒ 2.

❒ 1. Staff are isolated and work alone at their tasks.

APPENDIX G

Appendix G

Technology Integration
Pre-Survey for Teachers

Please provide the following background information:

Last 4 Digits of Your Social Security Number: ________________________

Name of
Your School: ________________________ District________________________

Grade(s) You Teach: ________________________ Gender: Female ❒ Male ❒

Subject(s) You Teach: Self-Contained ________________________

Years Employed as a Teacher: ____________ Years Employed at Your School: ____________

1. How frequently do you use a computer: Daily ❒ Weekly ❒ Monthly ❒ Rarely ❒ Never ❒

2. Your general expertise for using a computer is: Beginner ❒ Intermediate ❒ Advanced ❒ Expert ❒

3. I use a computer mostly for:	**Never**	**Rarely**	**Monthly**	**Weekly**	**Daily**
a) Personal purposes (e.g., own correspondence, email)	**1**	**2**	**3**	**4**	**5**
b) Classroom record keeping (e.g., attendance, grades)	**1**	**2**	**3**	**4**	**5**
c) Classroom instruction (e.g., presentations, student activities)	**1**	**2**	**3**	**4**	**5**
d) School communications (e.g., with other teachers, students, and/or parents)	**1**	**2**	**3**	**4**	**5**

4. The type(s) of software available for use at our school are:

(Check all that apply)

❒ Word processing software (e.g., Word, Word Perfect)
❒ Presentation software (e.g., PowerPoint, Apple Works)
❒ Spreadsheet software (e.g., Excel, Apple Works)
❒ Publishing programs (e.g., Acrobat, Publisher)
❒ Database programs (e.g., Access, FileMaker, Oracle)
❒ Internet access (e.g., Explorer, Netscape)
❒ Email access (e.g., Outlook, Eudora)

5. My students are able to access computers at our school:

(Check all that apply)

❒ All student have a computer in our classroom
❒ We have 1-2 classroom computers
❒ We have several computers in our classroom
❒ We have no computers in our classroom
❒ In a lab
❒ In a media center or library

6. How would you rate your proficiency to use the following technology applications or tools?	**Not At All**	**Basic**	**Moder-ate**	**Well**	**Expert**
a) Word processing (e.g., Word, Word Perfect, Apple Works)	**1**	**2**	**3**	**4**	**5**
b) Spreadsheet program (e.g., Excel, Apple Works)	**1**	**2**	**3**	**4**	**5**
c) Presentation software (e.g., PowerPoint, Hyper Studio)	**1**	**2**	**3**	**4**	**5**
d) Database program (e.g., Access, FileMaker)	**1**	**2**	**3**	**4**	**5**
e) Email (e.g., Outlook, Eudora)	**1**	**2**	**3**	**4**	**5**
f) Internet/Web Browsers (e.g., Explorer, Netscape)	**1**	**2**	**3**	**4**	**5**
g) Calendar or scheduling program	**1**	**2**	**3**	**4**	**5**
h) Publishing program (e.g., Acrobat, Publisher, Pagemaker)	**1**	**2**	**3**	**4**	**5**
i) Graphics program (e.g., PhotoShop, Paint Shop Pro)	**1**	**2**	**3**	**4**	**5**
j) Scanner	**1**	**2**	**3**	**4**	**5**
k) Hand-held device (e.g., PDA, GPS)	**1**	**2**	**3**	**4**	**5**
l) Graphing calculator	**1**	**2**	**3**	**4**	**5**
m) Digital Camera	**1**	**2**	**3**	**4**	**5**
n) SmartBoard	**1**	**2**	**3**	**4**	**5**
o) LCD projector	**1**	**2**	**3**	**4**	**5**
p) Removable Media (e.g., Zip Disk, CD Rom)	**1**	**2**	**3**	**4**	**5**

7. Please rate the different ways that you use technology:

Instructional Purposes	**Never**	**Seldom**	**Some-times**	**Fre-quently**	**Always**
a) When planning lessons, I consider how to incorporate technology into student learning experiences.	**1**	**2**	**3**	**4**	**5**
b) I work with other teachers to collaboratively plan and review lessons that involve the use of technology.	**1**	**2**	**3**	**4**	**5**
c) I look for technology-related activities that will improve my students' basic skills (e.g., reading, writing, math computation).	**1**	**2**	**3**	**4**	**5**
d) I look for technology-related activities that will increase my students' problem-solving skills and critical thinking.	**1**	**2**	**3**	**4**	**5**
e) I observe how other teachers integrate technology in their instruction.	**1**	**2**	**3**	**4**	**5**
f) I gather information for my lessons using technology.	**1**	**2**	**3**	**4**	**5**
g) I create my lesson plans using technology.	**1**	**2**	**3**	**4**	**5**
h) I design instruction that encourages my students to use technology.	**1**	**2**	**3**	**4**	**5**
i) I incorporate problem-solving activities for my students that require their using technology resources.	**1**	**2**	**3**	**4**	**5**
j) I design activities for my students that use technology tools to encourage creative expressions of individual learning.	**1**	**2**	**3**	**4**	**5**

k) I design activities for my students that use technology tools for collaboration with peers and outside experts.	**1**	**2**	**3**	**4**	**5**
l) I design student activities that use tech tools to facilitate discussion of ideas and reflection on learning experiences.	**1**	**2**	**3**	**4**	**5**
m) I design student activities that use technology tools for collecting, manipulating, and analyzing data (e.g., spreadsheets, databases).	**1**	**2**	**3**	**4**	**5**
Other Technology Uses:	**Never**	**Seldom**	**Some-times**	**Fre-quently**	**Always**
n) I design student activities to encourage researching information via the internet.	**1**	**2**	**3**	**4**	**5**
o) I give my students opportunities to create and share presentations using technology.	**1**	**2**	**3**	**4**	**5**
p) I teach students to evaluate the accuracy and bias of information they gather through technological means.	**1**	**2**	**3**	**4**	**5**
q) I deliver instructional information using technology.	**1**	**2**	**3**	**4**	**5**
r) I use technology to communicate with colleagues and staff for administrative purposes.	**1**	**2**	**3**	**4**	**5**
s) I use technology to communicate with students.	**1**	**2**	**3**	**4**	**5**
t) I use technology to communicate with parents.	**1**	**2**	**3**	**4**	**5**
u) I use technology to communicate with community members.	**1**	**2**	**3**	**4**	**5**
v) I use technology to collaborate with colleagues and staff on issues related to student learning.	**1**	**2**	**3**	**4**	**5**
w) I collect and analyze student data using technology.	**1**	**2**	**3**	**4**	**5**
x) I assess student learning using technology.	**1**	**2**	**3**	**4**	**5**
y) I use technology to organize grade information for students.	**1**	**2**	**3**	**4**	**5**
z) I use technology to organize grade information for parents and/or school administrators.	**1**	**2**	**3**	**4**	**5**
aa) I keep student attendance, progress, and demographic information using technology.	**1**	**2**	**3**	**4**	**5**
bb) I use technology when I post homework assignments and other class information for students or parents to access.	**1**	**2**	**3**	**4**	**5**

8. How often do your students use the following for in-classroom assignments or out-of-class assignments?

	Never	**Seldom**	**Some-times**	**Fre-quently**	**Always**
a) Computer applications to prepare assignments/papers (e.g., word processing)	**1**	**2**	**3**	**4**	**5**
b) Computer applications to analyze data or keep records (e.g., spreadsheets)	**1**	**2**	**3**	**4**	**5**
c) Computer or web-based applications to produce class presentations	**1**	**2**	**3**	**4**	**5**

	Never	Seldom	Some-times	Fre-quently	Always
d) The internet or other software to research information or find materials for assignments	**1**	**2**	**3**	**4**	**5**
e) Software to learn or practice new skills	**1**	**2**	**3**	**4**	**5**
f) Software to study for tests	**1**	**2**	**3**	**4**	**5**
g) Enrichment tools to aid in learning (e.g., graphing calculators, LCD projectors)	**1**	**2**	**3**	**4**	**5**
h) Computer communications to collaborate on assignments (e.g., email, web-based communication)	**1**	**2**	**3**	**4**	**5**
i) Computer communications to correspond with experts, authors, or others (e.g., email, web-based communication)	**1**	**2**	**3**	**4**	**5**
j) The Web to participate in virtual fieldtrips	**1**	**2**	**3**	**4**	**5**

9. What degree of support do you receive for incorporating technology into your teaching and learning experiences from the following:

	None	Hardly Any	Some	A Lot	Total Support
a) Your principal	**1**	**2**	**3**	**4**	**5**
b) Other teachers at your school	**1**	**2**	**3**	**4**	**5**
c) Organizations/businesses in your community	**1**	**2**	**3**	**4**	**5**
d) Parents of your students	**1**	**2**	**3**	**4**	**5**
e) Your students	**1**	**2**	**3**	**4**	**5**

For each of those who you rated as providing support, please explain what type of support you receive.

10. Please rate your level of agreement with the following statements.

	Strongly Disagree	Disagree	Agree	Strongly Agree
a) I think learning how technology can be used by teachers and students is exciting.	**1**	**2**	**3**	**4**
b) Students are more interested in learning when using technology to investigate an issue or solve a problem.	**1**	**2**	**3**	**4**
c) I feel that technology makes my work more complicated to complete.	**1**	**2**	**3**	**4**
d) Using technology can/does help students better understand what they are learning.	**1**	**2**	**3**	**4**
e) It takes a special talent to creatively facilitate and manage technology-based learning activities.	**1**	**2**	**3**	**4**

	Strongly Disagree	Disagree	Agree	Strongly Agree
f) Figuring out how to incorporate technology into instructional practices does not appeal to me.	**1**	**2**	**3**	**4**
g) I want to learn more about using technology for teaching and learning.	**1**	**2**	**3**	**4**
h) I feel confident in my ability to use technology for teaching and learning.	**1**	**2**	**3**	**4**
i) Creating technology-based learning activities is too time consuming compared to what is learned.	**1**	**2**	**3**	**4**
j) I think I am/will be a better teacher by using technology as part of my instructional practices.	**1**	**2**	**3**	**4**

11. What are *your school's* current technology strengths? Please provide examples.___________

____

____

____

12. What are *your* current technology strengths? Please provide examples.__________________

____

____

____

13. In what ways would you like to use technology in your classroom? Please provide examples:

____

____

____

14. What obstacles do you need to overcome in order to use technology in your teaching practices? Please explain. ____

____

____

APPENDIX H

Appendix H

Technology Integration
Post-Survey for Teachers

Please provide the last 4 Digits of Your Social Security Number: ____________________

Name of Your School: __________________________________

Name of Your District: _________________________________

****

1. How frequently do you currently use a computer:

Daily ❐ Weekly ❐ Monthly ❐ Rarely ❐ Never ❐

2. Your current expertise for using a computer is:

Beginner ❐ Intermediate ❐ Advanced ❐ Expert ❐

3. I use a computer mostly for:	**Never**	**Rarely**	**Monthly**	**Weekly**	**Daily**
a. Personal purposes (e.g., own correspondence, email)	1	2	3	4	5
b. Classroom record keeping (e.g., attendance, grades)	1	2	3	4	5
c. Classroom instruction (e.g., presentations, student activities)	1	2	3	4	5
d. School communications (e.g., with other teachers, students, and/or parents)	1	2	3	4	5

4. Please rate your <u>current proficiency</u> to use the following technology applications or tools:	**Not At All**	**Basic**	**Moderate**	**Well**	**Expert**
a. Word processing (e.g., Word, Word Perfect, Apple Works)	1	2	3	4	5
b. Spreadsheet program (e.g., Excel, Apple Works)	1	2	3	4	5
c. Presentation software (e.g., PowerPoint, Hyper Studio)	1	2	3	4	5
d. Database program (e.g., Access, FileMaker)	1	2	3	4	5
e. Email (e.g., Outlook, Eudora)	1	2	3	4	5
f. Internet/Web Browsers (e.g., Explorer, Netscape)	1	2	3	4	5
g. Calendar or scheduling program	1	2	3	4	5
h. Publishing program (e.g., Acrobat, Publisher, Pagemaker)	1	2	3	4	5
i. Graphics program (e.g., PhotoShop, Paint Shop Pro)	1	2	3	4	5
j. Scanner	1	2	3	4	5
k. Hand-held device (e.g., PDA, GPS)	1	2	3	4	5
l. Graphing calculator	1	2	3	4	5
m. Digital Camera	1	2	3	4	5
n. SmartBoard	1	2	3	4	5
o. LCD projector	1	2	3	4	5
p. Removable Media (e.g., Zip Disk, CD Rom)	1	2	3	4	5

5. To what extent do you do the following now that you have participated in the professional development offered by OETT/OK-ACTS?	Never	Seldom	Some-times	Fre-quently	Always
a. Incorporate technology into my students' learning activities when planning lessons.	1	2	3	4	5
b. Work collaboratively with other teachers in planning and reviewing lessons that involve the use of technology.	1	2	3	4	5
c. Use technology-related activities to improve my students' basic skills (e.g., reading, writing, math computation).	1	2	3	4	5
d. Use technology-related activities to promote problem-solving skills and critical thinking in my students.	1	2	3	4	5
e. Observe other teachers' use of technology in their classroom instruction.	1	2	3	4	5
f. Use technology to gather information for my lessons (e.g., search the web)	1	2	3	4	5
g. Create lesson plans using technology.	1	2	3	4	5
h. Design instructional activities that encourage students to use technology.	1	2	3	4	5
i. Design learning activities that require students to use technology resources.	1	2	3	4	5
j. Design activities for my students that encourages creative expressions of learning using technology.	1	2	3	4	5
k. Design activities that require students to use technology to collaborate with peers and/or outside experts on assignments.	1	2	3	4	5
l. Design student activities that use technology for discussing ideas and reflecting on learning experiences.	1	2	3	4	5
m. Design student activities that use technology for collecting, manipulating, and analyzing data (i.e., spreadsheets, databases).	1	2	3	4	5
n. Design student activities to encourage information gathering via the internet.	1	2	3	4	5
o. Provide student opportunities to create and share presentations using technology.	1	2	3	4	5
p. Teach my students to evaluate the accuracy and bias of information gathered using technology.	1	2	3	4	5
q. Incorporate technology into my instruction.	1	2	3	4	5
r. Use technology to communicate with colleagues and staff for administrative purposes.	1	2	3	4	5
s. Use technology to communicate with students.	1	2	3	4	5
t. Use technology to communicate with parents.	1	2	3	4	5
u. Use technology to communicate with community members.	1	2	3	4	5
v. Use technology to collaborate with colleagues and staff on student learning issues.	1	2	3	4	5
w. Collect and analyze student data using technology.	1	2	3	4	5
x. Assess student learning using technology.	1	2	3	4	5
y. Use technology to organize grade information for students.	1	2	3	4	5

5. To what extent do you do the following now that you have participated in the professional development offered by OETT/OK-ACTS?	**Never**	**Seldom**	**Some-times**	**Fre-quently**	**Always**
z. Use technology to organize grade information for parents and/or school administrators.	1	2	3	4	5
aa. Keep student attendance, progress, and demographic information using technology.	1	2	3	4	5
bb. Use technology to post homework and other class information for student or parent access.	1	2	3	4	5
cc. Use problem-based learning with my students.	1	2	3	4	5
dd. Search the web for student learning activities.	1	2	3	4	5
ee. Engage my students in authentic learning activities.	1	2	3	4	5

6. How often do <u>your students</u> use the following for in-class and/or out-of-class assignments?	**Never**	**Seldom**	**Some-times**	**Fre-quently**	**Always**
a. Computer applications to prepare assignments/papers (e.g., word processing)	1	2	3	4	5
b. Computer applications to analyze data or keep records (e.g., spreadsheets)	1	2	3	4	5
c. Computer or web-based applications to produce class presentations	1	2	3	4	5
d. The internet or other software to research information or find materials for assignments	1	2	3	4	5
e. Software to learn or practice new skills	1	2	3	4	5
f. Software to study for tests	1	2	3	4	5
g. Enrichment tools to aid in learning (e.g., graphing calculators, LCD projectors)	1	2	3	4	5
h. Computer communications to collaborate on assignments (e.g., email, web-based communication)	1	2	3	4	5
i. Computer communications to correspond with experts, authors, or others (e.g., email, web-based communication)	1	2	3	4	5
j. The Web to participate in virtual fieldtrips	1	2	3	4	5
k. Other: ________________________________	1	2	3	4	5

7. What degree of support do you received for incorporating technology into your teaching and learning activities from the following:	**None**	**Hardly Any**	**Some**	**A Lot**	**Total Support**
a. Your principal	1	2	3	4	5
b. Other teachers at your school	1	2	3	4	5
c. Organizations/businesses in your community	1	2	3	4	5
d. Parents of your students	1	2	3	4	5
e. Your students	1	2	3	4	5
f. Professional development providers	1	2	3	4	5
g. Others: __________________________________	1	2	3	4	5

8. **Please rate your level of agreement with the following statements.**	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
a. I think learning how technology can be used by teachers and students is exciting.	1	2	3	4
b. Students are more interested in learning when using technology to investigate an issue or solve a problem.	1	2	3	4
c. I feel that technology makes my work more complicated to complete.	1	2	3	4
d. Using technology can/does help students better understand what they are learning.	1	2	3	4
e. It takes a special talent to creatively facilitate and manage technology-based learning activities.	1	2	3	4
f. Figuring out how to incorporate technology into instructional practices does not appeal to me.	1	2	3	4
g. I want to learn more about using technology for teaching and learning.	1	2	3	4
h. I feel confident in my ability to use technology for teaching and learning.	1	2	3	4
i. Creating technology-based learning activities is too time consuming compared to what is learned.	1	2	3	4
j. I think I am/will be a better teacher by using technology as part of my instructional practices.	1	2	3	4

9. The items below ask you to respond about your level of understanding of various types of technology in two ways: (1) Your perceptions NOW that you have received various professional development through OETT/OK-Acts; and (2) your perceptions PRIOR TO receiving the professional development. Please mark a response in BOTH sections.

	To what extent do you understand the following NOW that you have participated in the professional development offered by OETT/OK-ACTS				**To what extent did you understand the following PRIOR TO participating in the professional development offered by OETT/OK-ACTS**			
	Very Little	**Some**	**Fairly Well**	**To a Great Extent**	**Very Little**	**Some**	**Fairly Well**	**To a Great Extent**
a. computers	1	2	3	4	1	2	3	4
b. computer software applications	1	2	3	4	1	2	3	4
c. other technology applications (i.e., PDA, LCD projector, digital camera, etc.)	1	2	3	4	1	2	3	4
d. search the web	1	2	3	4	1	2	3	4
e. overall technological skill	1	2	3	4	1	2	3	4

Thank you for your information

APPENDIX I

Appendix I

Technology Integration
Survey for Administrators

Please provide the last 4 Digits of Your Social Security Number: ______________________

Name of Your School: _________________________________

Name of Your District: ________________________________

1. How frequently do you currently use a computer:

Daily ❐ Weekly ❐ Monthly ❐ Rarely ❐ Never ❐

2. Your current expertise for using a computer is:

Beginner ❐ Intermediate ❐ Advanced ❐ Expert ❐

3. I use a computer mostly for:

	Never	Rarel y	Monthly	Weekly	Daily
a. Personal purposes (e.g., own correspondence, email)	1	2	3	4	5
b. School record keeping	1	2	3	4	5
c. School communications (e.g., with teachers, students, and/or parents)	1	2	3	4	5
d. Other: (Please specify)____________________________	1	2	3	4	5

4. How would you rate YOUR current proficiency to use the following technology applications or tools?	Not At All	Basic	Moder -ate	Well	Expert
a. Word processing (e.g., Word, Word Perfect, Apple Works)	1	2	3	4	5
b. Spreadsheet program (e.g., Excel, Apple Works)	1	2	3	4	5
c. Presentation software (e.g., PowerPoint, Hyper Studio)	1	2	3	4	5
d. Database program (e.g., Access, FileMaker)	1	2	3	4	5
e. Email (e.g., Outlook, Eudora)	1	2	3	4	5
f. Internet/Web Browsers (e.g., Explorer, Netscape)	1	2	3	4	5
g. Calendar or scheduling program	1	2	3	4	5
h. Publishing program (e.g., Acrobat, Publisher, Pagemaker)	1	2	3	4	5
i. Graphics program (e.g., PhotoShop, Paint Shop Pro)	1	2	3	4	5
j. Scanner	1	2	3	4	5
k. Hand-held device (e.g., PDA, GPS)	1	2	3	4	5
l. Graphing calculator	1	2	3	4	5
m. Digital Camera	1	2	3	4	5
n. SmartBoard	1	2	3	4	5
o. LCD projector	1	2	3	4	5
p. Removable Media (e.g., Zip Disk, CD Rom)	1	2	3	4	5

5. The items below ask about the practices of teachers, on the average, at your school in two ways:
(1) Your perceptions NOW that the teachers have received various professional development through OETT/OK-Acts; and (2) your perceptions PRIOR TO the teachers receiving the professional development. Please mark a response in BOTH sections. If you do not know if your teachers are implementing one or more of the following practices, please leave those items blank.

	To what extent do your teachers do the following NOW that they have participated in the professional development offered by OETT/OK-ACTS				To what extent did your teachers do the following PRIOR TO participating in the professional development offered by OETT/OK-ACTS			
	Not at All	Some-what	Fairly Often	Very Often	Not at All	Some - what	Fairly Often	Very Often
a. incorporate technology into their students' learning activities	1	2	3	4	1	2	3	4
b. work collaboratively with other teachers	1	2	3	4	1	2	3	4
c. use technology-related activities to improve their students' basic skills (i.e., reading, writing, math, computation)	1	2	3	4	1	2	3	4
d. use technology-related activities to promote problem-solving and critical thinking skills	1	2	3	4	1	2	3	4
e. observe other teachers' use of technology in their classroom instruction	1	2	3	4	1	2	3	4
f. use technology to gather information for classroom instruction (i.e., search the web)	1	2	3	4	1	2	3	4
g. create lesson plans using technology	1	2	3	4	1	2	3	4
h. design instructional activities that encourage students to use technology	1	2	3	4	1	2	3	4
i. design learning activities that require students to use technology resources	1	2	3	4	1	2	3	4
j. design activities that encourage creative expressions of learning using technology	1	2	3	4	1	2	3	4
k. design activities that require students to use technology to collaborate with peers and/or outside experts on assignments	1	2	3	4	1	2	3	4
l. design student activities that use technology for discussing ideas and reflecting on learning experiences	1	2	3	4	1	2	3	4
m. design student activities that use technology for collecting, manipulating, and analyzing data (i.e., spreadsheets, databases)	1	2	3	4	1	2	3	4
n. design student activities to encourage information gathering via the internet	1	2	3	4	1	2	3	4

	To what extent do your teachers do the following NOW that they have participated in the professional development offered by OETT/OK-ACTS				To what extent did your teachers do the following PRIOR TO participating in the professional development offered by OETT/OK-ACTS			
o. provide student opportunities to create and share presentations using technology	1	2	3	4	1	2	3	4
p. teach their students to evaluate the accuracy and bias of information gathered using technology	1	2	3	4	1	2	3	4
q. incorporate technology into teachers' classroom instruction	1	2	3	4	1	2	3	4
r. use technology to communicate with colleagues and staff for administrative purposes	1	2	3	4	1	2	3	4
s. use technology to communicate with students	1	2	3	4	1	2	3	4
t. use technology to communicate with parents	1	2	3	4	1	2	3	4
u. use technology to communicate with community members	1	2	3	4	1	2	3	4
v. use technology to collaborate with colleagues and staff on student learning issues	1	2	3	4	1	2	3	4
w. collect and analyze student data using technology	1	2	3	4	1	2	3	4
x. assess student learning using technology	1	2	3	4	1	2	3	4
y. use technology to organize grade information for students	1	2	3	4	1	2	3	4
z. use technology to organize grade information for parents and/or school administrators	1	2	3	4	1	2	3	4
aa. keep student attendance, progress, and demographic information using technology	1	2	3	4	1	2	3	4
bb. use technology to post homework and other class information for student or parent access	1	2	3	4	1	2	3	4
cc. use problem-based learning with their students	1	2	3	4	1	2	3	4
dd. search the web for student learning activities	1	2	3	4	1	2	3	4
ee. engage their students in authentic learning activities	1	2	3	4	1	2	3	4

6. **The items below ask you to respond about the level of understanding by the teachers at your school of various types of technology in two ways: (1) Your perceptions NOW that the teachers have received various professional development through OETT/OK-ACTS; and (2) your perceptions PRIOR TO the teachers receiving the professional development. Please mark a response in BOTH sections.**

	To what extent do your teachers understand the following NOW that you have participated in the professional development offered by OETT/OK-ACTS				To what extent did your teachers understand the following PRIOR TO participating in the professional development offered by OETT/OK-ACTS			
	Very Little	**Some**	**Fairly Well**	**To a Great Extent**	**Very Little**	**Some**	**Fairly Well**	**To a Great Extent**
a. computers	1	2	3	4	1	2	3	4
b. computer software applications	1	2	3	4	1	2	3	4
c. other technology applications (i.e., PDA, LCD projector, digital camera, etc.)	1	2	3	4	1	2	3	4
d. web searches	1	2	3	4	1	2	3	4
e. overall technological skill	1	2	3	4	1	2	3	4

7. What degree of support do teachers at your school receive for incorporating technology into your teaching and learning experiences from the following:

	None	**Hardly Any**	**Some**	**A Lot**	**Total Support**
a. Principals or Assistant Principals	1	2	3	4	5
b. Other teachers at the school	1	2	3	4	5
c. Organizations/businesses in the community	1	2	3	4	5
d. Parents of the students	1	2	3	4	5
e. The students	1	2	3	4	5
f. Professional development providers	1	2	3	4	5
g. Other: ____________________	1	2	3	4	5

8. In what ways would you like to see your teachers use technology in their classrooms? Please provide examples:

____

____

9. What obstacles do the teachers need to overcome in order to use technology in their teaching practices? Please explain:

____

____

APPENDIX J

Appendix J

Table 30

Full Scale Rotated Component Mix

N = 475		Component										
		1	2	3	4	5	6	7	8	9	10	11
5.a	Inc tech in lessons	.498	.162	.096	.233	.147	.106	.437	.303	.172	.164	-.218
5.b	Collaborate	.374	.292	.122	.176	.260	.081	.374	.163	.059	.441	-.108
5.c	Technology -basic skills	.343	.179	.051	.128	.114	.098	.723	.124	.010	.165	-.044
5.d	Problem-solving	.554	.142	.128	.138	.110	.039	.566	.116	.054	.168	-.006
5.e	Observe	.259	.237	.088	.158	.251	.053	.178	.019	.049	.597	-.034
5.f	Gather info -lessons	.307	.077	.056	.204	.145	.104	.160	.707	.154	.120	-.056
5.g	Create lesson plans	.326	.079	-.037	.104	.264	.063	.183	.537	.207	.197	-.098
5.h	Encourage student use	.680	.200	.144	.175	.197	.075	.285	.265	.118	.044	-.145
5.i	Require tech resources	.734	.142	.140	.195	.144	.129	.233	.209	.067	-.031	-.162
5.j	Encourage creativity	.760	.156	.159	.140	.190	.074	.244	.161	.094	.031	-.082
5.k	Tech to collaborate	.785	.146	.144	.038	.164	.150	.028	.030	.055	.143	.109
5.l	Reflection	.785	.152	.146	.113	.121	.087	.110	.076	.034	.213	.151
5.m	Data	.601	.053	.359	.014	.078	.115	.030	.043	.010	.293	.160
5.n	Gather information -students	.729	.081	.262	.099	.068	.208	.005	.254	.039	-.006	.006
5.o	Presentations	.778	.099	.290	.122	.104	.109	.059	.052	.050	.014	.102
5.p	Accuracy/bias of info	.718	.065	.267	.059	-.004	.168	.049	.085	-.017	.140	.142
5.q	Classroom instruction	.585	.139	.105	.211	.191	.158	.411	.201	.073	.067	-.063
5.r	Communication/colleagues	.018	.102	.018	.083	.674	.069	.220	.163	.122	.139	-.227
5.s	Communication/students	.389	.104	.221	.088	.564	.132	-.021	.049	-.019	.064	.333
5.t	Communication/parents	.130	.136	.058	.028	.791	.107	.056	.086	-.042	-.067	.102
5.u	Communication/community	.212	.108	.113	.025	.736	.068	.057	.061	.019	.018	.068
5.v	Collaborate/colleagues	.123	.167	.217	.103	.649	.094	.132	.239	.018	.197	-.030
5.w	Analyze student data	.205	.082	.079	.126	.239	.572	.225	.180	.075	.257	.159
5.x	Assess student learning	.288	.056	.084	.101	.196	.537	.366	.123	.114	.187	.184
5.y	Grade info to students	.194	.057	.114	.066	.071	.879	-.029	.076	.120	.018	-.029
5.z	Grade info to parents/school	.174	.059	.107	.067	.083	.879	-.040	.065	.064	.028	-.015
5.aa	Attendance	.161	.074	.153	.187	.053	.684	.133	.070	-.039	-.117	-.001
5.bb	Post homework	.173	.139	.212	.111	.403	.112	.114	-.020	.078	.062	.458
5.cc	Problem-based learning	.474	.114	.289	.111	.187	.225	.287	.107	.030	.042	.276
5.dd	Search web	.194	.114	.125	.162	.217	.205	.150	.736	.138	.012	.066

5.ee	Authentic learning activities	.312	.012	.073	.204	.218	.141	.368	.487	.008	-.177	.185
6a	Assignments/papers	.450	.116	.612	.091	.128	.141	.103	.079	.118	-.287	-.194
6b	Analyze data	.340	.032	.693	.075	.113	.176	.085	-.073	.110	.026	-.052
6c	Class presentations	.654	.110	.496	.137	.097	.155	.078	.059	.119	-.157	.009
6d	Research	.503	.142	.489	.089	.095	.207	.071	.327	.093	-.182	-.111
6e	Practice/learn skills	.123	.153	.283	.017	.199	.074	.643	.238	.083	-.051	.163
6f	Study for tests	.333	.129	.555	.086	.085	.087	.301	.059	.028	-.001	.242
6g	Learning aids	.392	.071	.569	.108	.003	.149	.181	.002	.024	.125	.075
6h	Collaborate	.290	.050	.711	.069	.258	.071	.010	.074	-.074	.174	.091
6i	Communications	.320	.039	.593	.080	.175	.009	-.013	.176	-.107	.379	.071
6j	Virtual trips	.308	.114	.313	.123	-.048	.097	.074	.345	-.026	.435	.210
7.a	Principal	.042	.681	.083	.218	.064	.037	.205	.011	.087	.155	-.233
7.b	Teachers	.091	.761	.033	.192	.119	.019	.063	-.069	.034	.153	-.201
7.c	Organizations	.142	.745	.095	.113	.138	.028	-.030	.024	.015	.078	.102
7.d	Parents	.175	.815	.015	.088	.193	.040	.028	.107	.047	-.061	.173
7.e	Students	.327	.700	.074	.168	.057	.185	.116	.153	.046	-.073	.155
7.f	Professional dev. providers	.100	.690	.061	.269	.045	.056	.154	.115	.077	.034	.084
8a	Exciting	.063	.214	.038	.717	.086	.113	.087	.125	.130	.041	-.080
8b	Student interest	.164	.200	.072	.729	.067	.038	.096	.011	.053	.030	-.007
8c	Work more complicated	.135	.078	-.015	.219	.037	.050	-.061	.219	.719	.060	-.067
8d	Student understanding	.125	.160	.191	.652	.008	.042	.077	.010	.144	.124	.183
8e	Talent	-.025	.023	.060	-.012	.006	.066	.137	-.108	.769	-.008	.082
8f	Not Appealing	.093	.084	-.005	.418	.015	.126	-.035	.251	.551	-.101	-.050
8g	Want to learn more	.034	.130	-.007	.745	.042	.100	.005	.086	.065	-.027	-.076
8h	Confident	.399	.119	.055	.458	.143	.117	.150	.174	.235	.031	.079
8i	Time consuming	.149	.092	.029	.365	.036	.021	.064	.166	.714	.037	.019
8j	Better teacher	.220	.155	.115	.630	.043	.102	.039	.154	.178	.116	.125

Extraction Method: Principal Component Analysis.

11 components extracted.

APPENDIX K

Appendix K

Appendix K-1

Table 31

Question 5 Subscale a Item Statistics (N = 501)

Item	Description	Mean	Std. deviation
5.h	Encourage student use	3.00	1.01
5.i	Require technology resources	2.96	0.95
5.j	Encourage creativity	2.84	0.97
5.k	Use technology to collaborate	2.45	1.03
5.l	Reflection	2.53	1.02
5.m	Data	2.15	1.06
5.n	Gather information - students	2.78	1.09
5.o	Presentations	2.39	1.08
5.p	Accuracy/bias of information	2.24	1.09
5.q	Classroom Instruction	3.12	1.00
5.cc	Problem-based learning	2.59	1.09

Appendix K

Appendix K-2

Table 32

Question 5 Subscale b Item Statistics (N = 501)

Item	Description	Mean	Std. deviation
5.f	Gather information for lessons	3.59	0.93
5.g	Create Lesson Plans	3.29	1.17
5.dd	Search Web	3.60	1.02
5.ee	Authentic Learning Activities	3.47	1.00

Appendix K

Appendix K-3

Table 33

Question 5 Subscale c Item Statistics (N = 501)

Item	Description	Mean	Std. deviation
5.r	Communication/colleagues	3.71	1.08
5.s	Communication/students	2.32	1.15
5.t	Communication/parents	2.89	1.11
5.u	Communication/community	2.46	1.08
5.v	Collaborate/colleagues	2.91	1.09
5.bb	Post homework	2.24	1.39

Appendix K

Appendix K-4

Table 34

Question 5 Subscale d Item Statistics (N = 500)

Item	Description	Mean	Std. deviation
5.w	Analyze student data	3.03	1.19
5.x	Assess student learning	3.06	1.14
5.y	Grade information to students	3.32	1.46
5.z	Grade information to parents/school	3.35	1.45
5.aa	Attendance	3.43	1.56

Appendix K

Appendix K-5

Table 35

Question 5 Subscale e Item Statistics (N =500)

Item	Description	Mean	Std. deviation
5.a	Incorporate tech in lessons	3.31	0.93
5.b	Collaborate	2.93	0.99
5.c	Technology basic skills	3.33	1.00
5.d	Problem-solving	3.07	1.00
5.e	Observe	2.61	1.08

APPENDIX L

Appendix L

Appendix L-1

Table 36

Question 6 Item Statistics (N = 502)

Item number	Description of item	Mean	Std deviation
6.a	Assignments/papers	2.66	1.23
6.b	Analyze data	2	1.17
6.c	Class presentations	2.27	1.14
6.d	Research	2.84	1.19
6.e	Practice/learn skills	3.08	1.15
6.f	Study for tests	2.11	1.18
6.g	Learning aids	2	1.13
6.h	Collaborate	1.96	1.09
6.i	Communications	1.88	1.03
6.j	Virtual trips	2.06	1.05

Appendix L

Appendix L-2

Table 37

Question 7 Item Statistics (N = 502)

Item	Description	Mean	Std deviation
7.a	Principal	4.23	1.01
7.b	Teachers	3.84	0.98
7.c	Organizations	2.65	1.24
7.d	Parents	2.86	1.24
7.e	Students	3.36	1.24
7.f	Professional development providers	3.81	1.00

Appendix L

Appendix L-3

Table 38

Question 8 Subscale a Item Statistics (N = 493)

Item	Description	Mean	Std deviation
8.a	Exciting	3.48	0.53
8.b	Student interest	3.31	0.64
8.d	Student understanding	3.15	0.48
8.g	Want to learn more	3.32	0.57
8.h	Confident	2.80	0.73
8.j	Better teachers	3.14	0.63

Appendix L-4

Table 39

Question 8 Subscale b Item Statistics (N = 495)

Item	Description	Mean	Std. deviation
8.c	Work more complicated	2.86	0.76
8.e	Talent	2.35	0.70
8.f	Not appealing	3.11	0.66
8.i	Time consuming	2.84	0.70

APPENDIX M

Appendix M

OETT/OK-ACTS Grant Application Demographic Page

District________________ **School**____________________ **Grant Number**______

Demographic Information

1. a Type of District/School: ___Rural ____Urban _____Suburban

1. b Campus type: circle one: Primary, Elementary, Middle School, Jr. High, High School, Alternative, Charter, Independent, Dependent, Career Technology

1. c Number of teachers in the district?_____________________________

1. d Number of teachers in the school?______________________________

2. a Total district enrollment on October 1, 2002: ___________________________

2. b Total school enrollment on October 1, 2002: ___________________________

3. a Percentage of students for free and/or reduced lunch as of October 1, 2002

District % _______________ School % _____________________

3. b Number of students for free and/or reduced lunch as of October 1, 2002

District # ________________ School #________________________

4. a District Ethnicity Information based on October 1, 2002

What is the ethnic percentage for the following groups in your district?

African American	Caucasian	Native American	Asian/Eastern Pacific Islander	Hispanic

4. b School Level Ethnicity Information based on October 1, 2002

What is the ethnic percentage for the following groups in your school?

African American	Caucasian	Native American	Asian/Eastern Pacific Islander	Hispanic

5. a Number of teachers who will participate in this grant proposal? ________________

5. b Number of students by grade level who will be served by the proposal.

Grade Level	PK	K	1	2	3	4	5	6	7	8	9	10	11	12	Total
Number of Students															

1. Enter the API scores

	2001 District	**2001 School**	**2002 District**	**2002 School**
Attendance				
OSTP				
Quality				
Total				

APPENDIX N

Appendix N

The University of Oklahoma

OFFICE OF RESEARCH ADMINISTRATION

July 15, 2002

Dr. Mary John O'Hair
Center for Educational & Community Renewal
SCI 308
CAMPUS MAIL

Dear Dr. O'Hair:

The Institutional Review Board-Norman Campus has reviewed your proposal, "OETT and OK-ACTS: Partnering for Professional Learning Communities (PLC)," under the University's expedited review procedures. The Board found that this research would not constitute a risk to participants beyond those of normal, everyday life, except in the area of privacy, which is adequately protected by the confidentiality procedures. Therefore, the Board has approved the use of human subjects in this research.

This approval is for a period of twelve months from July 12, 2002, provided that the research procedures are not changed from those described in your approved protocol and attachments. Should you wish to deviate from the described subject protocol, you must notify this office, in writing, noting any changes or revisions in the protocol and/or informed consent document and obtain prior approval from the Board for the changes. A copy of the approved informed consent document is attached.

At the end of the research, you must submit a short report describing your use of human subjects in the research and the results obtained. Should the research extend beyond 12 months, a progress report must be submitted with the request for continuation, and a final report must be submitted at the end of the research.

If data are still being collected after three years, resubmission of the protocol is required.

Should you have any questions, please contact me at irb@ou.edu.

Sincerely,

Susan Wyatt Sedwick

Susan Wyatt Sedwick, Ph.D.
Director of the Office of Research Administration and
Administrative Officer for the
Institutional Review Board-Norman Campus (MPA #1146)

SWS:lk
FY2002-443

Cc: Dr. E. Laurette Taylor, Chair, Institutional Review Board
Dr. Mark Nanny, Civil Engineering & Environmental Sciences

1000 Asp Avenue, Suite 314, Norman, Oklahoma 73019-4077 PHONE: (405) 325-4757 FAX: (405) 325-6029

APPENDIX O

Appendix O

Table 40

Variables of the Study

Dimensions of *Professional Learning Communities*	Factors of *Technology Integration*
Shared leadership Shared vision Collective learning Peer review and feedback Supportive conditions	Teachers’ use of technology o Teachers’ use of technology for students’ learning activities o Planning and collaborating about the use of technology o Using technology to communicate with others o Using technology for decisions about students’ learning needs o Sharing best technology practices Students’ use of technology Support teachers received for using technology Beliefs about the use of technology o Positive beliefs about technology benefits o Negative beliefs about technology benefits

APPENDIX P

Appendix P

Table 41

Descriptive Statistics of Teachers' Item Statistics (N = 218)

Item	Description	Mean	Std. Deviation
4.a	Word processing	3.71	0.94
4.b	Spreadsheet	2.69	1.11
4.c	Presentation	2.76	1.18
4.d	Database	2.00	1.07
4.e	Email	3.95	0.87
4.f	Internet	3.93	0.88
4.g	Calendar	2.72	1.19
4.h.	Publishing	2.45	1.23
4.i	Graphics	2.48	1.14
4.j	Scanner	2.17	1.20
4.k	Hand-held device	1.71	0.99
4.l	Graphing calculator	1.55	0.93
4.m	Digital camera	2.79	1.27
4.n	SmartBoard	1.83	1.04
4.o	LCD projector	2.14	1.25
4.p	Removable media	2.62	1.23

APPENDIX Q

Appendix Q

Table 42

Professional Learning Communities and Technology Integration Change Scores

Correlation Matrix

Dimensions of Professional Learning Communities and Factors of Technology Integration	Leadership	Vision	Collective learning	Peer review	Supportive conditions	Instructional	Planning	Communicating	Decisions	Shared practices	Students' use	Support	Beliefs positive	Beliefs negative
Leadership	—	.26	.28	.20	.40	0.21*	.05	.11	.04	.12	.09	.16	.19	.10
Vision		—	.27	.21	.34	.16	.09	.01	-.07	.09	.08	.02	.11	-.10
Collective learning			—	.31	.42	.14	.04	.28*	.05	.14	.09	.17	.03	-.02
Peer review				—	.35	0.31*	.09	.16	.09	.27*	.20*	.15	.24*	.05
Supportive conditions					—	0.28*	.10	.20*	.12	.18	.09	0.26*	.10	.02
Instructional						—	.41	.40	.21	.59	.56	.23	.27	-.02
Planning							—	.27	.21	.47	.28	.10	.09	.02
Communicating								—	.27	.35	.33	.27	.14	-.09
Decisions									—	.17	.14	.20	.06	.05
Shared practices										—	.38	.18	.16	-.06
Students' use											—	.17	.18	-.11
Support												—	.08	-.13
Beliefs positive													—	.31
Beliefs negative														—

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

APPENDIX R

Appendix R

Table 43

Professional Learning Communities and Technology Integration Paired Pre-Survey Correlation Matrix

Dimensions of Professional Learning Communities and Factors of Technology Integration	Leadership	Vision	Collective learning	Peer review	Supportive conditions	Instructional	Planning	Communicating	Decisions	Shared practices	Students' use	Support	Beliefs positive	Beliefs negative
Leadership	—	.46	.48	.31	.47	.11	.03	.10	-.07	.17	.08	.31*	.06	.06
Vision		—	.56	.27	.61	.12	.11	.20*	.03	.25*	.04	.34*	.19	.10
Collective learning			—	.46	.66	.15	.06	.24*	.01	.23*	.10	.30*	.02	.01
Peer review				—	.49	.22*	.06	.09	.05	.19	.17	.18	.12	.07
Supportive conditions					—	.11	.00	.18	-.04	.17	.03	.39*	.07	.00
Instructional						—	.58	.50	.51	.77	.81	.38	.37	.30
Planning							—	.42	.42	.62	.52	.19	.41	.36
Communicating								—	.35	.51	.49	.35	.25	.16
Decisions									—	.40	.47	.28	.26	.23
Shared practice										—	.62	.46	.39	.27
Students' use											—	.39	.29	.20
Support												—	.27	.05
Beliefs positive													—	.58
Beliefs negative														—

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

APPENDIX S

Appendix S

Table 44

Professional Learning Communities and Technology Integration Paired Post-Survey Correlation Matrix

Dimensions of Professional Learning Communities and Factors of Technology Integration	Leadership	Vision	Collective learning	Peer review	Supportive conditions	Instructional	Planning	Communicating	Decisions	Shared practices	Students' use	Support	Beliefs positive	Beliefs negative
Leadership	—	.59	.53	.35	.52	.20*	.04	.20*	.03	.22*	.17	.47*	.24*	.15
Vision		—	.67	.37	.64	.24*	.13	.26*	.03	.28*	.20*	.43*	.20*	.04
Collective learning			—	.54	.72	.20*	.07	.27*	.00	.25*	.24*	.42*	.14	.06
Peer review				—	.54	.27*	-.04	.15	.11	.29*	.26*	..40*	.14	-.01
Supportive conditions					—	.19	.02	.19	.01	.28*	.12	.49*	.19	-.01
Instructional						—	.51	.47	.49	.70	.79	.40	.43	.25
Planning							—	.45	.40	.62	.41	.22	.39	.40
Communicating								—	.36	.53	.47	.41	.31	.21
Decisions									—	.42	.47	.30	.36	.25
Shared practice										—	.59	.44	.45	.34
Students' use											—	.34	.31	.15
Support												—	.43	.25
Beliefs positive													—	.53
Beliefs negative														—

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