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THE INFLUENCE OF TECHNOLOGY INTEGRATION ON HIGH SCHOOL COLLABORATION THROUGH THE DEVELOPMENT OF A PROFESSIONAL LEARNING COMMUNITY: A MIXED METHODS STUDY

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

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degree of

Doctor of Philosophy

By
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Norman, Oklahoma
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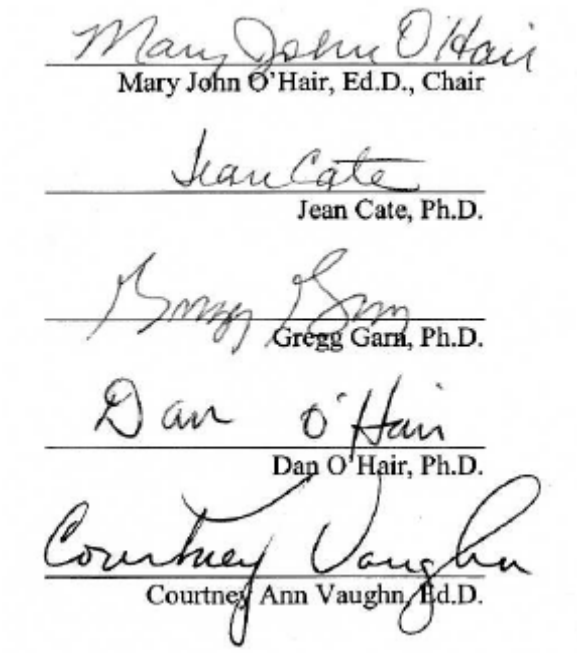
A DISSERTATION APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICY STUDIES

BY



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DEDICATION

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ABSTRACT

Today's traditional school structures result in isolation that negatively impacts systemic school change. The school's physical organization of a collection of disconnected, separated classrooms where a group of students are assigned to a teacher reduces the opportunity for teachers to share their work with one another and is limiting because it restricts learning to the experiences of that individual (Fullan, 2001). As a result of a lack of collaboration, teachers are isolated, their practices become stagnant due to the impossibility for them to engage in productive learning with their colleagues, and the impersonality of traditional schools can lead to estrangement, alienation and a lack of meaning in individual lives. The lack of professional dialogue among educational stakeholders remains a significant impediment to the successful development of strategies to improve schools.

Recent research has documented that professional learning communities and collaboration provide schools supportive environments for continued learning and increased student achievement (Louis, Kruse & Marks, 1996; McLaughlin & Talbert, 1993; Newmann & Wehlage, 1995; Newmann, Smith, Allensworth & Bryk, 2001; Smith, Lee & Newmann, 2001). Technology can serve as a catalyst for teachers to be learners as they examine ways to integrate technology effectively into their classroom practices (Atkinson, 2005; Becker & Reil, 2000; Burns, 2002; Dexter, Seashore & Anderson, 2002). This mixed methods study investigated the relationships between collaborative professional learning community development and technology integration in a purposefully selected sample of schools.

Data sources for this sequential explanatory mixed methods design included two survey instruments, interviews and document analysis. The data were analyzed using correlational analysis to describe the nature of the relationships in the dimensions of professional learning communities and factors of technology integration, with coded and themed qualitative data to add additional insight to the study. The results from the quantitative phase guided the interview protocol and selection of selected sites for the qualitative phase of the study. Four high schools were investigated further to determine how the schools developed and change.

The results of the quantitative phase demonstrated a small, positive significant correlation between the variables of the study and nine significant intercorrelations between the collaborative dimensions of professional learning communities and factors of technology integration. The results demonstrated the impact of combining collaborative professional learning communities and technology integration to increase learning and peer interactions within the community and the importance of the administrator in supporting change efforts. Within data analysis for the purposefully selected sample in the qualitative phase of the study, the themes of leadership and learning appeared. The emergence of communities of practice (Wenger, 1998) around the common concern of technology integration promoted inquiry and discourse for a collaborative school culture. Through collective learning and sharing practices, teacher leadership (Lambert, 1998) surfaced that built capacity for change in the community. The qualitative findings corroborated the quantitative results and demonstrated that collaboration in professional learning community development and technology integration were mutually influential and supportive.

CHAPTER ONE

Introduction to the Study

> The structures and culture of schools create such physical and psychological isolation of teachers that it is almost impossible for them to engage in productive learning with their colleagues. (Sarason, 1996, p. 17)

Today's traditional school structures result in isolation that negatively impacts systemic school change. Among these isolating school structures are its physical organization, individual teaching autonomy, inversion of responsibility for the most challenging situations, restricted dialogue and access to information (Glickman, 1993). The school's physical organization of a collection of disconnected, separated classrooms where a group of students are assigned to a teacher reduces the opportunity for teachers to share their work with one another and is limiting because it restricts learning to the experiences of that individual (Fullan, 2001). The lack of professional dialogue among educational stakeholders remains a significant impediment to the successful development of strategies to improve schools due to structural issues such as inadequate time for collaborative processing and learning.

Collaboration has been called the single most important factor in sustaining the effort to create a professional learning community and reduce teacher isolation (Dufour & Eaker, 1998); and there is evidence of improved student learning in schools with collaborative norms (Lee & Smith, 1996; Little, 1990; Louis, Kruse & Marks, 1996; Newmann & Wehlage, 1995; Schmoker, 1999). Technology integration can be beneficial to support and enhance the development of collaborative cultures in professional learning community development. As school communities engage in inquiry and discourse about school improvement practices, technology integration can enhance the collective efforts

to improve student learning. It can be a powerful tool for enabling collaborative interactions within and across levels, can be an accelerator of the momentum, and can serve as a direct support for teaching and learning (Fullan, 2003). Although the potential of collaboration's effectiveness is documented in the research, very few schools have established conditions and a culture to support this change (Glickman, 1993; Schmoker, 2002). There is very little research that addresses under what conditions technology integration impacts collaboration. Therefore, the focus of this mixed methods study was to research the relationships of technology integration and collaboration around teaching and learning to gain greater understanding for schools as they continually strive to become professional learning communities.

Background of the Problem

Beginnings of American Education

From the earliest days of settlement, Americans have attached importance to education. The 1642 Massachusetts Bay School Law required that parents assure their children know how to read and write the basics of the Biblical Scripture and the capital laws of the commonwealth; and the Massachusetts Law of 1647, the Old Deluder Satan Act, required every town to establish a public school by hiring a schoolmaster to teach the town's children (Urban & Wagoner, 2004). Colonial children received varying experiences depending on the region of the country. In the New England colonies, the focus was based on Christianity. Educational opportunities in the southern and middle colonies tended to be more limited than in the north. Middle colonies were also largely religious but dissenting religions and ethnic differences were the primary focus in private schools. In the south, education was typically provided at home or by private tutors.

During the seventeenth and eighteenth centuries, this colonial education was dominated by religious views, basic skills, and apprenticeship training. "Seldom did these schools in the colonial era offer instruction much beyond the basics, but for many…that was deemed necessary" (Urban & Wagoner, 2004, p. 27). With the religious focus, students were taught to read so they could read the bible, but then could read school books as well. Instruction was often provided in isolation by schoolmasters, private tutors, or parents who were the givers of knowledge. Educational opportunities often produced an educated elite of white, male students. Although girls were allowed to read, they were not allowed to attend grammar school or college.

In 1787, the Northwest Ordinance was enacted to provide for westward expansion and stipulated that a section of land in every township of each new state be reserved for the support of education (Urban & Wagoner, 2004). During the early nineteenth century, the one room schoolhouses of pioneer times were one of the few social institutions which people encountered daily. The common school, sometimes called a village school, reflected and shaped a sense of community that reduced isolation (Tyack, 1974). The school provided education in a loosely-structured system for children of all ages, ranging from toddlers to young men and women. Education was provided in varying configurations of instruction, such as one on one tutoring, peers teaching each other, and older students instructing and caring for the younger children. According to Tyack (1974), school and community were closely related, that is social and economic roles overlapped. "A child growing up in such a community would see work-family-religion-recreation-school as an organically related system of human relationships" (Tyack, 1974, p. 15).

As the country moved from an agricultural to a manufacturing economy in the late nineteenth and early twentieth centuries, educational leaders began to argue that a community-dominated form of education could no longer equip youth to deal with the changing demands of society. From 1910 to 1960, the number of one-room schoolhouses declined from 200,000 to 20,000. "This movement to take control of the rural common school away from a local community…was part of a more general organizational revolution in American education in which laymen lost much of their direct control over schools" (Tyack, 1974, p. 25). New bureaucratic patterns of educational organization were pioneered in the cities. The schools were organized in a fashion similar to the manufacturing economy according to the principles and concepts of the factory model (Darling Hammond, 1997). These schools were not organized for individual intellectual growth and were impersonal for teachers and students.

Traditional School Isolation

This description of the factory model school from the early twentieth century represents traditionally structured schools that are still the norm in our country today. Glickman (1993) emphasizes that this individual teaching autonomy is still present, as "the one room schoolhouse is repeated every few yards, all the way down the hall" (p.19). Darling-Hammond (1997) describes today's traditional school as a result of the factory model:

> Students move along a conveyor belt from one teacher to the next, grade to grade, and class period to class period stamped with lessons before they move on. They have little opportunity to become well known over a sustained period of time to any adults who can consider them as whole people or developing intellects…

> Teachers work in isolation from one another with little time to plan together or share knowledge. Students, too, tend to work alone and passively, listening to lectures, memorizing facts and algorithms, and engaging in independent seatwork at their separate desks. (p. 17)

In traditional school structures, all students do not receive an equitable opportunity for a quality education. Sizer (1985) emphasizes that if you "run a school like a factory, you will get uneven goods" (p. 205).

Traditional school structures are typically top-down, decision making organizations that are often cumbersome bureaucracies arranged into hierarchies. Elmore (2000) refers to this hierarchical structure as "loosely coupled" where the primary teaching decisions are controlled in the classroom, instead of by the school organization. While teachers assume responsibility for practices within the classroom, administrators are in charge of school-level conditions, such as protecting teachers from external scrutiny (Weick, 1979). "The traditional and cultural practices of loosely coupled systems act to prevent the kinds of direct inspection and improvement of instructional practices required by systemic reform" (Halverson, 2005, p. 5).

The organizational metaphor of modernity and traditional schools is the compartmentalized egg-crate, characterized by teacher isolation (Glickman, 1993, Hargreaves, 1994, 2001). The egg-crate represents the physical structure to keep people apart where each teacher is separated from others and unable to collaborate. Most teachers still teach alone, behind closed doors, in the insulated and isolated environment of their own classroom. According to Eaker, Dufour, and Dufour (2002), "traditional

schools often function as a collection of independent contractors united by a parking lot" (p. 10-11).

Classroom isolation offers many teachers a welcome measure of privacy, a protection from outside interference which they often value (Hargreaves, 1994). Yet teacher isolation also presents many problems. It can lead to teacher complacency and a lack of individual professional growth. Isolated teachers get little feedback on the value, worth, or competence of their instruction. The traditional norms of isolation and autonomy that have characterized the teaching professional have been shown to contribute to new teachers' decisions to change schools as well as lessening of a teacher's ability to be a continual learner (Johnson & Birkeland, 2003).

Sarason (1996) described teaching as a lonely profession nearly 40 years ago, and little has changed today. A number of circumstances account for this situation: the organization of space, time, and task seriously constrain interactions among colleagues (Little, 1990). Where isolation prevails, teachers deny the validity of school data, act as victims, and reject ownership of the school's achievement and curriculum problems (Eaker et al., 2002; Garmston & Wellman, 1999; Newmann, Bryk, & Nagaoka, 2001; Newmann & Wehlage, 1995; Smith, Lee, & Newmann, 2001). Barth (1991) stresses that educators need to acknowledge that they have created many of the barriers to high levels of student learning and asks:

> Are teachers and administrators willing to accept the fact that they are part of the problem?...God didn't create self-contained 50 minute periods, and subjects taught in isolation. We did – because we find working alone safer than and preferable to working together…We can work to change the embedded structures

so that our schools become more hospitable places for student and adult learning. But little will really change unless we change ourselves. (p.128)

High School Isolation

For more than a century, our high schools have met the workforce needs of an industrial society by organizing learning around a curriculum delivered in standardized time periods called Carnegie units (Lachat, 2001). Curriculum is defined as a set of units or facts; and credits are based on time served. Students are often tracked into a hierarchy of math and science placement that separate students by skill. "Today's large, impersonal high schools were designed for a different era and a different economy, and they are leaving too many young people behind" (Gates Foundation, 2005, p. 1). Nationwide, three out of every ten high school students will not graduate, and this number increases for minority students to four in ten for African American students and five in ten for Hispanic students (Gates Foundation, 2005).

High school reform efforts require a different approach to education to prepare today's students for a technological and global society characterized by rapid change. Examples of these reform efforts include *Breaking Ranks: Changing an American Institution* (NASSP, 1996), *High Schools That Work* (SREB, 1987) and *High Schools for the New Millenium: Imagine the Possibilities* (Gates Foundation, 2005). The overarching and paramount theme is that the high school of the twenty-first century should be more student-centered, collaborative with a focus on meaningful relationships, intellectually rigorous with curriculum organized around essential learning connected to authentic tasks, and personalized in programs and support services. The NASSP (1996) recommends that schools should focus on continuous and job-embedded professional

development and use technology to support teaching and learning; while the Gates Foundation (2005) suggests relevant learning opportunities through internships and community partnerships. "Such high schools will be learning communities that reflect cultures of respect and trust among staff and students, where the spirit of teaching and learning is driven by high standards of learning for all students" (NASSP, 1996, p. 31).

High schools are harder to change than other school levels because they are more organizationally and institutionally regimented and tend to be profoundly resistant to change (McLaughlin & Talbert, 2001). Teachers who do try new methods are often criticized by parents and colleagues who are comfortable with the school looking and behaving as it did when they were students. In general high school teachers are assigned to teach courses in a particular subject, and their professional background and identities are related to disciplines. They may teach more than 100 students in one day, making it difficult to develop meaningful relationships with their students.

Traditional, lecture-style instruction is the prevalent mode of instruction in high schools (McLaughlin & Talbert, 2001); and the current array of instructional methods and strategies produces low rates of productive time (Yair, 2000). Teacher lectures succeed in securing student engagement less than 50 percent of the time, thus Yair (2000) recommends active instructional methods with a student-centered approach. Since high schools are between grade school and higher education, teaching is also open to a wider range of institutional influences. McLaughlin and Talbert (2001) compare a high school principal to the mayor of a small city since there are so many issues and political influences.

Wood (1993) stresses that the lack of connection and community within a school is often due to the size of the school. Many urban and suburban high schools serve large numbers of students with a wide variety of skill levels. In 2002, 61 percent of American students attended high schools of 1,000 students or more (Snyder, 2003). In these large high schools, the internal traditional structure is extremely complex and trying to change one piece often affects many others. Sizer (1985) explains:

> In a typical school of fifteen hundred pupils and ninety five teachers, the orchestration of the adults with their teaching or counseling or administrative specialities and the students with their five or six course or "activity" options is a complicated process. Accordingly, things remain the same because it is difficult to change very much without changing everything. The result is sustained paralysis. (p. 211)

The notion of building collaboration is not new in schools. Even though collaboration is well-documented in the research, high schools are typically very isolated organizations whose teachers are often very set in their ways. Hargreaves (1994) states:

> Secondary schools are the prime symbols and symptoms of modernity. Their immense scale, their patterns of specialization, their bureaucratic complexity, their persistent failure to engage in emotions and motivations of many of their students and considerable numbers of their staff – these are just some of the ways in which the principles of modernity are expressed in the practice of secondary education. In many respects, state secondary education has become a major component of the malaise of modernity. (p. 8-9)

A Promising Strategy: The Professional Learning Community

Within school improvement research and high school reform efforts, there is an answer to this isolation and systemic school improvement: the professional learning community (Darling-Hammond, 1997; Dufour & Eaker, 1998; Fullan, 1999; Garmston & Wellman, 1999; The Gates Foundation, 2005; Lambert, 1998; Louis, Kruse & Marks, 1996; McLaughlin & Talbert, 2001; NASSP, 1996; O'Hair, Reitzug, Cate, Averso, & Atkinson, 2005; SREB, 1999). Professional learning communities represent a cultural shift from traditional school thinking. Schmoker (2004) emphasizes that there has never been a greater consensus that professional learning communities are the most powerful strategy for sustained, substantive school improvement. He stresses "a broad, even remarkable concurrence" among educational researchers and organizations who have determined that developing the capacity of educators to function as members of a professional learning community is the "best-known means by which we might achieve truly historic, wide-scale improvements in teaching and learning" (p.432).

In a professional learning community, all members of the organization learn together and engage in continual renewal with a focus on improved student learning. When all school stakeholders are collaborative learners, the organization can sustain change and continually renew itself (Covey, 1990; Senge, 1990; Sergiovanni, 1994). Professional learning communities exhibit self-organizing capacity; that is, they adapt and change through creating and reorganizing processes as needed for productivity. 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).

The important process of collaboration is woven into every dimension of professional learning community and learning organization development. In a collaborative culture, communication and learning flow as the community develops a shared vision that focuses on continuous improvement, solves problems, and learns from each other. Supportive conditions enable the community members to collaborate by providing structures and processes, and leadership is shared and distributed across the school.

Context

In 2001, Oklahoma Achievement through Collaboration and Technology Support (OK-ACTS) began with a school leadership grant from the Bill and Melinda Gates Foundation at the K20 Center for Educational and Community Renewal. Matching funds were provided by the Oklahoma Educational Technology Trust (OETT), the National Science Foundation, and the University of Oklahoma. The initial three-year leadership grant, known as Phase I, provided professional development for 800 head superintendents and principals from across the state in the IDEALS framework, "Ten Practices of High Achieving Schools"(O'Hair, McLaughlin & Reitzug, 2000) (see Appendix A). During Phase I, administrators received a laptop computer to help them engage in collaborative networking for the purpose of improving student achievement and facilitating the development of the practices for systemic whole school change. Participants attended a two-day leadership seminar, took an on-line technology assessment, participated in a year-long initiative by attending cluster meetings, and developed an action plan for the implementation of one chosen practice.

After completing the requirements in the leadership program, participants became eligible to apply for a competitive grant, known as Phase II, to deepen the work with their entire staff. The grants, funded by OETT, required schools to develop a collaborative proposal to implement three of the ten practices of high achieving schools (O'Hair et al., 2000) with a focus on the development of a professional learning community using technology integration to increase student achievement. The grant also required the schools to select a learning team, with representative members of the school community, to build leadership capacity for change through implementation of their goals. Awards for grant recipients included $50,000 in technology equipment, $4000 for staff release time, and $25,000 for year-long professional development by OK-ACTS trainers.

The professional development component was individualized to meet the specific needs of each school for implementation of their grant goals and the specific technology purchased. At an initial grant planning meeting, the OK-ACTS staff collaboratively developed the professional development plan with the administrator and learning team for the year-long professional development (see Appendix B). Over the course of the year, teachers received between 30 – 40 hours of professional development in regular monthly sessions. These sessions were supplemented by quarterly meetings, site visits, a winter conference, and continued communication and collaboration with teachers via e-mail, teleconferences or phone conversations.

Within the sessions, the OK-ACTS trainers were the teachers, modeling various processes and the use of technology, and the teachers were the students. Every session began with a discussion in which teachers shared the experiences they had had using the new approaches in the interval between the professional development sessions. This

sharing was followed by an activity that comprised the bulk of the session where teachers were assembled into collaborative groups for the authentic or problem-based activity. Various structures and processes, which teachers could take back to their classroom, were integrated into the lessons, in addition to technology integration. The activities were relevant to teachers, built on their prior knowledge of a situation, and offered opportunities for collaboration and personal reflection. These experiences and the time for reflection enabled the teachers to use and adapt the authentic experiences and technology-integration strategies that were modeled in the activities.

Problem

Research has shown that collaboration is an important factor in sustaining the effort to create a professional learning community and reduce teacher isolation (Barth, 1990; Darling-Hammond, 1997; Dufour & Eaker, 1998; Fullan, 1991; Little, 1990; Louis & Kruse, 1995; McLaughlin & Talbert, 1993; Newmann & Wehlage, 1995; O'Hair et al., 2000; Schmoker, 1999; Sergiovanni, 1994; Sizer, 1992). High schools are notorious for being isolated and inflexible organizations that are reluctant to embrace change (Fullan, 1991). The lack of professional dialogue among educators remains a significant barrier to successful school improvement, resulting in teachers' practices becoming stagnant and student achievement suffering (Barth, 1990; Darling-Hammond, 1997; Fullan, 1991). This isolation can lead to estrangement, alienation, and a lack of meaning in individual lives (Hargeaves, 1994, 2001). Isolated teachers get little feedback on their value and competence as professionals; and isolation can contribute to teachers' decisions to change schools or leave the profession (Johnson & Birkeland, 2003).

Purpose

While many school communities would support the importance of collaboration in professional learning community development, very few schools have established conditions and culture to support this change process (Glickman, 1993; Schmoker, 2002). There is also very little research that addresses the relationships of technology integration on this collaboration. The purpose of this mixed methods sequential explanatory study was to research the relationships of technology integration and collaboration to gain greater understanding for schools as they continually strive to become a professional learning community. In the first quantitative phase of the study, the nature of the relationships between dimensions of professional learning communities and factors of technology integration were examined. In the second qualitative phase, the experiences of staff provided a deeper understanding of technology's influence on the development of a collaborative culture and how collaboration influenced technology integration.

Research Questions

To accomplish this purpose, the study investigated the following quantitative research questions:

1. Is there an overall relationship between collaboration in professional learning communities and the integration of technology in the teaching and learning process?
2. And more specifically, is there a relationship between the collaborative dimensions of professional learning communities and factors for integration of technology for teaching and learning?

The quantitative portion of the study was used to determine the qualitative research questions in the second phase of the study to form a more complete picture of how technology integration influences collaboration to gain greater understanding for schools as they continually strive to become a professional learning community. The following qualitative research questions emerged from the relationships between the dimensions of a professional learning community and factors of technology integration:

1. How does technology integration influence collaboration within professional learning communities?
2. How does collaboration influence technology integration?

The mixed method research question required the blending of data and asked:

1. How do the qualitative findings explain the statistical results obtained in the quantitative phase?

Definition of Terms

1. Change - a highly complex, multivariate process through which individuals and organizations advance as they gradually come to understand, and become skilled and competent in the use of new methods and processes (Hall & Hord, 2001).
2. Collaboration - activities that a school community engages in when it collectively engages in inquiry and discourse about school improvement practices and how its collective efforts can work together to improve student learning (O'Hair et al., 2000).
3. Communities of practice - groups who share common concerns and issues and who, through their passion, deepen their understanding and knowledge in the area

of concern through interactions and learning together (Wenger, McDermott, & Snyder, 2002).

4. Culture - represented by ideas, knowledge, practices and beliefs in an institution.
5. Discourse - conversations, discussions and debates focused on teaching and learning issues.
6. Distributed leadership – school leadership practice is constituted in the dynamic interaction of multiple leaders and followers and their situation around particular leadership tasks. Leaders practice is stretched over the social and situational contexts of the school (Spillane, Halverson & Diamond, 1999).
7. Inquiry - the critical study of our practice by gathering and considering data, new knowledge and other's perspectives.
8. Leadership capacity - broad-based, skillful participation in the work of leadership within an institution (e.g., school) (Lambert, 1998).
9. Learning organization – an organization that is continually expanding its capacity to create its future (Senge, 1990).
10. Professional learning community (PLC) - the professional staff learning together to direct efforts toward student learning.
11. Stakeholders - individuals associated with an organization, such as students, faculty, staff, administrators, parents and community members.
12. Technology Integration – the use of technology as an effective learning tool that is tightly linked to content standards and integrated into ongoing classroom work, rather than taught as a separate or stand-alone subject (Barnett, 2003).

13. Vision – a picture of what is important to an organization and consensus of what is preferred to strive for in the future.

Significance

According to McLaughlin (as quoted in Dufour & Eaker, 1998, p. xi), professional learning community development is the most promising and powerful strategy for sustained, substantive school improvement. Although the literature and research has provided a great deal of information on their characteristics and effectiveness, professional learning communities are uncommon and practitioners are only beginning to learn how to actualize it (Eaker et al., 2002). The integral process of collaboration is woven into every aspect of professional learning community development and sustainability; and technology integration can be beneficial to support and enhance the development of a professional learning community (Atkinson, 2005; Burns, 2002; Dexter, Seashore, & Anderson, 2002; Riel & Fulton, 2001). This study illuminated the understanding of school collaboration by administrators and their school communities, highlighting the conditions, such as technology integration, that enhanced its development, sustenance and meaningful guidance towards the development of a professional learning community. It also added to the literature base on the role of technology integration in systemic school improvement, specifically focusing on its impact on collaboration. The implication for educational leadership preparation focused on the development of a knowledge base for future leaders in the importance of the leader's role in modeling and supporting technology integration's impact on the development of collaboration in professional learning communities.

Additionally, this research yielded valuable results due to the mixed methods design. This study was an important step forward because its two-phase approach made it easier to understand the complexity of developing collaborative cultures within professional learning communities. The mixed methods design combined quantitative and qualitative approaches to provide meaningful insight into the problem of traditional school isolation by identifying relationships between professional learning community dimensions and technology integration factors and providing a deeper understanding of how schools are developing collaborative cultures in professional learning community development. Methodologically, this study added to mixed methods research in education by elaborating procedural issues of the sequential explanatory design and integrating the results of the two sequential phases of the study.

Summary

As a result of a lack of collaboration, teachers are isolated and their practices become stagnant due to the difficulty for them to engage in productive learning with their colleagues. Research has shown that collaboration is an important factor in sustaining the effort to create a professional learning community and reduce this isolation; and there is evidence of improved student learning in schools with collaborative norms (Lee & Smith, 1996; Little, 1993; Louis et al., 1996; Newmann & Wehlage, 1995; Schmoker, 1999). Technology integration processes can be advantageous in contributing to the development of a professional learning community (Atkinson, 2005; Burns, 2002, Dexter et al., 2002, Riel & Fulton, 2001). Although recent educational research has documented the positive impact of professional learning community dimensions and technology integration, there is a lack of empirical data to determine the relationship between the

factors and to understand how schools develop through this systemic school improvement process. Therefore, this study gathered data to determine the relationship of technology integration and high school collaboration through the development of a professional learning community.

CHAPTER TWO

Theoretical Perspectives

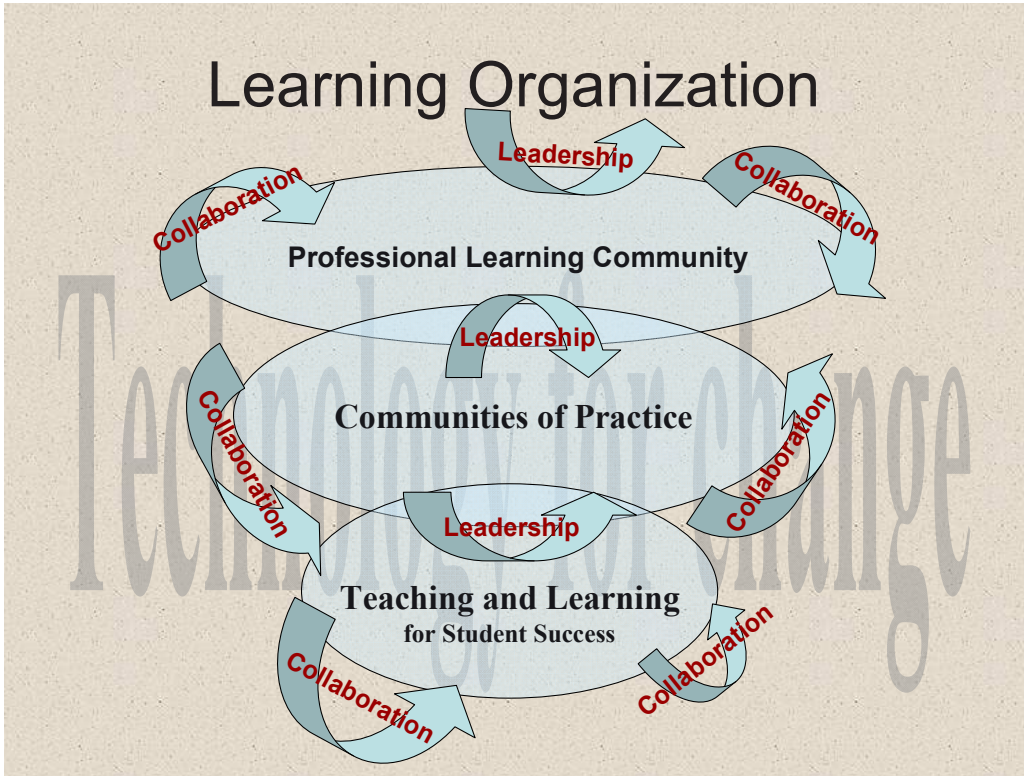
> The structure of a learning organization, complex, interrelated, evolving and adaptive, better reflects our own needs and promises to be engaged in creative self-expression and purposeful activity. (Fleener, 2002, p. 195)

Today's American schools face many challenges in the new age of standards and accountability. Since the 1983 publication of the landmark study *A Nation at Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education, 1983), educators have endured a number of criticisms targeted on the major failings of our nation's public schools. Most recently, the federal government has passed the school improvement initiative, *No Child Left Behind Act (NCLB)* (USDE, 2002), where legislation has called for the design and implementation of large-scale school change. In this climate of increasing local, state and federal pressures to improve student achievement in schools, the need for educational research to identify factors associated with school improvement is imperative. One strategy of substantive school improvement that has gained momentum during this past decade is the creation of professional learning communities.

To study technology integration's influence on collaboration through the development of a professional learning community by examining relationships, structures, and processes, the theoretical perspectives that will serve as the framework for this study were drawn from learning organization theories. The development of schools as professional learning communities using collaboration will be discussed in relation to change theory, communities of practice, and technology integration (see Figure 1). Organizational learning leads to shared leadership and a shared vision that increases a

school's capacity to change. Change dynamics in schools as learning organizations will be discussed in relation to leadership and professional development. The overarching theories involve "building learning organizations that develop people who learn to see as systems thinkers see, who develop their own personal mastery, and who learn how to surface and restructure mental models, collaboratively" (Senge, 1990, p. 367). Senge (1990) stresses that this powerful concept alters not only what we think about, but also our ways of thinking. The culture of a learning organization provides opportunities to develop new solutions and continue the reflective and collaborative process toward sustained improvement.

Figure 1. Representation of the connections and relationships among the theoretical perspectives



Source: Williams, L. (2006)

Learning Organizations

The work of many researchers and theorists has been instrumental in the evolution of the learning organization and professional learning community concepts. This model for comprehensive school reform emerges from organizational theory and systems thinking in the business sector (Covey, 1990; Senge, 1990; Sergiovanni, 1994). In Senge's 1990 publication of *The Fifth Discipline*, his work precipitates a change in American business practices, away from individual performance toward shared vision, collaborative learning, and growth in learning organizations. His theory emphasizes that "the whole of an organization can be more effective than the sum of its parts" (Senge, 1990, p. 12).

According to Weick (1979), "an organization consists of plans, recipes, rules, instructions, and programs for generating, interpreting, and governing behavior that are jointly managed by two or more people" (p. 235). He stresses that if an organization is to learn anything that the distribution, accuracy, and conditions of its memory become crucial characteristics of organizing. One of the most important capabilities of an organization is to "create the conditions that both generate new knowledge and help it to be shared freely" (Wheatley, 1999, p. 110). Organizations only survive if they maintain a balance between flexibility and stability (Weick, 1979). Flexibility is necessary so that current practices can be challenged and adapted as members of the organization work together in an ongoing endeavor to discover best practices and expand their expertise to promote continual learning. If an organization has total flexibility, it can not retain a sense of identity and continuity over time. Stability provides the means "to handle new

contingencies, since there are regularities in the world that any organization can exploit if it has a memory and the capacity for repetition" (Weick, 1979, p. 215).

Senge (1990) contends that the distinction between learning organizations and traditional authoritarian organizations is the mastery of five basic disciplines: systems thinking, personal mastery, mental models, shared vision, and team learning. Each provides a valuable dimension "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, 1990, p. 3). He stresses that the five disciplines should be developed simultaneously and are interconnected. "At the heart of a learning organization is 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" (Senge, 1990, p. 12-13).

In an organization, learning occurs at the individual, team, and holistic level. Organizations learn only when individuals experience personal growth and learning. Senge (1990) explains that the personal mastery discipline, grounded in competence and skills, also enhances the capacity to create the results we truly want in life. It adds a generative learning component that is an ongoing process. Senge (1990) describes this pursuit for committed life-long learning as "the spirit of the learning organization" (p. 141). Leaders can foster personal mastery by "building an organization where it is safe for people to create visions, where inquiry and commitment to the truth are the norm, and where challenging the status quo is expected" (Senge, 1990, p. 172). He emphasizes

that this will reinforce that personal growth is valued in the organization and recommends modeling as the primary leadership strategy.

Team learning is also imperative because teams, not individuals, are the "fundamental learning unit in modern organizations" (Senge, 1990, p.10). It builds on personal mastery with quality teams being comprised of individual generative learners. Team learning can set the climate and standard for learning together for the whole organization. It is "the process of aligning and developing the capacity of a team to create the results its members truly desire" (Senge, 1990, p. 236) With the mastery of discussion and dialogue through collaboration, team efforts often exceed expectations and accomplish much more than what could have been accomplished by individuals. As team members, "we never understood that we were participants in a universe that thrives on open information and that works with us to self-organize into systems of increased capacity" (Wheatley, 1999, p. 112).

According to Senge (1990), the focus and energy for learning is provided by the shared vision and generative learning can only occur with the presence of a vision that matters deeply to the individuals in the organization. A shared vision changes people's relationship to the organization and creates excitement, commitment and courage. "In fact, an organization's shared sense of purpose, vision, and operating values establish the most basic level of commonality" (Senge, 1990, p.208). Wheatley (1999) reminds us that we need to be able to trust that something as simple as a clear core of values and vision provides the shape for the organization and when it's kept in motion through dialogue, it can lead to order within the complexity.

Another discipline for building learning organizations focuses on the management of mental models. "Mental models are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (Senge, 1990, p. 8). Developing an organization's capacity to work with mental models involves both learning new skills and applying improvements that help bring these skills into regular practice. Through processes, such as inquiry and reflection, individuals become more conscious of the formation of mental models and how they influence actions and complex interactions. Ultimately, the benefit of integrating mental model management with learning organizations will alter our ways of thinking. It shifts from linear thinking dominated by events to a shared understanding based on interrelationships, patterns of change, and the structures producing these patterns (Senge, 1990).

Systems thinking is the fifth discipline of Senge's model that serves as the "conceptual cornerstone" of the learning organization (1990, p. 69). Capra (1996) characterizes systems thinking as a shift from modernisim and reductionism to holistic relationship thinking. Systems thinking focuses on seeing the whole organization, rather than just the parts of individual and team learning. Interdependencies and relationships in complex situations are the substance of organizations, but these interdependencies are fluid and shifting (Covey, 1990; Weick, 1979). Fleener (2002) emphasizes that:

> Relevant properties of the system cannot be discovered by examining isolated aspects of it; the systemic nature is destroyed when investigated piece-meal. The important features of a system are precisely the organization and relationship of its various parts in relation to the whole. (p. 107)

When we view systems from this perspective, we enter a new facet of connections that cannot be explained by studying the parts as isolated components. "We move into a land where it becomes critical to sense the constant workings of dynamic processes, and then to notice how these processes materialize as visible behaviors and forms" (Wheatley, 1999, p. 10-11).

The disciplines of learning organizations address learning from individual, team and organizational perspectives. This concept is supported by the educational research of Newmann, King and Youngs (2000) who found that increasing knowledge, skills, and competence of individual teachers is not sufficient to foster sustained school improvement. They emphasize that professional development is more likely to increase achievement for the entire student population if all aspects of school capacity are addressed and if teaching and learning is the focus of the discourse among the entire learning organization. Findings from case studies of nine schools show that comprehensive professional development should address five aspects of school capacity: (a) teachers' knowledge, skills and dispositions; (b) professional community; (c) program coherence; (d) technical resources; and (e) principal leadership. In the effective case schools that exhibit a higher school capacity, these various aspects emerge. The schools foster a professional community where teachers and administrators work together to examine their practices and results. Strong principal leadership and resources (e.g., time, materials, and expertise) provide supportive conditions for building school capacity.

The high capacity schools also focus on instructional program coherence by becoming selective, integrative and focused when considering new innovations. Research shows positive connections between strengthening instructional program

coherence and improving student achievement on math and reading standardized assessments (Newmann et al., 2001). Improvement efforts to strengthen instructional program coherence focus on a few core goals with a common instructional framework; and "are embedded within systemic strategies to build effective school leadership, teachers' professional community, parent and community involvement, and high quality instruction" (Newmann et al., 2001, p. 40). School administrators and their community focus on understanding the barriers and sources of incoherence and improving efforts to increase instructional program coherence.

Many incoherent schools suffer from too many innovations that often conflict with each other or with the school vision. They pursue every new fad so that it can be added to the school structure, however the diverse, multiple short-term innovations do not necessarily connect. Fullan (2001) discusses these types of schools that are often called "Christmas tree schools" (Bryk, Sebring, Kerbow & Rollow, 1998). He explains that they glitter from a distance with so many different initiatives, but when observed more closely are decorated at a superficial level, lacking coherence building and depth. "Unfortunately, ornaments are fragile, likely to be dislodged by the first ill wind, and never become organic. They may be *on* the tree, but they are not *of* the tree" (Dufour, Eaker, & Dufour, 2005, p. 21). 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 based on the shared vision.

Professional Learning Communities

In the past decade, educational researchers have begun to support the paradigm of learning organizations for schools. Dufour and Eaker (1998) emphasize that "if schools are to be significantly more effective, they must break from the industrial model upon which they were created and embrace a new model that enable them to function as learning organizations" (p. 15). In a professional learning community, all members of the organization learn together and engage in continual renewal. Halverson (2005) argues that "professional community is a special form of relational trust that arises from professional interaction around setting and solving the core problems of instructional practice" (p. 6).

Several researchers identify key characteristics, principles or dimensions of these learning communities (Dufour & Eaker, 1998; Halverson, 2003; Hord, 1997; Louis et al., 1996; McLaughlin & Talbert, 1993; Newman & Wehlage, 1995; O'Hair et al., 2005). McLaughlin and Talbert (1993) identify five specific requirements of a professional learning community: (a) leadership with a vision and commitment to developing a cohesive community, (b) time and space to talk and meet, (c) interdependent teaching roles, (d) active attention to renewal of community through symbols and celebration, and (e) structures that encourage exchange of ideas. Similarly, Louis et al., (1996) offer five elements that have some similarities to McLaughlin and Talbert's requirements, but focus more on student learning and reflective dialogue. Their identified characteristics include (a) shared norms and values, (b) focus on student learning, (c) reflective dialogue aimed to review and critique each other and the school, (d) deprivation of practice that encourages sharing skills and insights, and (e) collaboration to build expertise.

In 1995, the Center on Organization and Restructuring of Schools found that school restructuring from traditional to a professional community can improve student learning experiences and increase student achievement (Newmann & Wehlage, 1995). Newmann and Wehlage (1995) focus on three key features of professional communities: (a) teachers pursue a clear shared purpose for all students' learning, (b) teachers engage in collaborative activity to achieve the purpose, and (c) teachers take collective responsibility for student learning. In the Center's restructuring research project, schools that were considered most successful embrace a powerful vision to guide curriculum and instruction and structures to enhance knowledge, but provide for flexibility within the framework for discourse and experimentation. The *Successful Schools Restructuring* report shows that the level of professional community in a school has significant effects on student achievement, both in authentic and standardized assessment. In schools where teachers collaborate and report higher levels of collective responsibility for student learning, achievement was higher in mathematics, science, reading, and history. The primary implication of these findings is that if schools want to enhance their organizational capacity to boost student achievement, they should work on building a professional community that is characterized by a shared purpose, collaborative activity, and collective responsibility (Newmann and Wehlage, 1995).

Another professional learning community model offered by Shirley Hord (1997) is based on research at the Southwest Educational Developmental Laboratory (SEDL). Hord (1997) defines professional learning community, often referred to as PLC, as the professional staff learning together to direct efforts toward student learning. She conceptualized that professional learning communities involve the processes of

leadership strategies, change processes and staff interactions for school improvement (Hord, 1997). As a result of visits and research in schools in the midwest and an extensive literature review, five themes or dimensions of professional learning communities emerge: (a) supportive and shared leadership, (b) shared values and vision, (c) collective learning and application of learning, (d) supportive conditions, and (e) shared practice. She emphasizes that the dimensions are not isolated, but intertwined and impacting each other in numerous ways. Morrissey (2000) expands the concept and stresses that "the five dimensions exist when each of the five dimensions are in place and working interdependently together" (p. 28).

Dufour and Eaker (1998) make recommendations to "begin with the end in mind" (Covey, 1990, p.95) by developing a clear vision of what a learning community looks like to determine steps that might be taken for its development. The characteristics that they identified include: (a) shared mission, vision and values, (b) collective inquiry, (c) collaborative teams, (d) action orientation and experimentation, (e) continuous improvement and (f) results orientation. They provide an illustration of learning communities through the definition of the terms:

> Each word of the phrase *professional learning community* has been chosen purposefully. A *professional* is someone with expertise in a specialized field, an individual who has not only pursued advanced training to enter the field, but who is also expected to remain current in its evolving knowledge base. *Learning* suggests ongoing action and perpetual curiosity symbolized by two Chinese characters represented to study and to practice constantly. The term *community* suggests a group linked by common interests. When these three

> words are joined together, the phrase represents a learning organization in which professional educators utilize research findings as a basis of collaborative investigation in order to better achieve established goals. Personnel with professional learning communities readily recognize that staff must engage in ongoing study and constant practice as a vital aspect of the organization's commitment to continuous learning and improvement. The community provides an environment that fosters mutual cooperation, emotional support, and personal growth as the staff works together, rather than in isolation in order to achieve goals that have been jointly established (p. xi-xii).

Researchers at SEDL have studied the evolution of professional learning communities the past several years to identify specific actions taken to develop such a community within schools. Significant common themes were found across school sites. While some of these findings are not new to educational research or the characteristics that were previously discussed, there are actions of significance among the schools in regard to their development as a professional learning community. The themes include the role of the principal, a culture of collaboration, a commitment from all staff, the presence of a catalyst and the use of a critical friend or change facilitator (Morrissey, 2000).

The K20 Center for Educational and Community Renewal at the University of Oklahoma uses the IDEALS framework (O'Hair et al., 2000), which is grounded in research-based practices with a constructivist and democratic approach (O'Hair et al., 2005). The focus of the Center's work has been to support school leaders in developing and sustaining professional learning communities and integrating technology. IDEALS

is an acronym representing Inquiry, Discourse, Equity, Authenticity, Leadership and Service as key democratic principles. These *IDEALS* are put into action through a series of practices, *10 Practices of High Achieving Schools* (O'Hair et al., 2000) that are directly linked to high student achievement. (See figure in Appendix A).

Halverson (2003) suggests that professional community is a product of coordination of social interaction in a school. "Leaders influence the development of social networks not only through direct participation, but also indirectly through the formation of tasks shaped by the design and implementation of artifacts" (Halverson, 2003, p. 6). According to Halverson (2003), artifacts, such as programs, processes and policies, are a primary component of how leaders build the conditions for professional community. He uses the term "artifact" instead of "structure" because "artifact provides a tractable and identifiable unit of analysis…to trace how leaders think about how they spark and direct relational trust-building efforts in schools" (p. 8).

Based on the findings of several ethnographic research studies, Halverson (2005) provides a typology for classifying artifacts based on their function: catalytic, compounding and coherence artifacts. Leaders use catalytic artifacts to produce the initial discourse in school communities who are reluctant to engage in professional community. Compounding artifacts direct novel learning communities in problem-solving processes. Coherence artifacts connect initiatives for developing and implementing a shared vision. The leaders in the studies recognize the importance of collaborative action in creating systemic change in schools. They suggest that "professional community is a valuable by-product of efforts designed to engage staff in resolving chronic problems of teaching and learning. Their goals were to improve

student learning, and their means were to use a variety of artifacts to improve their staff's capacity to change" (Halverson, 2005, p. 26).

Regardless of the definition or number of characteristics outlined by researchers, remarkably similar conclusions or converging themes for creating and sustaining professional learning communities emerge in the literature and empirical research:

- Shared vision
- Shared and supportive leadership
- Collective learning, application of learning and shared personal practice
- Supportive conditions
- Continuous improvement with an action and results focus

Researchers observe improvements in schools where learning community characteristics exist (Darling-Hammond & McLaughlin, 1995; Louis, Kruse & Marks, 1996; McLaughlin & Talbert, 1993; Newmann & Wehlage, 1995; Newmann et al., 2001; Smith et al., 2001).

Shared Vision

Professional learning community models share a belief that the development of a shared vision and cultivating a culture to support the vision are integral for school improvement. Schools with a shared school vision have more positive results than schools with multiple programs and little coordination (Lee & Smith, 1994). Senge (1990) argues that "you cannot have a learning organization without a shared vision" (p. 209) and that the process of developing the shared vision builds commitment among the people involved. The best way to create ownership for the vision is to have those responsible for its implementation develop the plans for themselves. According to

Dufour and Eaker (1998), these guiding principles are not just articulated by school leaders, but are embedded in the hearts and minds of people throughout the school and should be used as a basis for all school decisions and changes.

Shared vision is a research-based practice that gives a school a sense of direction about students, learning, and schooling (O'Hair et al., 2005). It presents a picture of what is important to an organization and consensus of what is preferred to strive for in the future. Sergiovanni (2001) emphasizes that "the vision of a school must reflect the hopes and dreams, the needs and interests, the values and beliefs of everyone who has a stake in the school – teachers, parents, and students" (p. 149). Glickman's (1993) "convenant" for teaching and learning embeds the vision at a deeper level to provide a framework for core learning principles that are manifested in daily school practices.

In a learning community, the shared vision is developed using a collaborative approach that is based on the common values and beliefs about teaching and learning (O'Hair et al., 2000). Stakeholders should develop the vision using collective inquiry by "seeking out and learning about best practices" (Eaker et al., 2002, p.14). Senge (1990) encourages individuals to develop their own personal vision first, emphasizing that shared visions emerge from personal visions. "This is how shared visions derive their energy and foster commitment. If people don't have their own vision, all they can do is sign up for someone else's, and the result is compliance, never commitment" (Senge, 1990, p. 211).

A primary attribute of a professional learning community vision is a continuous focus on student learning (Hord, 1997). Michael Fullan (2001) describes this vision as the moral purpose of the school and contends that student achievement is a logical moral

purpose for an educational organization. Schools that focus on student learning and question "Is it better for kids?" tend to more easily and deeply adopt professional learning community dimensions. The *Successful Schools Restructuring* report (Newman & Wehlage, 1995) shows that the level of professional community in a school with a focus on teachers pursuing a clear shared purpose for all students' learning had significant effects on student achievement, both in authentic and standardized assessment. They also discuss the purpose of student learning to promote students' cognitive development and propose authentic teaching and learning that involves construction of knowledge, disciplined inquiry and value beyond school (Newman & Wehlage, 1995; Newmann, Bryk, & Nagaoka, 2001).

"Authentic practices require activities in which students study disciplinary content, organize information, consider alternatives, gather new information, and link the information and alternatives to what they already know" (O'Hair, et al., 2000, p. 327). In reports from the *Improving Chicago's Schools* initiative (Newmann et al., 2001; Smith et al., 2001), researchers provide evidence that organizing instruction around challenging, authentic intellectual work and interactive instructional strategies can achieve increased scores on standardized test scores and the production of more intellectually complex work. "Authentic achievement aims to nurture independent, critical thinking in students and intends to help students appreciate, live with, and experience the joy of working with cognitively complex problems" (Newmann & Associates, 1996, p. 44).

In addition to a focus on individual growth, several educational researchers (Beane & Apple, 1995; Glickman, 1993; O'Hair et al., 2000; O'Hair et al., 2005;

Wood, 1993) recommend that American schools concentrate on the original purposes of public education to prepare active, participatory, democratic citizens. "Schooling for democracy requires schools to practice authentic teaching and learning designed to connect students with the real issues of their community and lives" (O'Hair et al., 2000, p. 9). Creating more democratic schools focuses on serving the common good. "Traits such as a commitment to community and a desire to participate, values such as a sense of justice, equality, or liberty, skills of interpretation, debate, and compromise, habits of reflection, study, examining multiple perspectives, form the basics of democratic citizenship" (Wood, 1993, p. xxiii).

Shared and Supportive Leadership

Once the shared vision has been established with a purposeful focus on learning, it is important for the school administrator to provide supportive leadership and build leadership capacity in a collaborative school culture (Hord, 2004; Lambert, 1998; O'Hair et al., 2000). Shared and supportive leadership are two of the *Practices of High Achieving Schools* and involve processes and structures that reduce hierarchical decision-making practices (O'Hair et al., 2005). The ability of principals to provide supportive conditions emerge as a key factor in encouraging shared leadership (Huffman & Hipp, 2003). The role of the principal is to build capacity for learning communities and to facilitate shared power based on the shared vision, helping teachers make decisions for themselves and establish responsibility for their actions.

Research by Marzano, Waters, and McNulty (2005) emphasizes the importance of the principal as a leader of educational reform, understanding the changes that impact student learning and what these changes require of the teachers. Principal leadership

continues to be identified as the key factor in the success of professional learning communities (Dufour & Eaker, 1998; Huffman & Hipp, 2003; Sergiovanni, 2001), yet the principal's role has changed dramatically. Recent studies on school restructuring clarify the evolution of educational leadership from the isolated role of bureaucratic manager, then to instructional leader, and finally to the current highly interactive transformational leader of the school learning community (Sergiovanni, 2001).

Blasé & Blasé (1998) examine teacher perspectives on every day instructional leadership characteristics of principals. Data were drawn from a qualitative study of 800 teachers, and findings indicate that principals' positive behaviors reflected true caring and interest in professional support. The data also indicate several themes: talking with staff to promote reflection, giving feedback, modeling, making suggestions, and using inquiry and soliciting advice and opinions from the teacher. These findings support themes of shared inquiry and decision-making that underlie working together to promote professional community (Blasé & Blasé, 1998).

Newmann and Associates (1996) find that the most effective leaders delegated authority, advanced collaborative decision-making, and refrained from being the central problem solver. They emphasize that leaders did not resolve differences, but rather encourage and support an environment that builds the potential of staff to lead. In effective learning communities, administrators view each individual as a learner and leader in the quest for the shared vision. Leaders foster powerful collaboration when they engage teams of teachers in 1) clarifying the essential knowledge and skills of a particular grade level, course or unit of instruction; 2) developing common assessments of student learning;

3) analyzing results to identify areas of strength and weakness for both individual teachers and the team; and 4) establishing specific goals and action plans to improve student achievement (Dufour & Eaker, 1998).

Traditional school principals possess an authoritarian, bureaucratic style of leadership, while progressive school leaders relinquish some of their authority and responsibility for leadership to others (Sergiovanni, 2001). Shared leadership and decision-making is increasingly prevalent in professional learning communities, and leadership is distributed among all members of the school community (Lambert, 1998, 2003; Spillane, Halverson, & Diamond, 1999). Empowerment of teachers and professional staff members is essential if they are to become fully functioning members of the learning community. Teacher leadership is an essential element in schools that model shared leadership, where teachers change from classroom instruction to different instructional and leadership roles that goes beyond the walls of their classroom. "In a democracy such as ours, the more the leadership is shared and expressed, the better it is presumed to be" (Sergiovanni, 2001, p. 146).

Collective Learning and Shared Personal Practice

According to Hord (1997), the most logical and effective way to begin developing a professional learning community is to bring professionals together to learn. "Once a school has identified its point of focus for improvement, that particular subject can be used as a catalyst for learning" (Morrissey, 2000, p. 41). Collaborative teams work interdependently as they support one another and share strategies as they work together to accomplish goals that they could not achieve by working alone. The driving force of the collaborative culture of a professional learning community is the team. "Team learning is

a discipline of practices designed, over time, to get the people of a team thinking and acting together" (Senge, 2000, p.73). Eaker et al.(2002) emphasize important keys to highly effective teams: collaboration is embedded in routine practices, team norms guide collaboration, and teams focus on key questions associated with learning.

As teachers collaborate and work together to expand their professional expertise, a systemic effort to professional development is a necessary focus. Collaborative professional development strategies promote continual learning with a focus on increased student achievement and involves teachers as both learners and as teachers (Darling-Hammond & McLaughlin, 1995; Darling-Hammond, 1998). Darling-Hammond and McLaughlin (1995) identify several primary characteristics of effective professional development:

- engaged teachers in concrete, experiential tasks of teaching, assessment, and observation that illuminate the processes of learning and development;
- grounded in participants' questions, inquiry and experimentation as well as profession-wide research;
- involved collaborative sharing of knowledge among educators;
- connected to and derives from teachers' work with their students as well as to examinations of subject matter and teaching methods;
- sustained and intensive, supported by modeling, coaching, and problem solving around specific problems of practice; and
- connected to other aspects of school change.

These approaches shift from traditional models of drive-by, one day teacher workshops that are planned from a top-down approach to a model where teachers are involved in inquiry and discourse, where communication and learning flow in a collaborative culture.

Effective professional development training for systemic change should be on-going, job-embedded, and constructivist in design (Bernhardt, 2002; Sparks & Hirsh, 1997). Various processes to reflect and share best practices, such as coaching and mentoring, book clubs, professional networks (Lieberman, 1996), action research, study groups and partnerships with universities and institutions (O'Hair et al., 2005), encourage teacher collaboration in job-embedded professional development opportunities (Wood & McQuarrie, 1999). Fullan and Hargreaves (1996) warn that collegiality cannot be contrived by requiring teachers to plan together or engage in peer coaching. When professional development is constructivist in design, teachers are involved in authentic activities and are more likely to become actively involved in the learning and committed to the process of professional development (Bernhardt, 2002, Fullan & Hargreaves, 1996).

Elmore (2000) states "schools and school systems that are improving directly and explicitly confront the issue of isolation by creating multiple avenues of interaction among educators and promoting inquiry-oriented practices while working toward high standards of student achievement" (p. 32). Communities of practice are created by groups who share common concerns and issues and who, through their passion, deepen their understanding and knowledge in the area of concern through interactions and learning together (Wenger, McDermott, & Snyder, 2002). Institutionalized professional learning communities share a common vision that revolves around an emphasis on

student learning and deepen their understanding through collaborative process and knowledge sharing. Through this systemic approach to collective learning, there is an emergence of internal teacher leadership that builds the capacity for change for the organization and cultivates the community of practice (Wenger, 1998). The leadership becomes increasingly more complex and distributed within the school community.

Supportive Conditions

Supportive conditions are the structures of the organization that enable the school stakeholders to come together to learn, solve problems and share best practices. Hord (2004) emphasizes that supportive conditions are the glue that hold the dimensions together and include physical and structural capacity, in addition to capacity of the people working in the learning community. Faculty members, administrators, and others in successful schools establish norms of collegiality for discussing and debating the big questions about how to constantly renew and improve the educational environment for all students (Glickman, 1993). A commonality found with nearly all successful schools is that they have structures in place so that teachers have time to plan and work together collaboratively (Darling-Hammond, 1997; Joyce & Showers, 2002; O'Hair et al., 2000). Establishing these structures is critical to increasing student achievement and in the present leadership structure of most schools, the principal is the key person who is responsible for providing supportive conditions. Successful schools create time for people to work together for inquiry and discourse. In Rick Dufour's school at Adlai Stevenson High School in Illinois, he restructured the traditional schedule and worked creatively to find times where staff members worked collaboratively within the regular school day and calendar (Dufour & Eaker, 1998).

Unlike American teachers, teachers in other countries have professional responsibilities that involve them in many aspects of school improvement. Generally, half of their work week is spent teaching students, while the other half is spent working collaboratively with colleagues on curriculum and assessment development, effective instructional strategies and lesson planning (Darling-Hammond, 1997). Time is regularly built into the teacher's work day to facilitate teacher collaboration and learning in countries such as Belgium, Japan and Italy. One approach is exemplified in the Third International Mathematics and Science Study (TIMSS) research on improvement of the Japanese classroom in their lesson study work. In lesson study, groups of teachers meet regularly over long periods of time, ranging from several months to a year, to work on the design, implementation, assessment and improvement of research lessons (Stigler & Hiebert, 1999). These successful schools create time for teachers to collaborate and learn through inquiry and discourse; and the lesson study approach focuses on job-embedded professional development where teachers collaboratively plan lessons and share practices.

Researchers emphasize that the quality of relationships between the people within the school community provides an indicator of the extent to which schools are oriented towards professional learning community practices (Barth, 1990; Fullan, 2001; Sergiovanni, 2001). While process is important to the overall coherence of the organization, the relationships of people who work in the organization brings process to life (Brown & Duguid, 2000). According to Kouzes and Posner (1998), leaders create relationships and what really separates effective and ineffective leaders is how much they "really care about the people they lead" (p. 149).

For teachers to work collaboratively, they must feel comfortable to take risks, share information and build good relationships. The basis of a good relationship is trust (O'Hair et al., 2000), and teachers trust and talk to their colleagues more when they feel included in decisions about their job that ultimately increases student achievement (Glickman, 1993; Wood, 1993). High levels of trust promote risk-taking, honest communication, and deep commitments to school improvement. The absence of trust distracts personnel from issues of instruction to conflicts of personality and practice.

Creating trust requires people to be able to spend time together in collaborative endeavors. Covey (1990) describes the metaphor of an "emotional bank account" that describes the amount of trust that's been built in a relationship" (p. 188). He illustrates that being courteous, kind, honest and keeping commitments builds the emotional reserve of trust to facilitate more effective collaboration and communication. Conscious efforts to build trust characterize many efforts to create professional learning communities. Glickman (1993) illustrates this in the example of engaging participants in a team-building activity that will increase the level of acceptance and trust among the group before beginning the discussion of beliefs in developing core learning principles. This type of activity can also build a sense of collegiality that is essential to school improvement. All of the learning must be embedded in a trusting environment in which relationships form a safety net of support and positive challenge (Fullan, 2003). In authentic relationships, teachers provide long-term support for one another, challenge one another to improve, question current practices and perceptions, and learn together (Fullan & Hargreaves, 1996, Lambert, 1998).

Continuous Improvement

Although collaboration can improve school cultures and student achievement in learning communities (Lee & Smith, 1996; Little, 1990; Louis, Kruse & Marks, 1996; Newmann & Wehlage, 1995; Schmoker, 1999), the focus is central to the school vision with an emphasis on continuous improvement and results. McLaughlin and Talbert (2001) conducted case studies of professional learning communities in sixteen high schools. They found that only three of the sixteen schools had strong professional learning communities and that within the PLC of the three schools there was great variation. The strength of the community was related to the commitment to students and increased achievement. Further, they found the strength or weakness of the schools is dependent on whether or not the teachers collaborate to make breakthroughs in learning or whether they reinforce methods that are ineffective (McLaughlin & Talbert, 2001). Weak collaboration is always ineffective, but strong communities can make matters worse if their collaboration reinforces each other's bad or ineffective practices (McLaughlin & Talbert, 2001; Wenger et al., 2002). "Collaborative cultures, which by definition have close relationships, are indeed powerful, but unless they are focusing on the right things they may end up being powerfully wrong" (Fullan, 2001, p.67).

It is essential that the groups or teams are working towards a purposeful and targeted focus on continuous improvement (Schmoker, 2002; Dufour, 2004). Covey (1990) stresses that leaders should "organize and execute around priorities" by providing teachers specific guidelines and expectations that help them focus on teaching and learning with an emphasis on improved student achievement. According to Eaker et al.

(2002), all dialogue should be centered on three critical questions:

- What is it we want our students to learn?
- How will we know when each student has learned it?
- How can we improve on current levels of student achievement?

They suggest that team members work together to address these questions and increase their professional knowledge. Another key question addresses what happens when students do not learn. In a professional learning community, learning must be the constant, instead of time and support, so when students don't learn at the same rate, the school has a system of interventions in place to ensure that they do (Dufour, Dufour, Eaker, & Karhanek, 2004).

Successful schools are places in which teams of teachers meet regularly to focus on student work through assessment and change their instructional practice accordingly to get better results (Fullan, 2001). Teachers work collaboratively as they discuss the alignment of curriculum and instruction, observe and discuss each others' teaching, plan courses and programs together, and teach each other new practices. Once a school has established common standards and assessments, they can talk intelligibly and productively about how to promote higher levels of learning by creating, adjusting, and testing methods and lessons collaboratively (Schmoker, 2002). "When staffs work and learn within professional learning communities, continuous improvement becomes an embedded value" (Morrissey, 2000, p. 28).

As teachers collaborate and discuss student learning and assessment, they continually seek out evidence about the success or failure of their pedagogy. Bernhardt (2002) identifies four types of data (demographic, perceptual, student learning, and

school process data) that can help us monitor and assess progress. Professional learning communities utilize data-driven decision making strategies, set SMART goals, and take advantage of data's capacity to promote collaborative dialogue (Schmoker, 1999). "Combined with collaboration, goals and data create conditions that enable if not compel individual teachers to request and offer advice in helping their colleagues" (p. 6) and teachers learn best from each other (Rosenholtz, 1989). Data and results can be persuasive and powerful to create a desire to improve. Properly done, "accountability and improvement can be effectively interwoven, but it requires great sophistication" (Fullan, 1991, p. 87).

Collaboration for PLC Development

Research in and out of the educational field continues to reiterate the importance of focused, structured collaboration in the success of organizations (Barth, 1990; Darling-Hammond, 1997; Dufour & Eaker, 1998; Elmore, 2000; Fullan, 1991; Little, 1990; Louis & Kruse, 1995; McLaughlin & Talbert, 1993; Newmann & Wehlage, 1995; O'Hair et al., 2000; Schmoker, 1999; Senge, 2000; Sergiovanni, 1994; Sizer, 1992). As Hargreaves (1994) suggests:

> Collaboration is now widely proposed as an organizational solution to the problems of contemporary schooling, just as it is proposed as a flexible solution to rapid change and the need for greater responsiveness and productivity in business corporations and other organizations more widely. Collaborative decision making and problem solving is a cornerstone of post-modern organizations. (p.17)

In the foreward of *On Common Ground: The Power of Professional Learning Communities*, Schmoker (2005) states that this "concurrence among researchers and

practitioners in support of collaboration is both stunning and underappreciated" (p. xii). This integral process for school improvement is woven into every aspect of school culture and professional learning community development and sustainability (Dufour & Eaker, 1998). Supportive conditions enable the school stakeholders to collaborate by providing structures and processes; and collaboration is used to develop the shared vision, to share leadership responsibilities, to collectively learn and share best practices that focus on continuous improvement and results.

Collaboration is represented by those activities that a school community participates in when it collectively engages in inquiry and discourse about school improvement practices and how its collective efforts can work together to impact student success through them (O'Hair et al., 2000). These collaborative processes allow teachers to verbalize and sharpen their thinking as they teach one another (Slavin, 1995). Collaboration builds collegial relationships that strengthen the collective focus on learning. "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).

Research indicates that schools with collaborative norms are better able to support improved student results (Lee & Smith, 1996; Little, 1990; Louis, Kruse & Marks, 1996; Newmann & Wehlage, 1995; Schmoker, 1999). In professional learning communities, isolation is replaced with collaborative processes that are deeply embedded into the daily life of school. Teachers are not given choices about whether to be involved in collaborative efforts; rather they are called upon to be a contributing member of a team to improve school renewal efforts where they are expected to work interdependently with

other teachers to achieve common goals (Darling-Hammond, 1997; Eaker et al., 2002). Teams of teachers should meet regularly to share, refine, and assess the impact of lessons and strategies continuously to help increasing numbers of students learn at higher levels (Schmoker, 2005). Few educators claim that working in isolation is the best strategy for school improvement, but give reasons, such as time, why it is impossible for them to work collectively. Dufour (2004) demands that schools stop making excuses for failing to collaborate and contend that a staff that is determined to work together will find a way to make it happen. Collaboration for teachers can be liberating if they understand its value and potential. It can reduce isolation, increase job satisfaction, and promote staff renewal (Lee & Smith, 1994; Schmoker, 1999).

Promising High Schools

Although it is uncommon in American schools, certainly there are unique high schools where school-wide collaboration is the practice (Sparks, 2000). In *Schools That Work* (1993), George Wood shares stories of the successes and challenges of developing collaborative learning organizations. He describes several unique high schools such as Central Park East Secondary School in New York City and Thayer Junior/Senior High in Winchester, New Hampshire who are different from most traditional high schools across the country. "What is done here with and for students will make a difference in who they are when they leave school. This is because, unlike most of the official school reform agenda, the very assumptions about how to do school are challenged in these places" (Wood, 1992, p. 73).

In the model schools, teachers provide opportunities for students to engage in real experiences for genuine engagement in the world outside of school. They have decided

and proactively worked to insure that "we will have among us young people with habits of heart and mind that make democracy possible" (Wood, 1992, p. 76). The school has collaboratively established a vision, built leadership capacity, and focused on generative learning to establish the development of learning community. The administrators recognize the importance of collaborative action and provide conditions and artifacts to improve their staff's capacity to change (Halverson, 2005).

Communities of Practice

Within the model high schools, teachers share a common vision and collaboratively focus on deepening their knowledge, producing productive communities of practice (Wenger, 1998). Members of communities of practice don't necessarily work together every day and don't meet because it is required. They build personal relationships and become informally bound by the value that they find in learning together in activities that matter to them (Wenger et al., 2002). Since the members have strongly committed to the group, communities of practice can potentially improve instruction as well as change educational processes. "Communities of practice are organizational assets because they are the social fabric of the learning of organizations…an organization's ability to deepen or renew its learning depends on fostering communities of practice" (Wenger, 1998, p.253).

In traditional high schools, interactions most commonly occur within subject departments where department chairs serve as the formal leader in the community of practice (Printy, 2003). Although the community of practice can benefit from formal leadership, it is dependent on the informal leadership provided by teachers. Within communities of practice, informal leaders change over time and determine the content

and process of learning (Wenger et al., 2002). Through this systematic approach to collective learning, the community of practice is nurtured and the leadership becomes more shared and distributed, building capacity for change (Spillane et al., 2001; Wenger, 2002).

Building Leadership Capacity

One of the keys to achieving the cohesion and dynamics of a strong professional learning community is in how the leadership is stretched over the school. Instead of merely looking to the principal for educational guidance, the concept of leadership is broadened. Spillane, Halverson and Diamond (1999) propose a distributed theory of leadership:

> School leadership practice is constituted in the dynamic interaction of multiple leaders and followers and their situation around particular leadership tasks. Leaders practice is stretched over the social and situational contexts of the school; it is not simply a function of what a school principal, or indeed any other individual leader knows and does. (p. 7)

Hargreaves and Fink (2006) contend that professional learning communities "embody the most positive features of distributed leadership, bringing the energy and ability of the whole community forward to serve the best interest of all students" (p.128).

Schools need to develop leadership capacity and embed leadership among all members of the school community (Elmore, 2000; Hargreaves & Fink, 2006; Lambert, 1998, 2003; Spillane et al., 1999). Leadership capacity involves an infrastructure for learning composed of roles and responsibilities, inquiry, reflection, and a focus on

student learning that involves all community members, including teachers, parents, students, and stakeholders (Lambert, 2003). Barth (1990) states:

> School can be a place whose very mission is to ensure that everyone becomes a school leader in some ways and in some times in concert with others. A school can fulfill no higher purpose than to teach all of its members that they can make what they believe in happen and to encourage them to contribute to and benefit from the leadership of others. A community of leaders is a vision of what might become a vital part of the school culture. Without shared leadership, it is impossible for a shared culture to exist in a school (p. 171-172).

According to Lambert (1998), leadership is a collective learning process whereby leadership capacity is developed in light of two critical dimensions of participation – breadth and skillfulness. Breadth of participation corresponds to how many people are involved in the work of leadership, while skillfulness of leadership refers to leadership participants' "understanding of and demonstrated proficiency in the dispositions knowledge and skills of leadership" (Lambert, 1998). Lambert's Leadership Capacity Matrix summarizes conditions in schools with different levels of leadership capacity, highlighting the circumstances that confound effective school improvement. Lambert's ideal is a school with broad-based and skillful leadership, characterized by accessible data used to drive decision making, collaborative and broad involvement in varied roles and responsibilities, routine reflective practice and innovation, and high student achievement (Lambert, 1998). Lambert (1998) stresses:

> The leadership skills needed for collaborative work involve the ability to develop a shared sense of purpose with colleagues, facilitate group processes,

> communicate well, understand transition and change and their effects on people, mediate conflict, and hold a keen understanding of adult learning from a constructivist perspective. Leaders in a culture of change deliberately establish innovative conditions and processes in the first place…and then guide them after that" (p 115).

Building leadership capacity and structures in support of shared governance represent innovative, visionary elements of the school improvement process in creating and sustaining professional learning communities. "The organization that will truly excel in the future will be the organizations that discover how to tap people's commitment and capacity to learn and lead at all levels in an organization" (Senge, 1990, p. 4). Sustainability in organizations focuses on the way that the system constantly spawns leadership and commitment in all areas by fostering the intelligence, purpose and passion of all members of the organization (Fullan, 2003).

Teacher leadership is an integral component of high leadership capacity schools. Teachers change from the traditional role of closing the classroom door and teaching what they know to different instructional roles and leadership that goes beyond their classroom instruction. "Change in education comes only when teachers are helped to change themselves" (Newmann et al., 2000, p. 294). This "seizing power" refers to teachers becoming conscious that they have the skills and power to make things happen in their school and then taking action (Reitzug & O'Hair, 2002). The distributed leadership perspective instills teachers with leadership capacity since teachers have an opportunity to promote collective leadership that can lead to improved teaching practices and student learning.

In schools with high leadership capacity, the principal's role has also changed significantly. Capacity building is about giving people the training, resources and opportunity to pursue tasks, and then to hold them accountable (Lambert, 2003). "Leaders have to think constantly about giving the work back to the people who need to take the responsibility" (Heifetz & Linsky, 2002, p. 139). Capacity building principals are collaborative and inclusive and have the capacity to work with others by influencing, facilitating, guiding and mentoring (Lambert, 2003). The principal works throughout the school organization to strengthen relationships and continually guide the vision. 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 the teachers to enact the vision (Printy, 2004). The teachers accept leadership and take responsibility for their own learning.

Complexity in PLC Development

Professional learning communities are rare in practice even though the literature and research has provided a great deal of information on their characteristics, key concepts, and effectiveness. Educational change is a difficult process, and changes in schools represent serious challenges. It is a highly complex, multivariate process through which individuals and organizations advance as they gradually come to understand, and become skilled and competent in the use of new methods and processes (Hall & Hord, 2001). This advancement is rooted in the premise that change requires learning, and learning motivates change (Morrissey, 2000). Any school change, including the transformation to a professional learning community, requires abundant time, energy, and resourcefulness, along with large quantities of school leadership. According to Fullan

(1991), changes in school culture take from three to five years. It is extremely difficult due to many demands of teachers and administrators, growing accountability issues, increasingly diverse student needs, teacher isolation and burnout, and other stressors. Pounder (1998) suggests that implementing these changes in schools is difficult because constraining dilemmas abound in school cultures. Pounder (1998) discusses five dilemmas:

1. The need for change vs. the need for predictability
2. Resource gains vs. resource costs
3. Professional interdependence vs. autonomy
4. Balanced involvement vs. over-control/under-involvement
5. Shared influence vs. the need to be accountable

Professional learning communities require commitment to renew and improve practice as well as a collective will to engage collaboratively. While these collaborative processes seem straightforward, they do not address the complexity of most school cultures. Pounder's five dilemmas emphasize the complexity of various factors in the development of a professional learning community. Individual educators and schools as a whole organization struggle with these dilemmas and have difficulty reaching consensus on what they value. The dynamic complexity of professional learning communities can breed ambiguity and cause educators to focus on the familiar and what they control which results in the persistence of their existing culture. Pounder (1998) stresses:

> The difficulty of implementing any collaborative effort is that all of these factors must be considered in combination – as interacting factors. These multiple

considerations or perspectives do not operate in isolation of one another; a holistic approach is required. Therein lies the complexity of school collaboration. The salience of one factor relative to another may vary depending on the particular school, collaborative effort, point in time, or key players involved. Thus few of us would be willing to offer strict formulas for effective collaboration. (p. 180)

Other researchers also discuss the complexity of developing and sustaining a professional learning community. Huffman and Hipp (2003) discuss an interview in which Senge described the task of creating a professional learning community as formidable, i.e. a "slippery concept to put into practice". Fullan (2000) stresses that moving from initiation to implementation and ideally to institutionalization to develop a professional learning community continues to be a challenge because it's imperative to create a culture, not just structure of change (Fullan, 2000). This helps provide a lasting impact and the sustainability of the professional learning community development. "The pathways and how-tos are messy and difficult to grasp. We need to step back and consider new insights about the processes of dynamic, complex, non-linear reform" (p. 20) and produce a capacity to continually seek, critique and select new ideas and practices inside and outside the organization (Cate, Vaughn, & O'Hair, 2006; Fullan, 2003).

Dufour et al. (2004) also recommend that for changes to have a lasting impact they must be deeply rooted in the school's culture – the assumptions, beliefs, expectations, values and habits that define the school's norm. They describe several cultural shifts that must occur in the development of a professional learning community and point out that the shift from a focus on teaching to a focus on learning is the most

important step. Similarly, Morrissey (2000) emphasizes that a professional learning community is not a thing, but a way of operating. She stresses that

> [A] critical element in professional learning communities is the continuous engagement of staff in inquiry directed toward improving the learning of students. Such inquiry does not have an endpoint. Instead, it is a state of being, an ongoing process that is sustained over time and changes with the environment and expectations. (p. 28)

Although the research supports the professional learning community model, transforming and reculturing a traditional school into a professional learning community is complicated and difficult to implement. According to Fullan (1991), what works in one school may not work for another and what works in one year may not work in the next. "Furthermore, it is a task that is never quite complete, a journey with no final destination. Schools never arrive as a PLC – they simply drive the concept deeper and deeper into their culture" (Dufour, Eaker, & Dufour, 2005, p.233). Educational researchers stress that school success in educating students depends on commitment and competence of individuals within the staff (Dufour, 2004; Huffman & Hipp, 2002; Newmann & Wehlage, 1995). "The rise or fall of the professional learning community concept depends not on the merits of the concept itself, but on the most important element in the improvement of any school – the commitment and persistence of the educators within it" (Dufour, 2004).

Technology for Change

Technology can be a useful tool to support and enhance the development of a professional learning community (Atkinson, 2005; Burns, 2002; Dexter et al., 2002; Riel

& Fulton, 2001). A school's capacity to change can increase when technology integration training is embedded in an overall reform effort (Roschelle, Pea, Hoadley, & Gordin, 2000). Culp, Honey, and Mandinach (2003) confirm this belief and assert that technology can catalyze other changes in the content, methods, and overall quality of teaching, such as triggering changes from traditional teaching styles to constructivist methods. Technology can be useful for various purposes in regards to collaboration: (a) facilitating collaboration within and across levels for whole school improvement and (b) collaboration serving as a direct support for improvement of teaching and learning.

Technology's Impact on Collaboration for School Improvement

"Information technologies have changed the ways we learn, work and live…" (Ross, McGraw, & Burdette, 2003, p. 3). Technology provides many opportunities for data collection and analysis to inform decision-making processes toward whole school improvement. Riel and Fulton (2001) explain that technology increases "our ability to work and learn from others who are distant in time and location" (p. 519) and facilitates learning communities. Professional learning communities support teachers as they collaborate and collectively seek "technology-enriched learning environments" to improve teaching and learning (TSSA Collaborative, 2001). Collaborative activities and formative feedback are key components of instructional strategies that accompany effective technology implementation (Cradler, McNabb, Freeman & Burchett, 2002, p. 49).

Internet-based communities can assist in overcoming teachers' sense of isolation (National Research Council, 2002). Technology makes collaboration faster and easier through e-mail, listservs, videoconferencing and websites that have enabled members of

teacher communities to communicate with others to share information and provide support as classrooms move from isolation to connectedness. The National Research Council (2002) recommends that this on-line collaboration represents only part of technology's full potential to support real communities of practice. "Teacher communities of practice need chances for planned interactions, tools for joint review and annotation of education resources, and opportunities for on-line collaborative design activities" (National Research Council, 2002, p. 228).

Technology's Impact on Collaboration for Teaching and Learning

Technology can serve as a catalyst for teachers to be learners as they examine ways to integrate technology effectively into their classroom practices (Burns, 2002). The frequency, breadth, and depth of collaboration with colleagues influence the instructional context and the quality of technology use (Becker & Riel, 2000). "As the abundance of information overwhelms us all, we need not simply more information, but people to assimilate, understand and make sense of it" (Brown & Duguid, 2000, p.121). Teachers increase capacity and their own learning through "interactions with other professionals who offer ideas and evidence of effective practices, provide feedback and suggestions for improvement, and give moral support essential to the improvement process" (Knapp, Copland, Ford, & Markholt, 2003, p. 15).

Technology gives teachers permission to experiment and learn. While it would be unacceptable for a teacher to be deficient in using a teaching strategy effectively, with technology it is expected and "OK" that some colleagues know more than others. When teachers are learning to use new technology in their classrooms, they model the learning process for the students. Students who are often times very comfortable with the

technology can assume the role of teacher and when problems arise, teachers and students learn together in a cooperative endeavor.

Research indicates that computer technology can help support learning and can be useful in developing the skills of critical thinking, problem solving and higher order thinking skills (Cradler, McNabb, Freeman & Burchett, 2002). With the emphasis on student learning in learning communities, "teachers can create standards-based activities and assessments that employ whatever technology makes sense…books, e-mail, Web sites, whatever. Learning is the goal. Technologies are mere delivery systems" (McKenzie, 2000, p. 93). It also supports high expectations with students as knowledge builders and promotes their responsibility for their own learning (November, 2001). McKenzie (2000) recommends integrating information literacy into school learning. An "information literate school community" incorporates collective learning for teachers and students by writing, reasoning, thinking and communicating more powerfully with technology integration "The time is right to address a more powerful impact and potential for technology to affect teaching and learning" (Creighton, 2003, p. 8).

Summary

The culture of a learning organization provides opportunities to develop new solutions and continue the reflective and collaborative process toward sustained improvement. 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. In a professional learning community, all members of the organization learn together and engage in continual renewal. The integral process of collaboration is woven into every aspect of professional learning

community development; and technology can contribute to the development of a professional learning community (Atkinson, 2005; Burns, 2002, Dexter et al., 2002, Riel & Fulton, 2001).

CHAPTER THREE

Methodology

> Today's research world is becoming increasingly interdisciplinary, complex, and dynamic, therefore, many researchers need to complement one method with another, and all researchers need a solid understanding of multiple methods used by other scholars to facilitate communication, to promote collaboration, and to provide superior research. Johnson & Onwuebbuzie, 2004, p. 15

This mixed methods research examined technology's influence on collaboration to gain greater understanding for schools as they continually strive to become a professional learning community. Mixed methods research, which combines both quantitative and qualitative approaches, seeks both explanations and exploration for understanding in more depth. Research claims are also stronger and have a greater impact when based on a variety of methods because quantitative figures can be persuasive to policy makers, and qualitative research provides stories that can be used for illustrative purposes (National Research Council, 2002). Mixed methods designs include techniques from both quantitative and qualitative traditions yet combine them in a unique way to answer research questions that could not be answered any other way, which is indicative of the complexity of the components of this study.

Professional learning communities require commitment to renew and improve practice as well as a collective will to engage collaboratively. While these collaborative processes seem straightforward, they do not address the complexity of most school cultures. Transforming a school to a professional learning community is a highly complex, multivariate process that is extremely difficult (Cate, 2005). The dynamic complexity in this study to produce capacity for collaboration in professional learning community development through the influence of technology established the necessity of

a mixed methods design. It is the most appropriate means to gain information about the nature of the relationships between dimensions of professional learning communities, including collaboration and factors of technology integration, with a deep and rich understanding of how the schools developed.

For the mixed methods study, multiple data sources were collected and organized into three sets. The data sets included survey instruments, interviews, and grant documentation. Quantitative data sources included pre- and post- web-based survey instruments to gather information from teachers and administrators in participating schools. For the primary qualitative data source, interviews were conducted with a smaller purposefully selected sample of teachers and administrators at sites to provide cross-validation of the data and further explanation and deeper understanding of the research problem. Grant documentation data, which included the school grant applications, field notes, quarterly reports, professional development evaluation, state accountability report cards, principal interviews, grant assessment and end of year reflections, were used as ancillary data to help support the primary quantitative and qualitative data sources by enriching or clarifying the findings.

Design of the Study

The study utilized an ex post facto research design, since the quantitative and documentation data were collected after completion of the grant year. In the quantitative portion of the study, the variables were assessed using pre- and post- survey instruments. In the qualitative portion of the study, one-on-one interviews with teachers and administrators from selected sites were conducted to provide depth and understanding.

The quantitative and qualitative data were examined to investigate change with the intervention of professional development.

The quantitative portion, which occurred first sequentially, provided trends, explanations, and approaches to describe conditions, investigate relationships and study cause. The quantitative portion of the study was used to determine the qualitative research questions in the second phase of the study to form a more complete picture of how technology influences collaboration to gain greater understanding for schools as they continually strive to become a professional learning community. In the second phase, a qualitative multiple site approach was used to collect data through one-on-one interviews and grant documentation. The qualitative portion of the study provided a deeper understanding of the perspectives of the participants and presented additional data to explain the development of collaborative structures within a professional learning community for practitioners. The mix of quantitative and qualitative data best addressed the problem and answered the research questions, increasing the overall reliability of data gathered (Creswell, 2003).

This study used one of the most popular mixed method designs in educational research, sequential explanatory design, consisting of two distinct phases (Creswell, 2002, 2003; Creswell, Plano-Clark, Gutmann, Hanson, 2003; Tashakkori & Teddlie, 1998). This design is most used for explaining initial quantitative findings with qualitative data or to form groups based on quantitative findings to guide subsequent qualitative investigation (Tashakkori & Teddlie, 1998). It is a two-phased mixed methods approach where quantitative data are collected and analyzed first. A second qualitative phase was given priority and explained the initial quantitative results with a

deeper understanding. The visual model of the procedures for the mixed method sequential explanatory of this study was presented in Appendix C.

Population and Sample

The population studied was K-12 teachers and administrators with the target population being K-12 teachers and administrators who were 2004-2005 OETT/OK-ACTS Grant School participants. Twenty-one schools, that included 525 teachers and 30 administrators, represented the target group. The sample frame for the quantitative phase of the study was the completion of the pre- and post- surveys for both instruments, resulting in a purposive sample of n = 223 teachers and n = 15 administrators.

Grant schools in the target group were geographically dispersed across the state The school levels that were represented by the award included four high schools, two middle schools, two 6-12th grade secondary schools, two school districts, and eleven elementary schools. The schools ranged in size from 50-1000 students and resided in suburban, urban and rural school districts. The socioeconomic status at the twenty-one sites varied significantly with one school having very few students on free and reduced lunch count, to some having a very high percentage of identified free and reduced lunch students.

Instrumentation

Quantitative data sources included two pre- and post- web-based survey instruments to gather information from teachers and administrators in participating schools. The surveys gathered information about the schools' staffs performance as a professional learning community based on five dimensions (Hord, 1997), and factors of technology integration (SEDL, 2003). (See Appendices D & E for survey instruments.)

Professional Learning Communities Instrument

The first survey instrument, *School Professional Staff as Learning Community* (SPSLC) (Hord et al., 1999) was developed at the Southwest Educational Development Laboratory. The instrument was used as a pre-assessment for the OK-ACTS professional development team to show how well each school staff was performing as a professional learning community before the grant professional development began. The survey assessed performance of the staffs of the schools as a professional learning community based on the following five dimensions:

- School administrators participate democratically with staff sharing power, authority, and decision-making. (two descriptors)
- Staff shares vision for school improvements that have an undeviating focus on student learning and are consistently referenced for the staff's work. (three descriptors)
- Staffs collective learning and application of the learning create high intellectual learning tasks and solutions to address student needs. (five descriptors)
- Peers review and give feedback based on observing each other's classroom behaviors in order to increase individual and organizational capacity. (two descriptors)
- School conditions and capacities support the staff as a professional learning organization. (five descriptors)

The individual survey instrument formed a Likert scale from 1, Strongly Disagree to 5, Strongly Agree for 17 questions that measured descriptors of professional learning

communities categorized into five major dimensions. The response option for each descriptor was a 5-point scale with different descriptive sentences under the end points and middle value. Each of the seventeen descriptors consisted of three different sentences under its 5-point scale.

Quality of tests is measured through validity and reliability of the instruments. Validity allows interpretations of the data to be made based on the degree to which the test measures what it is supposed to measure. There are three interrelated aspects of validity: content, criterion-related, and construct. "Construct validity is the most important form of validity" (Gay & Airasian, 2000, p. 167). Constructs underlie research variables and construct validity seeks to determine whether the construct underlying a variable is actually being measured. According to Gay and Airasian (2000), reliability refers to the degree to which an instrument measures what it is to measure, and Cronbach's Alpha is the preferred measure of this internal consistency

The Appalachia Educational Laboratory (Meehan, Orletsky, & Sattes, 1997) conducted a field test of the SPSLC instrument with 690 teachers to assess the instrument's reliability, validity, and to draw conclusions about its use in school reform efforts. The sample consisted of 21 volunteer schools, which consisted of six elementary, six middle/junior high and nine high schools. The reliability of the SPSLC was measured by Cronbach's Alpha for internal consistency and by the stability (test-retest) method. Content validity was assessed in its development and reviewing phases; and concurrent validity was assessed through the parallel administration of a school climate instrument. Construct validity was measured in two ways: by the "known group" method and by the exploratory factor analysis.

The field test results revealed that all five internal consistent reliabilities, Alphas, for the dimensions' items were in the mid 80s and the Alpha for all 17 items was .94. The stability (test-retest) reliability was +.61. The concurrent validity with the School Climate Survey instrument was +.75. There was a significant difference ($p = .0001$) from the teachers in the field test on the five dimensions and the total instrument scale. The usability, reliability, and validity tests have been completed, and the instrument meets the expected criteria. It was concluded that the SPSLC instrument is "very useful as a screening, filtering or measuring device to assess the maturity of a school's professional staff as a learning community" (Hord et al., 1999, p.8).

Technology Integration Instrument

The second survey instrument, *Technology Integration* (TI) (SEDL, 2003), explored teacher and student use of technology and technology integration in the classroom. The instrument assessed the following factors of technology integration:

- Teacher 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)
- Student use of technology
- Support for technology
- Teacher beliefs about technology use (two factors: positive and negative)

The instrument consisted of ten questions, which included the factors of technology integration, with several sub-questions under each factor. The response option for each descriptor was based on a 5-point scale with different descriptive words,

ranging from strongly disagree to strongly agree, never to always, not at all to expert, and no support to total support.

Atkinson (2005) assessed the instrument's reliability and validity at the completion of the first year of the OETT/OK-ACTS grants to schools project. The sample (n = 501) included teachers from 21 grant schools, which consisted of twelve elementary, one middle school, three districts and five high schools. "An exploratory factor analysis was performed on questions five through eight of the *Technology Integration* post-survey to investigate the constructs being measured by the items under each question" (Atkinson, 2005, p. 67). Internal consistency reliability coefficient was computed using the Cronbach's Alpha formula for the factors and a separate factor analysis for question 5.

For question five, the result of the Varimax rotation method was a five factor solution suggesting subscales within the question: 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. Alpha coefficients for the five factors of question five ranged from .82 to .95, indicating good instrument reliability. For questions six through eight, Alpha coefficients were .89, .88, .83, .76, respectively. Cronbach's Alpha for the total scale reliability, with nine constructs, was .96, indicating satisfactory instrument reliability.

Construct validity of the instrument was supported by the literature cited in the study (Atkinson, 2005). Data found that it is more probable for teachers who participate in professional development to integrate technology into the teaching and learning in

their classroom (Atkinson, 2005; Becker & Riel, 2000; Burns, 2002). As items were written in the original survey development, experts were consulted to see if the items reflected their knowledge about technology integration. Revisions were made based on this feedback and consultation (SEDL, 2003).

Response Rate to Surveys

The 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 ($N = 525$) and administrators ($N = 30$) in the 2004 Grants-to-School program. The administrative sample included principals, assistant principals, and superintendents from the grant schools. The response rate for the surveys at each school site varied from 48 percent to 100 percent. Table 1 showed the survey response rate for pre- and post- survey instruments for both teachers and administrators.

Each teacher and administrator labeled their surveys with the last four digits of their social security number. These numbers were matched to identify 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 also been included in Table 1. For data analysis purposes, the sample for the quantitative phase of this study consisted of teachers ($n = 223$) and administrators ($n = 15$) who completed the *SPSLC* (Hord et al., 1999) and the *TI* (SEDL, 2003) longitudinal instruments. One of the 21 grant schools did not have paired responses of teachers for both instruments.

Table 1

Survey Response Rate

	Responses			
Instrument	Teacher	Percent	Administrator	Percent
School Professional Staff as a Learning Community (*SPSLC*) (Hord et al, 1999)				
Pre-	393	75	27	90
Post-	406	77	15	50
Pre- & post- pairs	251	48		
Technology Integration (*TI*) (SEDL, 2003)				
Pre-	397	76	29	97
Post-	396	75	23	77
Pre- & post- pairs	264	50		
SPSLC and *TI*				
Pre- & post- pairs	223	42	15	50

Interviews

The second set of data, which was the primary qualitative data source, was comprised of one-on-one interviews with teachers and administrators from selected sites. Generally, qualitative research makes "greatest use of unstructured, open-ended, informal interviews because these allow the most flexibility and responsiveness to emerging issues for both respondents and interviewees" (Schwandt, 2001, p. 135). The one-on-one, semi-structured interviews were conducted at purposefully selected high schools based on the quantitative portion of the study. Part of the intervention focused on the development of a learning team within each grant school, so interviews at each high school site included the administrator, teachers on the learning team, and teachers not on the learning team.

Teacher respondents were purposely selected by the school principal to provide different perceptions of the grant implementation based on diverse roles and experiences.

Interviews were conducted in a conversational, open-ended format, using the same interview protocol to gather data on their perceptions. The interviews provided better control over the types of information received since specific questions were asked to elicit the information (Creswell, 2005), however the semi-structured format allowed respondents to share additional perceptions in a less-directive manner. The interviews with the teachers and administrators were used to gather shared understanding from several individuals (Creswell, 2005), who collectively participated in grant goal professional development and implementation at their school site. Appendices F and G show a description of the respondents and the interview protocol.

Grant Documentation

The third set of data, that was ancillary qualitative data, included OETT/OK-ACTS grant documentation for each school that was collected throughout the professional development and grant implementation year. These narrative data sources included the school grant applications, field notes, quarterly reports, professional development plans and evaluation, state accountability report cards, principal and teacher interviews, grant assessment and end of year reflections. These qualitative data sources were reviewed for supplementary information to enrich or clarify the primary quantitative and qualitative data sources.

Procedures

Permission was obtained from the Institutional Review Board and from the authors of both surveys. All teachers and administrators were given an informed consent

form to sign (See Appendices H & I for forms and IRB approval). Data collection procedures were discussed with the administrators from each school or district to share with their staff. Web-based surveys, that include directions for explanation, were distributed to teachers and administrators via an email link. Teachers and administrators responded to the surveys within the designated time allotment. Demographic data on the surveys provided identification by school and by a 4-digit number that is unique and only identifiable by each participant. The confidentiality of each participant was maintained.

After the quantitative portion of the study, interviews were utilized to provide more explanation and deeper understanding. The principals for each selected school were contacted by email or phone and invited to participate. The process of selecting some teachers from the learning team and some teachers not on the learning team was described, and the exact time and location for the interviews were scheduled. At the beginning of each interview, the study and the procedure of the interview format was briefly described. Interviews lasted approximately one hour each and were audio taped and then transcribed for data analysis. Follow-up interviews were conducted by phone with selected individuals to add clarification after reviewing the transcriptions.

Data analysis

Quantitative Data Analysis

Sequentially, the quantitative data were collected and analyzed first in the mixed method study. The statistical software, *Statistical Package for the Social Sciences* (SPSS) (Green & Salkind, 2005), was used for the quantitative analysis. Survey data were checked for completeness and paired by participant number for the pre- and post-instruments. The data from the two survey instruments were summarized using

descriptive statistics to explain trends to indicate general tendencies in the data, the spread of scores and a comparison of how one factor relates to all others (Creswell, 2005).

Although this provides descriptive information, the correlational analysis was necessary to compare groups and look at the relationship between the two variables of the study: professional learning community development and technology integration. This correlational analysis, measured with Pearson's Correlation Coefficient, indicated the degree and direction of the relationship between the two variables on a scale from -1 to 1. Correlations were also analyzed to determine relationships between the dimensions of professional learning communities and the factors of technology integration. The overall correlational analysis and the correlations between the professional learning community dimensions and technology integration factors for the sample provided additional information to guide the development of qualitative research questions in the second phase of the mixed methods study.

After completing data analysis on the entire sample of 21 grant schools, quantitative data were analyzed to compare different demographic sets (i.e., school level, small schools versus large schools, rural versus urban versus suburban) to determine the least collaborative group in the sample. The SPSLC instrument assessed performance of the staffs of the schools as a professional learning community, with collaboration woven into every dimension. The pre-survey data from the instrument before the intervention were used to compare the different groups. One-way analysis of variance (ANOVA) *F*- tests were conducted to evaluate whether the group means on the different groups differed significantly from each other. Comparison of the mean scores and ANOVAs

provided data to choose a purposefully selected sample for the qualitative portion of the mixed methods study.

Qualitative Data Analysis

Complete interview transcriptions from each teacher and administrator were analyzed through a process of organizing, reducing and describing the data into codes. A spreadsheet was used to categorize the analyzed data by individual respondents, and then a composite description of the meanings of the experience was developed that represented each school site as a whole group. Interviews were conducted, transcribed, coded and themed by the researcher. A university professor also analyzed the data to provide inter-coder reliability for the codes and themes. Participants in the study were asked to verify the accuracy of the written interview transcriptions, codes, and themes using member checking. This trustworthiness technique of member checking established credibility during the qualitative analysis (Lincoln & Guba, 1985).

Grant documentation data were also analyzed as ancillary data to enrich or clarify the findings. The document analysis helped support the primary quantitative and qualitative data sources. The narrative data were examined for examples of items from the primary qualitative themes and significant correlations in the quantitative data. These data provided a deeper understanding of how the schools developed and changed.

Wolcott (2001) offers a distinction between analysis and interpretation of the data that is relevant to this study. Analysis is described as a "more limited, more precise, and more clearly defined role…where data are examined using systematic and standardized measures and procedures" (Wolcott, 2001, p.32-33). In this mixed methods study, analysis occurred separately after each of the two phases. The quantitative data were

analyzed using specific measures and procedures in *SPSS* software based on the data from the two survey instruments. The qualitative interviews were analyzed by coding and theming the transcribed interviews, and the grant documentation was reviewed for supplementary information to enrich or clarify the primary quantitative and qualitative data sources.

Interpretation, by contrast, is derived from our efforts as sense-making, a human activity that includes intuition, past experience, and emotion (Wolcott, 2001). Interpretation does not use specified procedures and falls on the more humanistic side, where analysis tends to be more scientific. In mixed methods studies, integration can be defined as the combination of the quantitative and qualitative research within a given stage of inquiry (Creswell et al., 2003). "Integration might occur with the research questions, within the data collection, within data analysis (e.g., transforming qualitative themes into quantitative items or scales), or in interpretation (e.g., examining the quantitative and qualitative results for convergence of findings)" (Creswell et al., 2003, p. 220). In this study, after the quantitative and qualitative data were analyzed separately, patterns were discerned when the data were mixed in the interpretation stage.

Mixing Quantitative and Qualitative Data

After analyzing the quantitative and qualitative data sets individually and studying the themes, the results of the two types of data were integrated during the interpretation phase of the study. The results that helped inform the study's major quantitative research questions were interpreted. Then, the results that informed the guiding research questions in the qualitative phase of the study were explained. This process provided findings from

the second, qualitative phase of the study to further clarify and explain the statistical results from the quantitative phase.

The study results were then discussed in detail by grouping the findings to the corresponding quantitative and qualitative findings and emerging themes related to each of the explored dimensions of a professional learning community and factors of technology integration. Each data set was examined and themed in a reductive manner, yet compared holistically. The interpretations were augmented by citing related literature and reflecting both quantitative and qualitative published studies on the topic.

Trustworthiness

The researcher's closeness to the grant project was beneficial and provided easier access to the respondents, but this close relationship raised questions of trustworthiness. While honesty of the respondents was an initial concern during the interview process, previous work with the sites indicated that teachers and administrators were extremely truthful when sharing information about their schools. At the beginning of the interview process, the researcher discussed confidentiality with the respondents. On several occasions in the middle of the interview, the respondent would stop and ask again who would hear this. Once the researcher assured them that their name and school would not be disclosed, they did not hesitate to share their perceptions about their administrator and colleagues. To ensure that participants' perceptions were collected without influence, member checks were utilized. Teachers and administrators who were interviewed were asked to verify the accuracy of the interview transcriptions, themes and findings.

Role of the Researcher

The second phase of the study focused on qualitative interviews and grant documentation to provide a deeper understanding of the perspectives of the participants. In qualitative studies, the researcher must acknowledge their connection to the topic of study to expose potential biases, values, and intents (Creswell, 2003). The researcher was one of the co-directors of the OETT/OK-ACTS Grants to Schools Project and was directly involved in the development of the grant application, review criteria, and professional development to assist in building professional learning communities that use technology to impact student achievement. The participants of the study were recipients of the grant. Bracketing of biases and preconceived notions from the personal lens of the researcher were crucial throughout the data collection and analysis portions of the study.

Prior to serving as co-director of the grant project, the researcher spent fifteen years in public education in various roles. She has experience as a secondary teacher, curriculum director and middle school principal. During her public school tenure, she had multiple opportunities for a wide variety of professional growth and education in professional learning community development and technology. The knowledge base and experience of the researcher provided powerful interactions with the participants during the interviews at the school sites.

Summary

This study examined the nature of the relationships between dimensions of collaboration in professional learning communities and factors of technology integration, and the perspectives and experiences of staff to provide deep understanding of how the schools developed. The purpose of this sequential explanatory mixed methods study was

to research the relationships between technology integration and collaboration to gain greater understanding for schools as they continually strive to improve to become a professional learning community. Quantitative data, collected from survey instruments, to assess the relationships between professional learning community dimensions and technology integration factors were analyzed. Interviews were conducted with a smaller purposefully selected sample of teachers and administrators at sites to further explain and understand teacher isolation. Grant documentation data were also examined to support the primary quantitative and qualitative data sources by enriching or clarifying the findings.

CHAPTER FOUR

Phase I: Quantitative Analysis and Results

> Professional learning communities support teachers as they collaborate and collectively seek strategies and "technology-enriched learning environments" to improve instruction and student learning. (TSSA Collaborative, 2001)

In this chapter, the analysis and results of the quantitative phase of the mixed methods study are described. The quantitative research questions provided the organizational structure for these analyses and findings. Descriptive and inferential analyses were used to investigate the relationship between the two variables of the study: collaboration in professional learning community development and technology integration in the teaching and learning process. Correlations were also examined to determine relationships between the collaborative dimensions of professional learning communities and the factors of technology integration. After completing data analysis on the entire sample of 21 grant schools, quantitative data were analyzed on the *SPSLC* (Hord et al., 1999) pre-survey instrument for different demographic sets to determine the least collaborative group before the professional development intervention. These analyses provided additional results to choose a purposefully selected sample for the qualitative portion of the mixed methods study.

Quantitative Sample and Descriptive Statistics

The accessible population of this study included the 2004-2005 Oklahoma Educational Technology Trust (OETT) Grant School administrators and teachers. Twenty-one schools, that included 525 teachers and 30 administrators, represented this population. For data analysis purposes, the sample for this quantitative phase of the study consisted of teachers (n = 223) and administrators (n = 15) who completed the pre- and

post- surveys for both instruments, the *SPSLC* (Hord et al., 1999) and the *TI* (SEDL, 2003).

Descriptive statistics of the sample were provided from the demographic questions on the survey instruments. Of the 223 teachers, 84.8 percent (*n* =189) were female and 15.2 percent (*n* = 34) were male. Three levels of school organizations were represented, with 34 percent (*n* = 75) of teachers at the secondary level, 61 percent (*n* =135) at the elementary level, and 5 percent (*n* = 13) representing districts. At the secondary level, high school teachers (n = 36) represented 16 percent of the total paired sample, with 17 percent (n = 38) represented at the middle school level and less than 1 percent (n = 1) at the 6th-12th grade secondary school level. Of the 15 administrators, 67 percent were female (n = 10) and 33% (n= 5) were male. Four levels of schools were represented, with 47 percent (n = 7) of administrators at the elementary level, 13 percent (n = 2) at the middle school level, 27 percent (n = 4) at the high school level, and 13 percent (n = 2) at the district level.

Teaching assignments at the grant schools varied from self-contained or subject-specific at one grade level to pre-kindergarten through twelfth grade. The teachers had been employed a mean of 13.19 years (SD = 8.729) with a range of 34 years of teaching experience. Almost one fourth of the teachers (23.2 percent) were in the first five years of their teaching career. Teachers had been teaching in the current grant school for a shorter time overall than total teaching experience, ranging from 1 to 32 years (M = 9.25, SD = 8.057).

Technology Background of the Sample

In addition to demographic data, descriptive data from the *Technology Integration* (SEDL, 2003) instrument provided information regarding the teachers' general computer expertise, frequency and type of technology use, and proficiency in technology applications or equipment. The frequency of computer use was self-reported on a scale of never, rarely, monthly, weekly or daily. The general expertise was reported on a scale of beginner, intermediate, advanced or expert. Teachers also responded to questions regarding the frequency of computer use for different tasks ranging from personal use and classroom record keeping to classroom instruction and school communication. Lastly, the teachers self-reported their proficiency in the use of several technology tools and software applications.

Table 2 showed the descriptive statistics for teachers' computer use and general expertise from the pre- and post- survey instruments. The results of a paired samples t-test indicated that there was not a significant difference in computer use and expertise.

Table 2

Descriptive Statistics for Teachers' Technology Use and Expertise

		Descriptive statistics	
Technology use	*n*	Mean (on a scale of 1 – 5)	Standard deviation
Computer Use			
Pre-	221	4.84	0.50
Post-	223	4.89	0.41
Computer expertise			
Pre-	223	2.09	0.73
Post-	223	2.10	0.73

Teachers were asked to respond to questions concerning how they used a computer for tasks ranging from personal use and record-keeping to school communication and in classroom instruction. The mean for personal computer use decreased from the pre- to post- survey, while the other areas that use computers in school had an increase of the mean. Table 3 showed the descriptive statistics from the pre- and post- survey instruments for each of these areas.

Table 3

Descriptive Statistics on How Teachers Use Computers

	n	Mean (on a scale of 1 – 5)	Standard deviation
Personal use			
Pre-	223	4.23	1.15
Post-	223	3.77	.67
Record-keeping			
Pre-	223	4.31	1.29
Post-	223	4.36	1.11
Instruction			
Pre-	223	3.05	.74
Post-	221	3.18	1.32
School communication			
Pre-	223	3.98	1.31
Post-	222	4.11	1.19

Paired samples t-tests were performed to determine if these areas of computer use resulted in significant change after the professional development intervention. To determine practical significance, Cohen's *d* statistic was computed to measure effect size. *D* values of .20, .50 and .80, regardless of sign, are interpreted as small, medium and large effect sizes, respectively (Green & Salkind, 2005). The only category that resulted

in significant difference was personal computer use with a medium effect size as illustrated in Table 4.

Table 4

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
Personal Use	0.46	1.02	0.07	0.32	0.59	6.69	222	0.000	.45
Record-keeping	-0.05	1.01	0.07	-0.18	0.08	-0.73	222	NS	-.05
Instruction	-0.14	1.21	0.08	-0.03	0.30	-1.66	220	NS	-.12
School communication	-0.14	1.05	0.07	-0.28	-0.00	-1.98	221	NS	-.13

Teachers also self-reported on their proficiency in the use of several technology tools and software applications. The responses included not at all, basic, moderate, well and expert on a scale of 1 to 5. Teachers increased in all areas of application and equipment use based on the means. Eleven of the sixteen areas for software application and tool usage showed significant change from paired samples t-tests (See Table 5.) The areas that had the largest change and effect sizes included the use of Smartboards and LCD projectors. With the significance level at $p<.001$ and the magnitude of the effect size, $d = .60$ and $d = .59$ respectively, the results indicated a strong medium effect size for personal technology use in these areas.

Table 5

Paired Samples Test: Teacher Proficiency in Software Applications and Tools

	Paired differences								
				95% Confidence interval of the difference					
	M	*SD*	Std. error mean	Lower	Upper	*t*	*df*	Sig.(1-tailed)	d
Word processing	-0.10	0.83	0.06	-0.21	0.01	-1.78	221	NS	-.12
Spreadsheet	-0.10	0.84	0.06	-0.29	-0.07	-3.21	222	0.002	-.12
Presentation	-0.07	0.83	0.06	-0.18	0.04	-1.24	222	NS	-.08
Database	-0.28	0.85	0.06	-0.39	-0.16	-4.77	219	0.000	-.33
Email	-0.13	0.93	0.06	-0.25	-0.01	-2.09	222	NS	-.14
Internet	-0.12	0.77	0.05	-0.22	-0.02	-2.35	221	NS	-.16
Calendar	-0.26	1.10	0.07	-0.40	-0.11	-3.48	221	0.001	-.24
Publishing	-0.24	0.92	0.06	-0.37	-0.12	-3.92	221	0.000	-.26
Graphics	-0.22	1.10	0.07	-0.35	-0.09	-3.32	222	0.001	-.22
Scanner	-0.10	0.83	0.06	-0.21	0.01	-1.87	221	NS	-.12
Hand-held device	-0.21	0.85	0.06	-0.32	-0.1	-3.70	221	0.000	-.25
Graphing calculator	-0.13	0.70	0.05	-0.22	-0.04	-2.79	221	0.006	-.19
Digital camera	-0.32	0.93	0.06	-0.44	-0.19	-5.07	221	0.000	-.34
SmartBoard	-0.64	1.06	0.07	-0.78	-0.5	-8.97	222	0.000	-.60
LCD projector	-0.61	1.04	0.07	-0.75	-0.48	-8.71	217	0.000	-.59

Quantitative Research Questions

The quantitative phase of this study compared groups and investigated the relationship between the two variables of the study: collaboration in professional learning community development and technology integration. The quantitative results were also used to guide the second qualitative phase of the study in research question development and sample selection. The two quantitative research questions that this study investigated included:

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

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

Conceptual Framework

The theoretical perspectives in chapter 2 supported the collaborative dimensions in professional learning communities and factors of technology integration that serve as the variables of the quantitative phase of this study. These dimensions and factors are illustrated in Table 6.

Table 6

Variables of the Study

Dimensions of *Professional Learning Communities* (Hord et al., 1999)	Factors of *Technology Integration* (SEDL, 2003)
Shared leadership	Teachers' use of technology • Teachers' use of technology for students' learning activities

Shared vision	• Planning and collaborating about the use of technology
Collective learning	• Using technology to communicate with others • Using technology for decisions about students' learning needs
Peer review and feedback	• Sharing best technology practices
Supportive conditions	Students' use of technology
	Support teachers received for using technology
	Beliefs about the use of technology • Positive beliefs about technology benefits • Negative beliefs about technology benefits

Collaboration is an integral process for school improvement that is woven into every aspect of school culture in professional learning community development and sustainability (Dufour & Eaker, 1998). Collaboration is represented by those activities that a school community participates in when it collectively engages in inquiry and discourse about school improvement practices and how its collective efforts can work together to impact student success through them (O'Hair et al., 2000). Teachers are working collaboratively as they discuss the alignment of curriculum and instruction, observe and discuss each others' teaching, make decisions together, share lessons and knowledge, and teach each other new practices. Collaborative school communities share information, focus on building relationships and trust, and are comfortable to take risks and ask questions.

In a collaborative culture, communication and learning flow as the school community solves problems and learn from each other. Supportive conditions enable the

school stakeholders to collaborate by providing structures and processes; and collaboration is used to develop the shared vision, to share leadership responsibilities, to collectively learn and share best practices that focus on continuous improvement and results. Table 7 illustrated how collaboration is woven into each dimension of professional learning communities based on the *SPSLC* (Hord et al., 1999) instrument questions.

Table 7

Evidence of Collaboration in Professional Learning Community Dimensions

School Professional Staff as a Learning Community (Hord et al., 1999) Dimension and Instrument Items	Survey language indicating that collaboration is embedded into PLC dimension
Shared leadership (Items 1a, 1b)	-Staff is consistently involved in discussing and making decisions together with administration about most school issues.
Shared vision (Items 2a, 2b, 2c)	-Entire staff discusses visions for improvement such that consensus and a shared vision results
Collective learning (Items 3a, 3b, 3c, 3d, 3e)	-Entire staff meets together to discuss issues, share information and learn with and from each other. -Staff meets regularly and frequently. -Staff discusses the quality of teaching and learning. -Staff makes and implements plans together. -Staff debriefs and assesses the impact of their actions together and makes revisions.

Peer review and feedback (Items 4a, 4b)	-Staff regularly and frequently visit and observe each other's classroom teaching and provide feedback to each other.
Supportive conditions (Items 5a, 5b, 5c, 5d, 5e)	-Time and space is arranged and committed in proximity for whole staff interactions. -Processes and procedures are used to encourage staff communication. -Trust and openness characterize the staff. -Caring, collaborative and productive relationships exist among the staff.

Quantitative Data Analysis

The statistical software, *Statistical Package for the Social Sciences* (SPSS) (Green & Salkind, 2005), was used for the quantitative analysis on the paired data from the two survey instruments. The two survey instruments, *School Professional Staff as a Learning Community (SPSLC)* (Hord et al., 1999) and *Technology Integration (TI)* (SEDL, 2003) were utilized as assessments of the variables of this study. A correlational analysis, measured with Pearson's Correlation Coefficient (r), was conducted using the quantitative data. The correlation coefficients indicated the degree and direction of the relationship between the two variables on a scale from -1 to 1.

The *SPSLC* (Hord et al., 1999) instrument forms a Likert scale from 1, Strongly Disagree to 5, Strongly Agree for 17 questions that measure descriptors of professional learning communities categorized into the five dimensions. The *TI* (SEDL, 2003) instrument consists of ten questions, which include the four factors of technology integration, with several sub-questions under each factor. The response option for each

descriptor is based on a 5-point or 4-point Likert scale with different descriptive words, ranging from strongly disagree to strongly agree, never to always, not at all to expert, and no support to total support. Atkinson (2005) conducted a factor analysis of the *TI* (SEDL, 2003) instrument that indicated the items that contributed to the constructs measured by each question or sub-question. (See Table 8 for items.) Z scores were computed to standardize the metric scales of all instruments and used for the correlational analysis.

Table 8

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
Teachers' beliefs regarding use of technology		
	Positive	8a, 8b, 8d, 8g, 8h, 8j
	Negative	8c, 8e, 8f, 8i

When multiple correlations were conducted on the same set of data for the second quantitative research question, the risk of making a type I error, to erroneously conclude the presence of a significant correlation across the tests, increased. The Bonferroni

correction procedure is one of the most common adjustment methods of controlling type I error because it can be used for any application involving multiple hypothesis testing, however Jaccard and Wan (1996) have pointed out that this method can become too conservative when the number of comparisons grows large. The use of a modified procedure, the Holm's sequential Bonferonni method, is preferred because it is less conservative and has greater power (Green & Salkind, 2005). The method still retains an overall type I error rate of 5% (alpha = .05), but evaluates each paired comparison at a different alpha level after rank ordering the significance values obtained by the multiple tests. This modified procedure was conducted for the intercorrelational analysis between the dimensions of professional learning communities and the factors of technology integration to reduce the risk of a type I error.

Relationship Between Collaboration in Professional Learning Communities and Technology Integration

Question one examined the overall relationship between collaboration in professional learning communities and the integration of technology in the teaching and learning process. A correlational analysis, measured with Pearson's Correlation Coefficient (r), was conducted to determine if there was a relationship between the two variables of this study. 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).

Correlation coefficients were calculated for the overall means of the change scores of the pre- and post- survey results to determine if a relationship existed between

collaboration in professional learning communities and technology integration. The correlation between the variables was significant, $r(223) = .17$, $p < .000$, $R^2 = .03$. These results indicated a positive correlation between the two variables of this study and a small correlation coefficient based on Cohen's (1988) scale. A small practical significance that accounted for 3 percent of the variance between the variables was demonstrated by the correlational analysis. The results of the quantitative analysis for the overall correlation revealed that a significant relationship does exist between collaboration in professional learning community development and technology integration.

Relationship Between the Collaborative Dimensions of Professional Learning Communities and Factors of Technology Integration

The second quantitative research question explored the relationship between the collaborative dimensions of professional learning communities and factors for integration of technology for teaching and learning. Pearson product moment correlation coefficients were utilized to determine if there were relationships between the collaborative dimensions of professional learning communities assessed by the *School Professional Staff as a Learning Community (SPSLC)* (Hord et al., 1999) and the factors of technology integration measured by the *Technology Integration (TI)* (SEDL, 2003) instrument. A Holm's sequential Bonferonni method was conducted to reduce the risk of a type I error with the multi-correlational analysis. The results of the analysis of the Pearson product correlations demonstrated the relationships between each dimension of collaborative professional learning communities and factors of technology integration. (See Table 9.)

Table 9

Collaborative 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
Leadership	—	.41	.36	.26	.41	.13	.06	.14	.08	.18*	.04	.19*	.04
Vision		—	.43	.28	.39	.01	-.08	-.03	-.06	.10	-.11	.09	.03
Collective learning			—	.35	.58	.16*	.04	.11	.07	.11	.03	.01	.09
Peer review				—	.36	.13	.13	.18*	.17*	.17*	-.02	.20*	.10
Supportive conditions					—	.07	-.01	.17*	.09	.15*	-.01.	.12	-.07
Instructional						—	.45	.53	.47	.67	.50	.33.	.29
Planning							—	.36	.41	.41	.36	.30	.29
Communicating								—	.58	.40	.42	.36	.18
Decisions									—	.34	.36	.28	.17
Shared practices										—	.35	.26	.19
Students' use											—	.28	.19
Support												—	.14
Beliefs positive													—

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

Shared Leadership and Decision-Making

A correlational analysis was conducted between the dimension of shared leadership and decision making and the factors of technology integration. Significant correlations were revealed for two of the factors of technology integration: sharing

practices and supporting technology integration. The results showed that teachers share practices with other teachers collaboratively to plan and review lessons that involve the use of technology (r = .18). The strongest correlation in shared leadership and decision making was the factor of support that teachers receive for using technology (r = .19) with practical significance of .04. (See Table 10 for intercorrelations of shared leadership and decision-making and factors of technology integration.)

Table 10

Intercorrelations of Shared Leadership and Factors of Technology Integration

	Shared practices for technology integration	Support provided for technology use
Professional learning communities: Shared leadership and decision-making	.18*	.19*

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

Collective Learning

The analysis for collective learning in professional learning communities had a significant correlation with the factor of using technology for instructional purposes. The results demonstrated a small, positive correlation, $r = .16$, $p<.05$, $R^2 = .03$. Teachers collectively learning together impacted opportunities provided to students for using technology. Examples of new student opportunities included encouraging creative expression, using technology to produce products and publish work, using technology to collaborate with peers and incorporating problem-solving activities that require the use of technology resources.

Peer Review and Feedback

The results of the correlation coefficients for peer review and feedback and factors of technology integration illustrated the greatest amount of significant correlations. Four of the nine factors that promoted technology integration were positively correlated with peer review and feedback in professional learning communities. Table 11 illustrated the factors and their positive correlations. Again, teachers receiving support for technology use was the largest correlation with the professional learning community dimension of peer review. As teachers collaboratively provided feedback to their colleagues, they communicated using technology, shared best practices and used data to make decisions.

Table 11

Intercorrelations of Peer Review and Feedback and Factors of Technology Integration

	Communicating with technology	Data for decision-making	Shared practices for technology integration	Support provided for technology use
Professional learning communities: Peer Review and Feedback	.18*	.17*	.17*	.20 *

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

Supportive Conditions

The data analysis provided a description of the interactions between the dimension of supportive conditions in professional learning communities and the factors that impact using technology for teaching and learning. The results showed that supportive conditions, such as physical and organizational processes, enhanced technology use for teachers to communicate with others ($r = .17$), with a practical

significance of .03. Sharing practices with other teachers collaboratively that involved the use of technology (r = .15) was also increased with supportive conditions.

Summary of Intercorrelations

There were nine correlations (see Table 12) discovered between the collaborative dimensions of professional learning communities and factors of technology integration change score means that were statistically significant at the corrected level of p = .05.

Table 12

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

Dimensions of PLC and Factors of TI	Shared leadership	Shared vision	Collective learning	Peer feedback	Support
Instructional uses of technology			.159*		
Planning for technology integration					
Communicating with technology				.177*	.174*
Using data for decision-making				.167*	
Shared practices for technology integration	.180*			.166*	.145*
Students' use of technology					
Support provided for technology use	.189*			.197*	
Teachers' beliefs about the use of technology					

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

The dimension of peer review and feedback were correlated with the greatest number of technology integration factors. The technology integration factor of sharing practices was correlated with the greatest number of professional learning community dimensions. Supportive conditions for professional learning community development and support for technology integration each correlated with two factors or dimensions, including the strongest relationships of all intercorrelations.

Group Comparison Quantitative Data Analysis

After completing correlational data analysis to examine the relationships between the variables of collaboration in professional learning communities and technology integration, paired quantitative data were analyzed on the *School Professional Staff as Learning Communities (SPSLC)*(Hord et al., 1999) pre-survey instrument to compare levels of collaboration among different groups before the intervention. Analysis of variance (ANOVA) *F*-tests were conducted to measure significance of mean scores for different demographic sets; including school level, school size and rural versus urban versus suburban. Comparison of the mean scores and significance for each group provided data to choose a purposefully selected sample for the qualitative portion of the mixed methods study.

Data analysis indicated that there were no significant differences in levels of collaboration when examining school size and location; including rural, urban and suburban schools. When the quantitative analysis was conducted to compare school levels using the *SPSLC* instrument pre-survey, comparison of mean scores demonstrated that the mean of 3.86 for elementary schools (n = 150) was greater than the mean of 3.60 for secondary schools (n = 92), though not significant. This indicated that secondary

schools scored lower on the collaborative dimensions of professional learning communities, suggesting more isolation among teachers. Since the difference was not significant, further investigation was conducted.

The secondary schools in the sample were represented by middle schools, high schools, and 6th-12th grade schools. When exploring the results of the secondary versus elementary differences, one middle school in the sample emerged as an outlier in comparison to the other secondary sites. Further quantitative analysis comparing the elementary school sample individually to the different secondary configurations revealed significant differences. Table 13 showed the mean scores for the different levels of schools.

Table 13

School Level Means for SPSLC pre-survey instrument

		Descriptive statistics	
School Levels	*n*	Mean	Standard deviation
Total Elementary	150	3.86	.63
Total Secondary	92	3.60	.73
Secondary Configurations			
Middle Schools	45	4.06	.53
High Schools	44	3.37	.71
6th – 12th grade Schools	3	3.71	1.03

ANOVA *F*-tests were conducted to evaluate the hypothesis that some school levels are less collaborative and more isolated than other levels. Results indicated that differences occurred between group means of school levels. The ANOVA was

significant, $F(4,253) = 7.48$, $p < .01$. As assessed by η^2, the strength of relationship between school level and SPSLC was strong, with the school level factor accounting for 11 percent of the variance of the dependent variable. Since the overall *F* test was significant, follow-up tests were conducted to evaluate pair-wise differences among the means. The post-hoc analyses, using Tukey, explained that the mean differences occurred between high school and elementary and between high school and middle school ($p < .001$).

High schools were significantly different with the lowest school level mean score of 3.37 on the collaborative dimensions of professional learning communities, making it the least collaborative level for the sample in this study. These results are supported in the literature with teacher isolation documented to be a more significant problem at the high school level (Fullan, 1991; Hargreaves, 1994; McLaughlin & Talbert, 2001).

The overall relationship of the two variables of the study, collaboration in professional learning communities and the integration of technology in the teaching and learning process was also analyzed for the different school levels. Correlational analyses, measured with Pearson's Correlation Coefficient (r), were conducted for elementary, total secondary, middle school, high school and district levels. Coefficients of determinations (R^2) were computed to assess the practical significance of the correlation coefficients.

The correlation between the variables was significant at the total secondary level, $r(73) = .29$, $p < .012$, $R^2 = .08$ and at the high school level, $r(36) = .37$, $p < .015$, $R^2 = .14$. There were no significant overall correlations for the other school levels. The results of the overall correlation for the total secondary and high school levels indicated a significant positive correlation that is medium between collaboration in professional

learning communities and technology integration. Small practical significance that accounted for 8 percent and 14 percent of the variance for secondary and high schools, respectively, was demonstrated by the correlational analysis. The results of the school level quantitative analysis for the overall correlation revealed that a significant relationship does exist between collaboration in professional learning community development and technology integration at the secondary and high school levels.

Since the high school level was identified as less collaborative and more isolated before the intervention and had a significant medium correlation between professional learning communities and technology integration, the four high school sites were purposefully selected as the sample for the second qualitative phase of the study. The qualitative portion of the study provided further explanation and deeper understanding of the research problem of school isolation. The perspectives of the participants presented additional data to explain the development of collaboration and technology integration within professional learning community development.

Descriptive statistics, showing pre- and post- survey means for both instruments, were computed for each of the high school sites (See Table 14). School Apple showed increases on both professional learning community development and technology integration from the pre- to the post- data collection, but the changes were not significant. School Bartlett had the lowest SPSLC mean on the pre-survey, indicating that it was the least collaborative school in the qualitative sample. It was also the only site that showed significant growth in both areas: technology integration ($t = 2.46$, $p = .03$) and professional learning community development ($t = 3.02$, $p = .015$). School Cherry decreased on the SPSLC mean and had a slight insignificant increase on technology

integration. School Dogwood had the highest mean on the pre-survey, indicating that it was the most collaborative site in the sample before the intervention. They decreased from the pre- to the post- professional learning community, but showed significant growth in technology integration ($t = 4.16$, $p = .025$).

Table 14

School Sample Sites Means for SPSLC and TI instruments

		Descriptive statistics			
		SPSLC Instrument		TI Instrument	
Schools	*n*	Mean	Standard Deviation	Mean	Standard Deviation
High School Apple	27				
Pre		3.21	0.83	2.89	0.61
Post-		3.43	0.74	3.14	0.64
High School Bartlett Pear	13				
Pre-		3.04	0.52	2.61	0.62
Post-		3.69*	0.60	3.04*	0.76
High School Cherry	16				
Pre-		3.54	0.66	2.78	0.49
Post-		3.23	0.60	2.85	0.68
High School Dogwood	5				
Pre-		4.04	0.27	2.88	0.38
Post-		3.73	0.46	3.28*	0.45

**Significant growth*

Summary

The analysis and results of the quantitative phase of the mixed methods study were described in this chapter. Descriptive statistics on demographic information and technology background were described for the sample. Correlational analyses were used to investigate the relationship between the two variables of the study: collaboration in professional learning community development and technology integration in the teaching

and learning process. An overall positive correlation (r = .17) was calculated that was small, yet significant. Intercorrelations were examined, using the pre- and post- survey change means, to determine relationships between the collaborative dimensions of professional learning communities and the factors of technology integration. Nine statistically significant correlations were shown between the collaborative dimensions and factors for integrating technology into the teaching and learning process.

The overall relationship of the two variables of the study was also analyzed for different school levels. Significant correlations existed for total secondary (r = .29) and high school (r = .37) levels, indicating positive medium relationships. Quantitative data were analyzed on the *School Professional Staff as Learning Community* (SPSLC) (Hord et al., 1999) pre-survey instrument for different demographic sets to compare different levels of collaboration. These analyses provided additional results to choose a purposefully selected sample for the qualitative portion of the mixed methods study.

CHAPTER FIVE

Phase II: Qualitative Analysis and Results

> Collaboration and technology go hand in hand. It's not just a teacher with the technology on an island….we're sharing information and learning together, and technology is the reason for everyone to collaborate. The technology influenced the collaboration by enhancing it and opening up new ways to collaborate; and the collaboration around our shared vision of technology integration has improved classroom instruction and students are motivated and more actively engaged in their own learning. (2005 Grant School Principal, Interviews, p. 5)

Chapter five presented the analysis and results of the qualitative phase of this mixed methods study. The quantitative portion of the study, presented in Chapter 4, was used to determine the qualitative research questions in the second phase of the study to form a more complete picture of how technology influences collaboration to gain greater understanding for schools as they continually strive to become a professional learning community. The qualitative research questions and emerging themes served as the organizational structure for this chapter. The data analysis from interviews and grant documentation provided a deeper understanding of the perspectives of the participants and the processes that described the development of collaborative cultures within professional learning communities. The principals' and teachers' lived experiences are presented in this chapter.

Qualitative Sample

In the first phase of this mixed methods study, the quantitative results indicated that the high schools in the sample were the least collaborative group. Since this group was identified as most isolated before the intervention, the four high schools were purposefully selected as sample sites for the qualitative phase of the study to better understand if and how the schools developed and changed. In each school site, a

purposefully selected sample of participants was included to represent varying views and experiences of the staff. In each high school, interviews were conducted with the principal to determine his/her role in the grant implementation process and the school vision for collaboration and technology integration. Part of the intervention of the professional development structure included the establishment of a learning team to build leadership capacity among the school staff. In each sample school, teachers were interviewed who served on the learning team, in addition to interviewing teachers who were not on the leadership team, to determine varying perceptions and experiences and gain a clearer understanding of how the integration of technology and professional learning community development impacted the teachers.

The four purposefully selected high schools all served 9th-12th grade students, but varied significantly in size, residential area and socioeconomic status of the students. Table 15 showed demographic information for each of the schools. Confidentiality was maintained for the schools, teachers and principals through the use of pseudonyms when discussing the qualitative results.

Table 15

Qualitative Sample Sites – Demographic Data

School	Number of Students	Number of Teachers	Residential Area	Percent Poverty	Percent Minority
School Apple	832	48	Rural	48%	46%
School Bartlett Pear	330	23	Rural	19 %	10 %
School Cherry	312	32	Rural	53 %	27 %
School Dogwood	1,822	113	Suburban	27 %	23 %

School Apple

Before the grant, the principal of School Apple described her staff as a typical, traditional high school faculty with very little collaboration or discourse embedded into the daily practices of school. The principal had been amazed how technology had been a good motivational interest to get teachers talking about good teaching and working together to solve problems and support each other. A teacher on the learning team stressed, "The grant was a springboard for improvement in technology integration and collaboration and that they collectively fuel the fire for whole school change" (Interviews, 2006).

School Bartlett Pear

Principal Bartlett described the entire grant process as an amazing adventure. "Little did I know how much it would change our school…I have seen dramatic changes in the classrooms and how the teachers are interacting with the students" (Interviews, 2006). One teacher who was new to the school site at the beginning of the grant emphasized the isolation in the traditional high school when she arrived. "Everyone was nice, but we were in our own area, doing our own thing. But the technology and collaboration facilitated trust, and we've come together as a high school staff" (Interviews, 2006).

School Cherry

According to the principal, School Cherry has a high percentage of students on free and reduced lunch and resides in an overall poorly educated community, where only 20% of its population has graduated from high school. The principal has been at the school for several years and emphasized the challenges of collaboration in his traditional

high school, which happens to be rich with technology equipment due to numerous grant awards. He stressed that staff development and implementation were the greatest challenge in the school since there were so many initiatives in progress.

School Dogwood

Dogwood is a large suburban high school with almost 2000 students. According to the principal, one of the greatest challenges in such a large school is communication and collaboration. One of the previous school initiatives focused on creating smaller learning environments and school-within-a-school teams in the large school structure. The grant focused on one grade-level team that was comprised of a mathematics, science, social studies and English teacher who were all assigned a common group of students. They focused on shared vision that included personalization, relationship building and student involvement with an emphasis on technology integration within interdisciplinary instruction.

Qualitative Research Questions

In the quantitative phase of this study, a significant, positive relationship was established between collaboration in professional learning communities and technology integration; however the direction of the relationship is unknown. The qualitative data will provide a deeper understanding of the relationship between the variables and the processes that described the development of collaborative cultures within professional learning communities. The results of the quantitative phase were used to develop the following qualitative research questions:

Question One: How does technology influence collaboration within professional learning communities?

Question Two: How does collaboration influence technology integration?

Collaborative Culture and Technology Integration

The qualitative research questions explored the influence of collaboration on technology integration and technology's impact on collaboration in professional learning community development. Since the qualitative research questions and interview protocol were based on the findings from the initial quantitative phase of the study, themes primarily emerged based on the treatment of professional development from the grant program. A semi-structured interview process was purposefully used to allow for the possibility of alternative themes to develop. Grant documents for each school were also examined as ancillary data for examples of items from the primary qualitative themes to provide a deeper understanding and clarify how the schools developed and changed.

From the high school participants' experiences, two themes of shared practices for change emerged: leadership and learning. Several sub-themes emerged under the two major themes of learning and leadership (See Table 16). The experiences indicated commonalities and similarities between the themes and research questions, making overlap evident. This illustrated the complexity and interdependency of relationships of technology integration and collaborative professional learning community development. Relationships of themes that emerged in all school sites were discussed, yet within the themes the content was disparate. The perceptions in each school either focused on presence and strengths within the themes or a lack of existence, indicating an area of need.

Table 16

Qualitative Themes and Sub-themes

Leadership	Learning
• Building leadership capacity – Shared leadership – Shared decision-making • Communication • Shared vision • Supportive leadership • Supportive conditions – Physical and structural capacity – Capacity of people	• Teacher learning – Redefined personal vision for learning and professional growth – Collective learning and knowledge sharing (Job-embedded professional development) – Emergence of communities of practice (Wenger, 1998) – New concept for student learning: authentic and technology-rich learning environments, new teaching strategies • Student learning & success – Increased motivation and engagement – Involved students in their own learning – Empowered students – Increased API scores

Shared Practices for Change

As the school year progressed, the staffs became involved in shared practices for systemic school improvement and change. Leadership and learning combined to impact the development of the schools. As teachers had opportunities to learn and redefine their vision for learning around technology integration, they worked collaboratively in mentoring roles, establishing leadership capacity. The ability of principals to provide supportive conditions encouraged shared leadership and greater capacity for change.

With collective learning and shared leadership, teachers changed their instructional practices within the classroom, impacting student success.

Leadership

Building leadership capacity through a shared vision and collaborative decision-making with high leadership skills and high staff participation (Lambert, 1998) is the ideal for school reform efforts. The support of the principal is essential; however the traditional roles of school principals have progressed. Instead of the principal making all of the decisions as a bureaucratic manager, he/she empowers school teachers and other stakeholders to share power based on the shared vision, helping teachers make decisions for themselves and establish responsibility for their actions.

Shared leadership and decision making. Dogwood High School had been involved in efforts that were collaborative and focused on shared decision making prior to the intervention. Interview participants from the other three high schools indicated that before the grant the leadership in their school was very traditional with primarily top-down decision making. A teacher at Apple High School shared feelings that were indicative of this leadership style, "Often times as a teacher you just do your job in the classroom and think that nobody cares what you think and that the administration will just tell us what to do and make decisions for us" (Interviews, 2006).

Through collaboration and professional learning community development, Apple and Bartlett High Schools demonstrated growth in building leadership capacity and shared decision making. Principal Bartlett stressed that his team leaders learned so much about leadership. Most of them had not been in a leadership position before so "it was new and scary. They don't look at themselves as being the boss, but they've done an

exceptional job in leading their team groups and accepting the teacher leader role" (Interviews, 2006). The principal at Apple High School credited the success of their grant's implementation and success to the strong teacher leaders. She emphasized that she chose the right people, supported them and then got out of their way. "I learned to step back and give power to them. They were more aggressive than I would have been because there is strength in numbers and peer pressure" (Interviews, 2006). When they were mentoring and leading their colleagues, they pointed out that if they can find the time and learn to integrate technology, then so could they.

As the project evolved, the principals provided many opportunities for shared leadership for various stakeholders, including teachers, students, parents, and community members. They emphasized the importance of technology in planning and facilitating these collaborative efforts. Principal Apple stated, "We use technology for so many basic tasks to assist us in managing huge amounts of information such as attendance, grades and discipline in our student management system. I remember the days when everything was done by hand in a teacher's grade book or office files. It was so time consuming. Now, technology provides us with a much more efficient way of managing the data that saves time so that we can spend it with kids instead of pushing papers" (Interviews, 2006).

At Apple and Bartlett High Schools, the principals also stressed the importance of collaboration and technology use at all levels, beginning with (a) modeling it at the administrative level, (b) assessing it in the interviewing process when hiring new staff members and (c) incorporating it in opportunities and structures at all levels. The principal from Apple High shared that she now models the use of technology in meeting

presentations, agendas and data-driven decision making. At first, she felt that integrating technology took extra time since it was a new skill, but now stresses how much time it saves her and definitely makes her job easier. She also believed that modeling the use of technology has helped her receive staff support and buy-in for the initiative. Teachers at Bartlett High School became actively involved in pursuing additional equipment and resources for their school improvement plan. According to the principal, leadership means taking the initiative to seek out information and investigate resources, such as other grant opportunities. "Instead of the team leaders or administration writing grants, teachers are taking personal responsibility to write themselves….that's new thinking here at Bartlett High School" (Interviews, 2006).

The shared leadership at Apple High School developed throughout the grant year. It began with a top-down administrative focus but shifted to the development of the grant learning team that later evolved to a school leadership team that was collaboratively involved in decision-making for the site. "The team members gained confidence and competency to be able to assist with various leadership roles and aid in school decision making. Through a collaborative approach, we received support from central office and the school board in our decisions" (Quarterly Report, 2005). Bartlett High School continued to stress the benefits of both formal and informal collaboration and open lines of communication through email and staff discourse.

The lack of shared leadership at Cherry was depicted by data that showed that the learning team had not been involved in the vision and that they had not even seen the grant application until after receiving the award. Several sources included information referring to the problems with implementation and follow through. The quarterly reports

that had been turned in by the school did not include the professional learning community development or depict a value for learning. It solely described the status of equipment deployment and technical issues.

Communication. Effectively communicating to all stakeholders was emphasized by all principals as a key component to a collaborative school culture. Principal Dogwood stressed that "We can't just talk that we should collaborate, but as principals we have to put it into practice and get everyone involved. Then you're not just this school...you're actually a good, productive community of learners" (Interviews, 2006). One of the most effective ways to share information is through email and web page messages, where technology enhances school communication. All of the principals had moved their faculty to actively participating in basic dissemination of information through weekly email messages. Teachers can email peers, administrators, parents and others to enhance networking opportunities with information flow. In Dogwood High School, all teachers had also developed web pages to enhance communication with parents by constant access to class assignments, grades and announcements.

Several of the schools also mentioned data-driven decision making as an integral component to their school's collaborative processes. Principal Apple shared:

> We collect data for everything we do. In a meeting earlier this week, my teacher leadership team gathered data from a needs assessment and we used a laptop computer and Excel to develop graphs and charts to display the data for presenting it in a collaborative meeting with the total staff. Technology is a great tool to convey the information in a clear, concise manner so that everyone can

understand. It assisted us in providing a visual that we imported into a PowerPoint presentation to share with the staff. (Interviews, 2006)

Furthermore, Principal Dogwood emphasized the ease of keeping running reports and longitudinal data when technology is used to assist with organizing the data for work on site goals.

Overall, the schools discussed that they use technology as a tool to enhance communication and collaboration within their school. They shared many practical examples and situations of how it can be used as a tool to enhance collaboration, save time and assist in providing immediate data and feedback to schools in management situations, and how it is enhancing learning within classroom settings. Teacher Apple discussed how their high school staff shares with their colleagues all information, resources and ideas that they find. "Collaboration has increased because we can also share practices via email…once we find something on the Internet, we communicate with each other back and forth and are able to discuss teaching strategies" (Interviews, 2006).

Shared vision. In a learning community, a shared vision is ideally developed using a collaborative approach to create ownership and commitment (Senge, 1990). Principal Apple saw the benefits of this approach and was the only principal who involved a teacher leadership team in planning and developing the initial grant application. This group played an integral role and helped develop the vision for technology integration and learning community development based on their beliefs about teaching and learning, resulting in total commitment. One teacher emphasized, "Our role was to help implement the vision, and I can honestly say that it has been one of the most successful things that we have done as a high school staff" (Interviews, 2006). Another

teacher at Apple High School believed that the entire staff bought in to the vision because it was non-threatening and implemented internally from their colleagues who they trusted. The staff knew that "we were in it for the same reason….together we asked ourselves what we do to become better and in turn, make things better for our students" (Interviews, 2006).

In the other three high schools, the vision began with administration, but was implemented very differently, with varying levels of success. At Cherry High School, the superintendent and central office staff developed the grant application and did not involve site administrators or teachers in the process. The site principal stressed that the initiative was top-down and was introduced when they were involved in seven other projects. Teachers shared that the entire staff showed a lack of commitment and often felt overwhelmed and confused by the different grant initiatives.

Principals at Bartlett and Dogwood High Schools admitted that the initial vision emerged from administration, but at both sites teachers were involved immediately after notification of the grant award. A Bartlett Teacher stressed that the teachers selected for leadership were reluctant initially, but that the principal provided support and convinced the learning team. The principal carefully selected team leaders who were good teachers, hard-workers and staff who were well-respected and trusted by their colleagues. They were not necessarily strong in technology use, but were interested in doing what's best for kids and not resistant to change. Principal Bartlett emphasized:

> It was much easier for the team leaders to sell the vision and get ownership from their peers than if I would have done it in a top-down, autocratic manner. When we put strong teachers like that in a leadership position, it sends a message that

we're serious about the initiative. The grant had to be a collegial and collaborative effort to be successful. (Interviews, 2006)

Supportive leadership. Cultivating a culture and providing supportive leadership to sustain a shared vision is integral for school improvement. The ability of principals to provide supportive conditions emerge as a key factor in encouraging shared leadership (Huffman & Hipp, 2003). In three of the four high schools, the principals provided many avenues and structures to get stakeholder input and establish ownership and buy-in towards a more collaborative school culture, including meetings, committees, district level advisory boards, core teams, departments and summer retreats. Principal Bartlett supported the learning team by covering classes, providing equipment and resources, encouraging implementation of the vision and developing a bulletin board in the teacher workroom for sharing grant opportunities, lesson ideas and networking strategies. At Dogwood High School, administration provided a common planning period in the master schedule to provide meeting time for the team. Teacher Apple explained that their administration is very pro-technology, both the district superintendent and school principals. "They value professional development and are providing time for us to learn together and additional equipment and resources to make it beneficial to our kids" (Interviews, 2006).

Support by school administration continued to be a prevalent theme in the grant documentation for Schools Apple, Bartlett and Dogwood. The principal and assistant principal at Apple High School provided time for the learning team to work with their teams through various ways of scheduling such as during special student programs and on professional development and meeting days. They also purchased additional

resources based on needs identified by the staff. At Dogwood, supportive leadership was provided by stewarding the vision for technology integration and providing time and additional classroom resources. Bartlett teachers continued to highlight the supportive conditions that were received from administration to implement technology integration.

Principal Cherry also realized the importance of school structures, but admitted that "formal" structures were not in place and had not been established as an expectation for the staff. The teachers didn't attend meetings regularly, and he did not provide time for collaboration. He confessed that he thought it would happen naturally, but that it didn't. "I realize that it has to be more purposeful and structured to encourage buy-in from the entire staff" (Interviews, 2006). A teacher at Cherry High School confirmed:

> We hardly have meetings….one before school starts, one at Christmas and one at the end of the year. Even at the three that we do have, we're in separate sessions in different rooms and lots of times the coaches and band teachers have something else with their activities and don't come…they're not expected to come. Even informally, I don't see many teachers, other than the four that I eat lunch with everyday. I don't know very many of the teachers….one of the coaches introduced himself to me yesterday and we've almost finished 3rd quarter. (Interviews, 2006)

Cherry School also does not encourage the stakeholder involvement that the others discussed. The principal mentioned that they don't focus on parents and community because they have fewer educated people in their small, rural town. "Our parents tend to have blue-collar jobs and don't have time or knowledge to offer. We're the experts, and

we think that parents should step back, listen to us and let us do our job as the professional educator" (Interviews, 2006).

Supportive conditions. The structures of the organization that enable the school stakeholders to come together to learn, solve problems and share best practices are supportive conditions. They include physical and structural capacity, such as providing resources and expertise, in addition to capacity of the people working in the learning community. One of the supportive structures mentioned most was time. Teachers and principals at all four schools stressed the importance of providing time to meet, collaborate, discuss and learn together, but only three of the schools acted according to these beliefs. Time was also the most common obstacle that made implementation and collective learning difficult. According to Teacher Apple, "We are really busy. It is hard to get out of the classroom to get together, so time is always a hindrance. Technology has made it easier to collaborate. We'll send emails around, sharing ideas and resources" (Interviews, 2006).

At Bartlett High School, collaboration occurs informally more than in formal, structured settings. The collaboration is encouraged by the principal, but primarily initiated by teachers. One example occurred when a teacher went to a professional development session at the local University. When she returned, she had several website resources for different content areas that she shared with the other staff members. According to Teacher Bartlett, "We discuss and share things all of the time. We're a small enough school that sometimes it's easier to walk down the hall and collaborate informally" (Interviews, 2006). The principal echoed ideas about informal collaboration and stressed the impact of the professional development:

> Throughout the grant, the professional development sessions were a pinnacle of sharing information and learning together. That's when most of the conversations evolved. The teachers would share how they did something, troubleshoot the technology and discuss ideas. When OK-ACTS wasn't here, it was much more informal with teachers having conversations in the hall, during lunch and sending emails. (Interviews, 2006)

Teachers at Dogwood also stressed the importance of informal collaboration. Even though administration has provided a common planning period so we have time to share, the informal conversations are equally productive.

For teachers to work collaboratively in both formal and informal settings, they must feel comfortable to take risks, share information and build good relationships. High levels of trust promote risk-taking, honest communication, and deep commitment to school improvement at Apple, Bartlett and Dogwood High Schools. One teacher not on the learning team at Apple High School emphasized, "We were receptive to the teacher leadership team because relationships were established internally. For us, it was non-threatening and fun. We knew that they wanted to make a difference for our kids and we trusted them" (Interviews, 2006). A coach at Dogwood discussed how his learning had impacted him in numerous ways. "Now that I've been trained and feel much more comfortable and willing to try new things after 33 years of teaching, new skills are transitioning to my class and football coaching" (Interview, 2006).

Learning

Learning together in a collaborative and collective manner about technology integration was a logical way to bring professionals together for a common purpose.

Effective professional development was provided that focused on job-embedded, constructivist, and an on-going design. As leadership capacity was built, mentoring and coaching relationships progressed where teachers were learning from their colleagues as they discussed best practices.

Teacher learning. As teachers began participating in discourse and collaborating about the technology use and integration, it redefined their personal vision for learning and professional growth. In each building, there was a wide variety of teacher technology expertise where some colleagues knew more than others and typically the students knew more about the technology than many of the teachers. Teachers discovered that they could learn and relearn strategies to impact their instruction and student success. Teacher Bartlett emphasized that it wouldn't be permissible for a teacher to be unfamiliar with their content and curriculum, but "since technology is a newer generation tool, it gives the teachers an opportunity to not know everything, and that's okay. It encourages the development of the teachers to become learners with the students" (Interviews, 2006). The learning team and students served as support and instructors for teachers; and job-embedded professional development provided opportunities for teachers and students to learn together. A teacher at Dogwood High School, who was admittedly old-school but showed significant growth, concluded, "I'm not sure where all of the technology integration will go over the next several years since it changes so fast, but it's a growing process that's not ending…..and we'll continue to learn together" (Interviews, 2006).

Field notes also indicated that all four staffs had a wide variety of abilities, but that the learning team concept facilitated teachers helping each other and learning

together in a collective and collaborative manner. According to one teacher not on a school learning team, teachers learn better from each other and sometimes they feel uncomfortable asking questions in a large group. At Apple, the learning team divided up and took responsibility for a very large high school staff and the training of trainers implementation was very successful. At Bartlett, "there was an excitement for this new and innovative technology, and the realization by teachers how they could be instructional leaders in and outside their classrooms" (Quarterly Report, 2005). Principal Dogwood emphasized, "Technology integration is a great place for teachers to start with focused dialogue. They are working one-on-one and with peer tutoring to support each other and share and learn together" (Interviews, 2006).

In addition to building leadership capacity and shared decision making, the learning team development enhanced the collective learning and sharing of knowledge among the staff in Schools Apple, Bartlett and Dogwood. Learning team members became mentors for their colleagues and "the access to new knowledge was a springboard to take us to alternative teaching methods" (Quarterly Reports, 2005). Collaborative teams in the schools worked interdependently as they supported one another in this mentoring relationship. Learning team members provided support by modeling, coaching and problem solving with their colleagues about specific problems of practice. One of the teacher leaders on the learning team at Bartlett High School discussed his mentoring role and the team's commitment to collaboration:

> I encourage my colleagues to collaborate and use technology and am available to help them out if they have problems or questions. The learning team concept has facilitated everyone believing in our school improvement efforts and that we have

> enough people here that they're not alone in tackling it. I now see teachers who appreciate the value of collaboration and technology, know that there are colleagues to help out and are more willing to try new teaching strategies. (Interviews, 2006)

In Cherry High School, the learning team concept did not materialize like the other sites. One of the teachers shared that the ball had been dropped due to miscommunication and confusion over different initiatives. The learning team was unsure of their leadership responsibilities and felt overwhelmed. One teacher mentioned that the only thing she did was show up to training sessions and meet to discuss technology equipment needs for other grant applications. All interview participants stressed that collaboration was very rare and that the only time that teachers collaborate was informally at lunch or "when grants make us collaborate like the OETT grant" (Interviews, 2006). Principal Cherry, who admitted that he had not established structures and processes for collaboration and professional development within the school, emphasized that the continued learning and development was the greatest struggle and challenge. He mentioned that he still had teachers who had taught a long time and weren't willing to change. "We're not as far as we need to be, and I don't have anything in place to set this expectation formally. With so many initiatives, that just has not been a priority with the school" (Interviews, 2006).

As participants in all four high schools discussed the processes of implementing a collaborative culture and developing a learning community within their school, professional development continued to be mentioned as both a need and a key component. All high school participants emphasized that the professional development

for technology integration and learning community development had been hands-on and more authentic than traditional professional development. Principal Dogwood shared how teams of teachers at her school began discussing interdisciplinary units and curriculum alignment within the technology integration. She emphasized that the technology and collaboration have changed how teachers teach. "They are providing authentic experiences for their students that enhance interdisciplinary connections, problem solving and critical thinking" (Quarterly Reports, 2005).

The technology and collaborative culture began to facilitate the development of a new concept for student learning for many of the traditional teachers in the high schools. Teacher Dogwood stated,

> [I]n the past I was old-school and used a lot of lecture in my class, the technology and learning with my colleagues has enabled me to be able to do many things that really help me in the classroom a lot.(Interviews, 2006)

Confirming this teacher's comments, the Dogwood Principal emphasized that he was the one teacher who probably grew the most. "He began to integrate problem solving and authentic curriculum experiences into his lessons and has totally bought into how much it enhanced his class. He became empowered with new teaching strategies and increased knowledge" (Interviews, 2006).

Technology integration and collaboration enhanced classroom instruction and teaching strategies, according to teachers in all four high schools. Through the professional development, teachers learned ways to use technology in teaching practices and new strategies and methodology. Principal Dogwood stressed that this was important and extremely positive for the growth of the team, but "what it really became was much

deeper….a reflective process about what we want our students to know and about how students learn best. It is transferring directly to the students in the classroom" (Interviews, 2006).

Student learning and success. The impact of technology as a tool for the schools' collaborative processes and professional learning community development has snowballed directly to the classroom according to most of the interview participants. Teacher Dogwood emphasized that teachers have to be willing to take risks and step out of their comfort zone because the kids know so much more than many of us in regards to technology. "At first it's scary, but once you get into it, you get excited about a new way of teaching that involves the students more" (Interviews, 2006). As the teachers felt more comfortable in using technology and taking risks to try it within the classroom with their curriculum, students became excited about having increased opportunities and technology access in class. All participants emphasized that the students love the technology.

Principal Apple stressed how technology engages and motivates many of her low socioeconomic students who would not have access to technology outside of school. She has seen increases in attendance and decreases in discipline problems in classrooms where teachers are integrating technology with authentic teaching and learning.

> Technology is a hook that hits a real passion for many kids in society today. They are comfortable and engaged by video games, internet and text messaging; and it's a way to positively impact and reach students who we can't reach in any other way. All kids can benefit from more authentic instruction with technology integration, but for some of my at-risk kids, it's the magic potion that engages them in the learning. (Interviews, 2006)

Teachers in other schools agreed that technology increased overall student engagement due to its multimedia-like format. Teacher Bartlett believed that it makes the students much more involved with the learning process. He emphasized, "the extra layer of interactivity that technology brings as an instructional tool changes the way the students perceive information forever, and I don't think that will ever wear off" (Interviews, 2006).

Principal Dogwood also witnessed technology's positive impact on student motivation in the classroom. As she observed a teacher's interdisciplinary lesson, using a webquest and assessing students based on a PowerPoint, she saw the typically unmotivated students volunteering to go first and getting really excited about their work. When she asked a student what he liked best about the collaborative lesson that integrated technology, he responded that it's fun and that he learned so much more than he would have on a test since he had to take what he knew and go further with his presentation. She was so impressed with the higher order thinking skills that were incorporated in the lesson with integrated synthesis and interpretation of data, but to the kids, they were just having fun!

Several teachers emphasized that technology and collaboration involve the students in their learning more than traditional methods and increases their interest in the material. The hands-on experiences where students had an opportunity to actively participate in the lesson involved them in their own learning rather than being passive participants. Teacher Bartlett emphasized her belief that "the technology is helping the students transfer their knowledge among the content areas and helping them make connections" (Interviews, 2006). According to Teacher Dogwood, anything that keeps a

kid interested in the learning and involved will definitely impact student achievement. Among the four schools, the collaboration and technology integration impacted various measures of improved student success, including standardized test results, class performance, improved discipline and attendance and reducing dropout rates. Grant documentation data showed that students were receiving greater technology access, were more motivated and interested and were on-task during classroom activities.

The impact of collaboration and technology was also empowering for the students, according to participants at several high school sites. The students were helping teachers and other students in the learning process and technology integration. Teacher Apple emphasized, "The students caught the wave of excitement around the technology and the pride and ownership that they have acquired is powerful for total school involvement" (Interviews, 2006). Others discussed the sense of pride and ownership of the students as they were involved and took responsibility for their own learning and created authentic products.

One way to evaluate a school's progress toward its educational goals is illustrated by the states accountability measure. In today's educational climate of high standards and accountability, federal regulations under *No Child Left Behind (NCLB)* (USDE, 2002) require all states to develop a school accountability system that measures performance and progress. In Oklahoma, the Academic Performance Index (API), measures Adequately Yearly Progress (AYP) based on several factors that contribute to overall educational success. The possible scores on the API range from 0 to 1500, with 1000 being the average state score of schools and districts in the 2001-2002 school year. "Adequately Yearly Progress (AYP) is determined by the success or failure of an

individual school or district in achieving the state defined performance benchmarks" (Oklahoma State Department of Education, 2006, p.1).

The factors used in the calculation of an API score include student achievement data based on state achievement tests; school completion which includes attendance, dropout and graduation rates and academic excellence. Academic excellence includes ACT scores and participation, Advanced Placement (AP) credit and college remediation rates in reading and mathematics. The API 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 student achievement data (80 percent), attendance (10 percent) and academic excellence (10 percent).

As a part of the grant application, the schools provided their 2003-2004 score. The 2004-2005 API scores were obtained from the School Report Card (Education Oversight Board, 2004, 2005) and compared to the 2003-2004 scores. All but one of the grant schools in the quantitative phase of the study were included in the analysis. The excluded grant school was a subdivision of another school and did not receive a separate API score. Table 17 displayed the State of Oklahoma's average API scores and the study schools' API scores for two years. The schools involved in the study had an 80 percent larger increase in API than the state average. For the purposefully selected sites in the qualitative phase of the study, all of the high schools also had an increasing API score.

Table 17

Study Schools' Academic Performance Index

Total Sample	2003-2004	2004-2005	Increase	*Percent Comparison
2004-2005 Grant Schools	1090	1222	132	10.8
State of Oklahoma	1086	1159	73	6.29

*Percent increase of grant schools compared to state

Summary

The results of the qualitative data were analyzed and described in this chapter. A description of the purposefully selected sample sites and participants for the second phase of the study was included. Themes that emerged from the interview participants' experiences and grant documentation data included two shared practices for change: learning and leading. Both themes answered the qualitative research questions, with evidence of overlapping concepts. The experiences illustrated commonalities with interdependent relationships of technology integration and collaborative professional learning community development. The use of quotes was included throughout the qualitative findings to provide a richer understanding of the lived experiences of the schools, principals and teachers. An analysis of the Academic Performance Index (API) of the schools in the study was performed to determine the changes in scores within the grant school year and was compared to the state's average API increase.

CHAPTER SIX

Summary and Discussion

> The community evolved with a focus on teacher learning through intentional establishment of communities of practice each with a domain of school improvement focused on student learning, a community that was interconnected with mutual respect, and a common practice that supported teaching and learning. Increased learning facilitated the stretching of leadership across the school community. (Cate, 2004, p. 146)

This chapter summarized the problem, research questions, and design of the study. The emphasis of this chapter was to discuss and draw conclusions about the results; to link the primary results to the theoretical framework; and to interpret the mixing of the quantitative and qualitative data. Limitations of the study and implications for practice, preparation programs, and future research were also included. To investigate the meaning of the findings, the quantitative and qualitative data were mixed and blended during the interpretation phase of the study that is presented in this chapter. The mixed methods research question guided the discussion and asked how the qualitative findings explained the statistical results obtained in the quantitative phase.

Problem

Today's traditional schools are characterized by isolated structures and culture making it difficult for its teachers to engage in productive learning with their colleagues. Research has shown that collaboration is an important factor in sustaining the effort to create a professional learning community and reduce this isolation; and there is evidence of improved student learning in schools with collaborative norms (Lee & Smith, 1996; Little, 1993; Louis et al., 1996; Newmann & Wehlage, 1995; Schmoker, 1999).

Technology integration processes can be advantageous in contributing to the development of a collaborative culture in professional learning community development (Atkinson, 2005; Burns, 2002, Dexter et al., 2002, Riel & Fulton, 2001). Although recent educational research has documented the positive impact of professional learning community dimensions and technology integration, there is a lack of empirical data to determine the relationship between the factors and to understand how schools develop through systemic school change.

Research Questions

The quantitative research questions that guided the first phase of this study included:

1. Is there an overall relationship between collaboration in professional learning communities and the integration of technology in the teaching and learning process?
2. And more specifically, is there a relationship between the collaborative dimensions of professional learning communities and factors for integration of technology for teaching and learning?

The quantitative portion of the study was used to determine the qualitative research questions in the second phase of the study to form a more complete picture of the problem. The following qualitative research questions emerged from the relationships between the dimensions of a professional learning community and factors of technology integration:

1. How does technology integration influence collaboration within professional learning communities?
2. How does collaboration influence technology integration?

The mixed method research question required the blending of data and asked how the qualitative findings explain the statistical results obtained in the quantitative phase.

Design of the Study

For this mixed methods study, multiple data sources were collected and organized. The data included survey instruments, interviews, and grant documentation. Quantitative data sources included pre- and post- survey instruments to gather information from teachers and administrators in participating schools. Interviews were conducted with a smaller purposefully selected sample of teachers and administrators at sites to provide cross-validation of the data and further explanation and deeper understanding. Grant documentation data were also analyzed to help support the primary quantitative and qualitative data sources by enriching the findings.

The sample for the first quantitative phase of the study included 223 teachers and 15 administrators from various school levels across the state. Correlations and intercorrelations, measured with Pearson's r, were examined to determine relationships between the collaborative dimensions of professional learning communities and the factors of technology integration. Quantitative data analysis also provided results to choose a purposefully selected sample for the qualitative portion of the mixed methods study and to guide the content of the interview protocol. The results of the data from four high school sites in the qualitative phase of the study were analyzed. Themes that emerged from the interview participants' experiences and grant documentation data included two shared practices for change: learning and leading.

Summary and Discussion of Results

Quantitative Results and Discussion

In the first quantitative phase of this study, the overall correlation between collaboration in professional learning communities and technology integration for teaching and learning demonstrated a significant, positive correlation (r = .17) with small practical significance. As the school communities focused on the development of collaboration in professional learning communities, there was an increase in the integration of technology. In contrast, as the school communities focused on technology integration, there was a corresponding implementation of collaboration in professional learning community development. The overall relationship between the two variables of the study was positive, but no direction or cause could be established in a correlational analysis. The results of the quantitative phase of this study provided empirical evidence to support findings in other research (Atkinson, 2005; Becker & Riel, 2000, Dexter et al., 2002) that compares the relationship of professional learning community characteristics and technology integration.

For the data set of the change score means from *SPSLC* (Hord et al., 1999) and *TI* (SEDL, 2003) pre-surveys to post-surveys, there were nine statistically significant correlations (See Table 18). These correlations demonstrated the significance of the interactions between two of the professional learning community characteristics: peer feedback and shared leadership with the positive relationships of communicating about technology integration, sharing best practices, data for decision making, and support for technology use. Supportive conditions, such as common planning times and meetings, and collective learning were also significantly correlated to factors of technology

integration. These structures and processes provided opportunities for teachers to observe others' use of technology and to collaboratively communicate about technology integration by sharing best practices. Collective learning has a positive relationship with teachers' use of technology for instructional practices.

Table 18

Correlations between SPSLC Dimensions and TI Factors

Dimensions of *Professional Learning Communities*	Factors of *Technology Integration*
• Peer review and feedback	• Using technology to communicate
	• Data for decision making
	• Sharing best technology practices
	• Support for technology integration
• Supportive conditions	• Using technology to communicate
	• Sharing best technology practices
• Shared leadership	• Sharing best technology practices
	• Support for technology integration
• Collective learning	• Instructional uses of technology

Through an assessment of the intercorrelations between the collaborative dimensions of professional learning community development and factors of technology integration, the dimension of peer review and feedback were correlated with the greatest number of technology integration factors. Four of the nine factors that influenced technology integration were correlated to peer review and included sharing best technology practices, using data for decision making, communicating about technology

integration, and support for incorporating technology. The results of this study provide empirical evidence to support other research. Burns (2002) discovered that long-term professional development, that was focused on a learner-centered and technology integrated approach to teaching, resulted in change in and across classrooms. As teachers began to communicate and collaborate on shared curricular and instructional technology goals and practices, they became more reflective about their practice. This professional development approach shifted reliance from external experts to "in-house expertise" where teachers provided feedback and support to each other (Burns, 2002).

In a study on the relationships of professional learning communities and technology integration, Atkinson (2005) showed that the interactions of peer review and feedback demonstrated an atmosphere of mutual respect, involved teachers in observing others' classrooms, and having inquiry and discourse about strategies in the classrooms. Using the same instruments and quantitative analysis, findings from her study also identified four significant, but different correlations between peer review and feedback and factors of technology integration. The dimension of teachers sharing best technology practices in a collaborative manner with their peers was the only common peer review intercorrelation in this study and Atkinson's research (2005). The correlation between collaborative professional learning community development and technology integration involved teachers in peer review and feedback early in the intervention process. Similar to Atkinson (2005), these findings opposed research that peer review and feedback was the last dimension of professional learning communities to develop (Hord, 2004).

The technology integration factor of sharing practices was correlated with the greatest number of professional learning community dimensions: shared leadership, peer

review and feedback, and supportive conditions. Principals impacted the technology integration and sharing practices by providing time, creating a culture that valued professional development and learning, and building leadership capacity in the community. The results of this study supported research from Atkinson (2005) and Dexter et al. (2002). Modeling, coaching and mentoring around technology integration created a climate in which it was easier to overcome the norms of privacy in the classroom (Dexter et al., 2002).

Supportive conditions for professional learning community development and support for technology integration each correlated with two factors or dimensions, which included the strongest relationships of all intercorrelations. Supportive conditions correlated with communicating, peer review and feedback and shared leadership. Technology leaders provided time, space and conditions for change; in addition to building leadership capacity and creating a culture for relationship development. "Supportive administrators nurture the development of human capacities through promoting social processes within a caring environment" (Atkinson, 2005, p. 123). The results of this study provided empirical evidence to support other research on supportive conditions and technology integration (Atkinson, 2005; Burns, 2002).

Qualitative Results and Discussion

In the second phase of this mixed methods study, qualitative data were analyzed, illustrating complexity and interdependency of relationships of collaborative professional learning communities and technology integration. Leadership and learning emerged as themes from the lived experiences of the participants. The experiences indicated commonalities and overlapping ideas that flowed between the themes.

Leadership. Before receiving the grant and professional development intervention, each high school exemplified characteristics of an isolated, traditional high school. School leadership styles were primarily autocratic with a top-down decision making focus. When evaluated on an adapted leadership matrix (Lambert, 1998) that is illustrated in Table 19, three of the four schools began the year in the low skill/low participation quadrant. Dogwood School had a high degree of participation, but low skill within the team that was the focus of the grant.

Table 19

Leadership Capacity Matrix for Qualitative Sample

	Low Degree of Participation	High Degree of Participation
Low Degree of Skill	• Principal as autocratic manager • One-way flow of information; no shared vision • Little innovation in teaching and learning • Poor student achievement or only short-term improvements on standardized scores Examples: School Apple & Bartlett (pre-intervention); School Cherry (pre- and post-intervention)	• Principal as "laissez faire" manager • No collective responsibility • Undefined roles and responsibilities • Random innovation; some classrooms are excellent while others are poor • Static overall student achievement Examples: School Dogwood (pre- and post- intervention) & Bartlett School (post-intervention)

High Degree of Skill	• Principal & key teachers are purposeful leadership team • Limited use of school-wide data; information flow within designated leadership groups • Efficient designated leaders; others serve in traditional roles • Student achievement is static or shows slight improvement Example: Apple School (post-intervention)	• Principal, teachers and students as skillful leaders • Broad involvement, collaboration, and collective responsibility reflected in actions and roles' • Reflective practice that leads consistently to innovation • High or steadily improving student achievement Ideal: High degree of skills and high participation

Source: Adapted from Lambert (2003).

After the professional development intervention, Apple High School moved from low skill/low participation to the high skill/low participation quadrant. School Bartlett also moved quadrants from the low skill/low participation quadrant to low skill/high participation. The results of this growth were depicted by change mean scores on the survey instruments and qualitative data from interviews and grant documentation. Through collaborative professional learning community development and technology integration, Apple and Bartlett High Schools demonstrated growth in building leadership capacity.

Communication flow and vision in the high schools also illustrated the low skill/low participation quadrant at the beginning of the grant. Information was exchanged in a top-down manner with one-way flow of information from the principal to the staff. The vision was not shared but developed solely by the principal or central office administration and forced upon the school staffs. As the year progressed, Apple High School built a strong team of teacher leaders who bought in to the vision that had been imparted by administration. Information began to flow in both directions within the

designated leadership team, but not among the entire staff. By the end of the year at Bartlett High School, the entire staff was participating moving them to the high degree quadrant for staff participation. Although the leadership skill level was improving, it was still in the low area on the matrix.

In addition to building leadership capacity in their schools, the principal's ability to provide supportive conditions emerged as a key factor in encouraging shared leadership (Huffman & Hipp, 2003). In three of the four high schools, the principals provided supportive conditions to establish commitment and buy-in from their teachers. Providing time and resources were most mentioned from teacher interviews as essential supportive conditions for school change. Principal Cherry saw the value of the supportive structures and processes, but admitted that the "formal" structures were not in place and had not been established as an expectation for the staff. The "formal" structures, such as established meetings and committees, were also not in place at Bartlett High School. However, the principal encouraged informal communication, by supporting a culture that valued collaboration and sharing of best practices. Principal Bartlett also focused on building trusting relationships with all school stakeholders.

Professional learning community results from school leaders using structures for intentional coordination of social interaction among teachers in situations of practice (Halverson, 2003). Halverson (2005) provided a typology for classifying these structures, or artifacts, based on their function: catalytic, compounding and coherence artifacts. Principals used catalytic artifacts, such as receiving the OETT/OK-ACTS grant, to produce initial discourse about professional learning communities in the schools. The grant acted as a catalytic artifact in the schools and created new opportunities for

interaction and obligation with a focus on improving school capacity and preparing for change. In Apple High School, the development of the grant application by the leadership team created opportunities for rich interactions that helped teachers understand the change process. The collaborative writing process of assembling the different parts of the application developed trust and commitment among the team, which assisted in grant implementation.

Leaders use compounding artifacts to focus the professional learning community on problem-solving and to reshape the improvement efforts (Halverson, 2005). The compounding artifact of integrating technology into the teaching and learning process built on the prior efforts of catalytic artifacts by helping to convert trust into authentic, collaborative interactions among the staff. Halverson (2005) emphasized that compounding artifacts are used by leaders to "telescope" into problems where the teachers focused on certain aspects of teaching and learning to allow the details of problems to stand out and be more manageable. As the schools received professional development about learning communities and technology integration, teachers became more aware of the best approaches for their own learning and began to see similarities between their needs and those of their students. They began to shift from traditional instructional strategies to more authentic instructional opportunities to involve the students in their own learning. "Leadership tasks that initially supported opportunities for staff interaction blossomed into communities of practice that addressed chronic problems of practice" (Halverson, 2005, p. 17).

Finally, leaders use coherence artifacts to link disparate initiatives together for developing and reinforcing a shared vision (Halverson, 2005). According to Newmann et

al. (2001), instructional program coherence described how leaders create "interrelated programs for students and staff that are guided by a common framework for curriculum, instruction, assessment and learning climate and that are pursued over a sustained period" (p. 297). In the final quarterly meeting for the schools at the end of the year, teachers and administrators from all twenty-one sites came together to share practices and successes with one another. Each school developed a plan to continue and sustain the work of the grant. As coherence artifacts, these improvement plans compelled principals and teachers to commit to the technology integration instructional framework and to use this framework as a guide to professional development and continued implementation.

At Apple, Bartlett and Dogwood the coherence artifacts enabled the staffs to begin moving to a shared vision. Initially when they received the grant, the teachers indicated that they had "bought in" to the principal's vision of professional learning community development and technology integration. Senge (1990) emphasized that if people don't have their own vision, all they can do is sign up for someone else's. This characterized the staffs early in the change process, illustrating compliance. Through the catalytic artifact of the grant, the compounding artifact of the intervention with a focus on technology integration and the coherence artifacts; the school staffs began to move from compliance of the administrator's vision to commitment of a shared vision. Conversely at Cherry, the central office vision for equipment acquisition lacked the commitment for teacher learning and the importance of professional development. The autocratic leadership style was used and the staff was never involved. The superintendent stated that a teacher's job should only focus on the classroom and not include school level decision making or collaboration.

Learning. As teachers began collaborating about technology integration, their personal vision for learning was redefined. In "learning how to learn" to use technology, the teachers became more cognizant of the best approaches for their own growth and began to see commonalties between their needs as learners and those of their students. They began to offer more authentic instructional opportunities to involve the students in their own learning. The findings of this study support the research of Burns (2002) when she described the power of technology as a catalyst for teachers' reimagining themselves as co-learners with colleagues and students. Similar to the results of this study, she emphasized:

> Though technology was not the main course in our professional development approach, it was the main ingredient, woven throughout most activities. Its power rested not in its instrumentality -- its capacity to deliver information instantly, to solve problems, or to communicate. Rather, the technology served as a vehicle for "learning about learning," a mirror in which teachers could see reflected their best practices for learning and teaching. (Burns, 2002, p. 10)

Teachers in the grant schools reflected on their learning and vision for learning, through the vehicle of technology integration. Time was provided; and opportunities for teachers and students to learn together provided job-embedded professional development where all members became partners in learning. Teachers on the learning team provided support for learning by modeling, coaching and problem solving with their peers about specific practices and lessons. The results of this study support other research (Burns, 2002). In her work at SEDL, findings indicated that the distance between teachers and students -- academic, emotional, and physical -- had diminished as teachers became co-

learners with students. She emphasized that, "Teachers were given time to make mistakes, to focus on process, to explore new options, to get frustrated and angry, to work with colleagues to find a solution, and to reflect on the process of learning and teaching" (Burns, 2002, p.10).

As teachers worked collaboratively to share practices and discuss the integration of technology in their content area, they began to think beyond the boundaries of their individual curricula and initiated the development of interdisciplinary units and lessons. As collaboration increased, teachers were more likely to incorporate practices integrated with other areas of content. Principal Dogwood emphasized that technology integration was a great way to start focused dialogue between teachers in different content areas that resulted in the development of interdisciplinary units and alignment of curriculum across disciplines. Bartlett High School discussed similar changes and a progression to informal teaming with increased staff collaboration and communication. These results confirm the break down of content barriers as exemplified in other research (Burns, 2002).

The technology integration and collaborative culture began to facilitate a renewed concept of student learning in the classroom. For some of the "old-school" teachers, instructional practices were transformed from traditional lecture style to providing problem-based and authentic experiences for students. The teachers' role in the classroom changed from knowledge-giver to knowledge-facilitator. As teachers became more comfortable, not experts, with the use of technology; they were more willing to take risks and offered opportunities for their students. The increased knowledge and new teaching strategies fostered empowerment and reflection for teachers and was mirrored by active experiences that empowered and engaged students in producing their own

learning. These results support the research of Becker and Reil (2000), which focused on constructivist computer use, and Burns (2002) which emphasized the creation of learner-centered environments supported by technology.

Technology became an essential learning tool for research, problem solving and creative expression for students of all ages as access increased within the school communities. Teachers and principals at all school sites agreed that technology integration increased overall student engagement and motivation, and had a positive impact on school attendance and discipline. Students acquired a sense of pride and ownership as they created authentic products and published their work. In regards to student achievement data, an analysis was conducted on the API scores for all grant schools. The schools involved in the study had an 80 percent larger increase in API than the state average increase. These findings confirmed research from a quantitative analysis performed on the 2003-2004 grant schools (Atkinson, 2005).

Relationship of leadership and learning. Within the themes, a generative model occurred between learning and leadership. As teachers were brought together for the common purpose of technology integration, they collectively learned and collaborated, sharing best practices for increased student achievement. In schools where the principals provided supportive conditions, such as structures and processes that were both formal and informal, the school community came together to learn and solve problems. Through these collaborative experiences and collective learning, leadership capacity and shared decision making increased in three of the four schools.

High levels of trust promoted risk-taking, honest communication, and commitment for the shared vision. As this model for generative learning was expanded

to the classroom, teaching practices improved and became student-focused, fostering more involvement in their own learning process. Classrooms were exciting and engaging for learning and collaboration, and a sense of a partnership for learning and leading prevailed throughout the whole school community. The learning impacted the leadership, which impacted classroom practices for improved student achievement.

Composite School Descriptions

Qualitative analysis included categorizing the data by individual respondent and then combining participants from each site to develop a composite description by each school as a whole. The common themes of leadership and learning emerged from all four high schools, but content was disparate among the sites. Composite descriptions describing the meanings of the experiences for the participants in each school indicated either strengths or areas of need.

School Apple. The principal described her staff as very traditional and isolated before the grant, but she had the vision for collaboration and establishing a professional learning community. With this belief, she contacted several key teacher leaders to assist her with the development of the grant application. Through sharing the planning and implementing of the grant, they became excited and committed to the vision and became a valuable asset. Both school level and central office administration were extremely supportive, providing time, additional resources and a culture for reflection and growth. One teacher emphasized, "They value professional development and are providing time for us to learn together" (Interviews, 2006).

Quantitative data indicated an increase in both professional learning community development and technology integration for Apple School, although not a statistically

significant change. The principal credited the success of the grant to the strong teacher leadership team. The original learning team that was a required component of the grant application evolved into the school leadership team. The group of teachers, administrators and stakeholders collaboratively discussed all school issues and were involved in shared decision making and building leadership capacity for change.

School Bartlett Pear. Perhaps we can learn most from Bartlett School. They were identified as the least collaborative staff based on the *SPSLC* (Hord et al., 1999) pre- survey instrument. Qualitative descriptions from staff interviews and grant documentation depicted a very traditional, isolated high school before the intervention. Bartlett did not have the highest means in the variables of the study after the intervention, but they were the only school to show significant change in technology integration ($t = 2.46$, $p = .03$) and professional learning community development ($t = 3.02$, $p = .015$).

The principal of Bartlett High School empowered the teacher leaders on the learning team and provided support for the implementation to be successful. He carefully selected team members who were well-respected and trusted by their colleagues, good teachers, and open to change. As the teacher leaders were training staff on integrating technology into their content area, the principal personally covered classes so that everyone could attend. Although, formal structures and meeting times were not in place, a collaborative culture for change was embraced and informal collaboration became a powerful vehicle for sharing practices and teaching strategies. The learning team served as mentors and provided support for their peers through job-embedded professional development.

School Cherry. The grant application for Cherry High School was developed by the superintendent and central office staff and did not involve the building principal, who was responsible for its implementation. The principal emphasized on several occasions that the district operated in a top-down, autocratic style of leadership and that a primary focus was on grant development projects. Acquisition of equipment was most important, rather than the need for professional development about technology integration. Central office leadership did not demonstrate support for teacher learning and building leadership capacity, and often set up roadblocks to learning during the professional development planning. When Cherry received the grant, it was already involved in seven other initiatives. Teachers echoed the principals concerns in the qualitative interviews and admitted to feeling overwhelmed and confused by the various projects, resulting in a lack of commitment.

The quantitative survey data at Cherry School did not indicate significant growth for the staff in collaborative professional learning community development or technology integration. The mean decreased on the *SPSLC* measurement and slightly increased on the *TI* instrument. Qualitative results mirrored the quantitative findings. The principal voiced the importance of school structures for change, but admitted that he had not established the expectation of meeting and collaborating for his staff and school community. Stakeholder and parental involvement was not encouraged or valued.

School Dogwood. The focus of the grant at Dogwood targeted an interdisciplinary teacher team who had previously focused on collaboration within a smaller learning community initiative. The initial vision and grant application was developed by the school principal in isolation, but was integrated with the focus of

previous work. When notified of the grant award, the teachers embraced the opportunity because it aligned with their prior focus on personalization, relationship building and student involvement. Administration provided supportive conditions, such as a common planning period for the team and time for them to receive professional development and plan lessons collaboratively around technology integration.

Overall, the team at Dogwood School was a traditional group, with one teacher admitting that he was "old-school". Before the grant, he described his classroom as primarily lecture and note-taking in format. Visiting his classroom at the end of the school year illustrated a total transformation in instructional strategies after 33 years of teaching. He described the focus on technology integration as the key component in his change and emphasized that he felt empowered with his new authentic and interdisciplinary practices. He illustrated the authentic experiences metaphorically, "authentic teaching is like throwing bread crumbs out to the students to get them to follow a trail to what you want them to learn" (Field Notes, 2005).

When analyzing the quantitative data for Dogwood, the staff demonstrated a decrease in mean scores in professional learning community development, but did show significant increases in technology integration ($t = 4.16$, $p=.025$). The staff was the only group who had focused on collaboration and formal teaming structures before the intervention and had the highest mean score on the pre- *SPSLC* instrument, indicating that some dimensions of professional learning community had developed before the intervention. Although, several structures and processes were already established, the qualitative data from participant interviews indicated that the technology integration moved the collaboration and collective learning to a much higher level.

Interpretation of Mixed Data

The study results were discussed in detail by grouping the findings to the corresponding quantitative and qualitative findings and emerging themes related to each of the explored dimensions of a professional learning community and factors of technology integration. The mixed methods research question guided the discussion and asked how the qualitative findings explained the statistical results obtained in the quantitative phase. Table 20 showed the comparison and overlap of quantitative intercorrelations and qualitative themes, demonstrating how the qualitative findings explained the initial quantitative results. The qualitative results supported the quantitative results, but also deepened the results as specific descriptions emerged of how the schools changed.

All of the intercorrelations integrated with one of the qualitative themes and for some of the intercorrelations, the overlap of the themes represented dual relationships. Three correlations from the quantitative portion of the study integrated with the shared practice of learning, showing a connection between the quantitative and qualitative data. Teachers learning collectively about instructional uses of technology demonstrated a small significant correlation in the quantitative data and was evidenced in the qualitative theme of learning. Other intercorrelations that were demonstrated in the theme of learning include communicating with technology for instructional use and sharing practices for technology integration. In the qualitative interviews, teachers and principals emphasized the use of e-mail for teachers to share ideas and resources and web pages to increase communication with parents and community.

Table 20

Comparison of Quantitative Intercorrelations and Qualitative Themes

Dimensions of PLC and Factors of TI	Shared leadership	Collective learning	Peer feedback	Support
Instructional uses of technology		.159* (Teacher Learning**)		
Communicating with technology for instruction			.177* (Teacher Learning**)	.174* (Leadership: Supportive Conditions**)
Using data for decision-making for instructional use			.167* (Teacher Learning & Leadership: Shared Decision-making**)	
Shared practices for technology integration	.180* (Teacher Learning & Shared Leadership**)		.166* (Teacher Learning**)	.145* (Teacher Learning & Leadership: Supportive Conditions**)
Support provided for technology	.189* (Shared Leadership & Supportive Conditions**)		.197* (Teacher Learning & Leadership: Supportive Conditions**)	

* Correlation is significant at the corrected 0.05 level (2-tailed)
** Qualitative Theme and Sub-theme

The thematic shared practice of leadership was represented in two of the quantitative intercorrelations. Building the capacity for supportive conditions to enhance communication with technology for instructional use and for shared decision making and

leadership were confirmed with the qualitative data. At Apple High School, teachers emphasized how the traditional school structures had transformed into a collaborative culture that focused on building leadership capacity and shared decision-making due to the supportive conditions provided by the superintendent and principal. They provided time, additional resources, and support for building relationships and collaboration for teachers to communicate and share practices about technology integration.

Four of the intercorrelations from the quantitative phase of this study were corroborated with data from both themes of learning and leadership. Support provided for technology use enhanced peer review and feedback. It demonstrated the importance of leadership in providing supportive conditions for teachers to provide feedback to their colleagues to enhance the learning process. Building supportive capacity also enhanced shared leadership and shared practices for technology integration. Lastly, the relationship of peer review and feedback was correlated to using data for decision-making for instructional use. As the leadership used data to make decisions for improvements in instructional practice, collaboration and learning was enhanced. At Apple High School, the leadership team met on a regular basis and learned collectively through the collaborative interactions. The principal discussed how the leadership team used data collected from classroom visits and a needs assessment to make decisions about professional development needs for integrating technology into instructional practices.

The qualitative findings corroborated the quantitative results and demonstrated that collaboration in professional learning community development and technology integration were mutually influential and supportive. The relationship between the variables was reciprocal. The teachers shared need to learn about technology integration

contributed to the development of collaborative professional learning communities; and as the school cultures became more collaborative, technology became more integrated in to the teaching and learning process. Technology made collaboration simpler and faster with the use of e-mail and web pages, especially in the large schools; and as collaboration and communication spread, more teachers became interested in using technology. This supported the National Research Council (2000) which emphasized that Internet-based communities, e-mail and websites assisted in overcoming teachers' sense of isolation. The significant relationship between the two variables supported and motivated schools to become focused on continuous growth and systemic change for substantive school improvement, which is indicative of a learning organization (Senge, 1990).

Relationship of Current Study to Theoretical Framework

The culture of the schools operating as learning organizations provided opportunities to develop new solutions and continue the reflective and collaborative process toward sustained improvement. The findings of this study supported the theory that an important capability of a learning organization was to create the conditions that generate new knowledge and help it be shared freely where people were continually learning how to learn together (Senge, 1990; Wheatley, 1999). The teachers created new knowledge for technology integration and collaborated within and among classrooms about teaching and learning. This organizational learning with continual renewal increased professional learning community development and school capacity for change (Dufour & Eaker, 1998; Hord, 1997; Huffman & Hipp, 2003; Newmann et al., 2000; Sergiovanni, 1994).

Communities of practice began to develop in several of the schools as the staff collectively took responsibility and learned together about technology integration. According to Wenger et al. (2002), launching a community of practice begins in stages 1 and 2, where "potential" is discovered and "coalescing" of the community occurs. "They typically start as loose networks that hold the potential of becoming more connected and thus a more important part of the organization. As members build connections, they coalesce into a community"(Wenger et al., 2002, p. 68). Three of the four school communities who started as loose, traditional networks began to promote inquiry and discourse for a collaborative school culture, which is descriptive of stage 2 where coalescing of the community occurs (Wenger et al., 2002). Their understanding in technology integration was deepened through interactions and learning together. Through collective learning and sharing practices, teacher leadership also surfaced that built capacity for change in the community and cultivated the community of practice (Wenger, 1998).

Most research on professional learning community development has not investigated its relationship with technology, even though Roschelle et al. (2000) emphasized that a school's capacity to change can increase when technology integration is embedded in an overall reform effort. The quantitative and qualitative findings of this study strengthened the theoretical literature base on the relationship of the two variables. It supported other quantitative (Atkinson, 2005) and qualitative research (Burns, 2002; Dexter et al., 2002). In addition to substantiating these studies, it added to theory with the mixed methods methodology that combined quantitative and qualitative analyses.

In the research of Dexter et al. (2002), investigators explored the relationship of technology and professional community in six case study sites that were selected due to their exemplary use of technology and a common reform vision. One of the themes that emerged in the findings demonstrated an overall relationship between technology and collaboration, but "it was impossible to tease out a simple causal relationship" (Dexter et al., 2002, p.493). Since the cases were selected because of their exemplary technology use, it was also not possible to give a definitive answer to the question of the role of technology in professional communities. The findings of this research study verified the relationship of the two variables and explained how collaboration in professional learning community development and technology integration impacted one another.

Unlike the research of Dexter et al. (2002), the schools in this study were not selected due to exemplary technology use. Grant schools varied a great deal in technology use and professional learning community development. The goal of the professional development intervention was to take the schools from where ever they were and to provide training and support for school improvement. Three of the four high schools demonstrated growth in professional learning community development and technology integration based on the quantitative and qualitative data.

While the relationship between the variables has been established, what role did technology integration play in facilitating school change? Based on the findings of this study when supportive structures were in place, technology integration was advantageous in contributing to the development of collaborative professional learning community development and accelerated the change within the school improvement efforts. Teachers viewed the technology as a constantly changing tool where it was acceptable

and common to not know everything, making it the focus of learning how to learn continuously. This reduced the anxiety that many feel about revealing areas of weakness in teaching strategies or curriculum. One teacher explained that she didn't believe that another initiative would accelerate the change like technology had in her school.

> When I tried to integrate writing and literature into my biology class, the students questioned why we were doing English in science class. With the technology, they recommend its integration to help them understand the concept better. The technology is helping them transfer their knowledge among the content areas and helping them make connections. (Interviews, 2006)

Morrisey (2000) identified the presence of a catalyst and the use of a change facilitator when studying the evolution of a professional learning community. The findings of this study supported this research, where technology was a catalyst for change (Burns, 2002; Morrisey, 2000). Receiving the grant, the professional development intervention, and external expertise of the K20 staff was the change facilitator for the schools. The findings of this mixed methods study confirmed the beliefs of Culp et al. (2003) that technology can catalyze other changes in the content, methods and overall quality of teaching.

A primary attribute of a professional learning community vision is a continuous focus on student learning (Hord, 1997). As teachers in the grant schools learned collectively and felt more comfortable in using technology and trying it in their instructional practices, students became excited about having increased access and authentic, technological experiences in class. Principals and teachers stressed that the technology integration and authentic learning experiences resulted in students being more

engaged, motivated and involved in their own learning. Findings in this research study supported theory on student motivation that emphasized that students' learning experiences were optimized when instruction was authentic, challenging, demanded skills and allowed for student autonomy (Yair, 2000). In reports from the *Improving Chicago's Schools* initiative (Newmann et al., 2001; Smith et al., 2001), researchers provided evidence that organizing instruction around challenging, authentic intellectual work and interactive instructional strategies can increase scores on standardized test scores and the production of more intellectually complex work. Based on an analysis of the API score of the schools in the study, they had an 80 percent greater increase in API than the state average.

Implications for Practice

In a climate of increasing pressure and accountability to improve student achievement in American schools, the need for educational research to identify factors associated with school improvement is crucial. Today's traditional school structures often result in isolation that negatively impacts systemic school change. Building a collaborative culture has been identified as an important factor in the development of professional learning communities (Dufour & Eaker, 1998) and has been linked to improvements in schools (Lee & Smith, 1994; Newmann & Wehlage, 1995; Newmann et al., 2001). Although the potential of collaboration in professional learning community development has been documented, very few schools have established conditions and a culture to support this change (Glickman, 1993; Schmoker, 2002). The model of collaborative professional learning community development is not a cookie cutter approach or an easy step-by-step list of things to do. It is an extremely complex process

that involves systemic reform and change efforts. What may work in one school, may not work in the neighboring school with similar demographics or may work on an entirely different timeline.

The results of this mixed methods study illuminated the understanding by administrators and their school communities of the development of collaborative cultures in professional learning communities. It provided evidence and understanding of how high schools did or did not change and contributed to the theory base for learning, leadership and communities of practice. It also added to the literature base on the role of technology integration in systemic school improvement, specifically focusing on its impact on collaboration. Quantitative results indicated several significant correlations between the collaborative dimensions of professional learning communities and factors of technology integration. Application of these contributions to theory can provide new perspectives that can be investigated further and perhaps become generalizable, offering a model to support systemic school change.

According to Hord (1997), the most logical way to begin developing professional learning community is to bring professionals together to learn. In this study, the schools identified technology integration as its point of focus for improvement. Morrissey (2000) emphasized that the identified focus for improvement can be used as a catalyst for learning, which was indicative of the technology integration focus as demonstrated by the qualitative results of this study. In a professional learning community, learning occurs at the individual, team and whole school levels. Senge (2000) emphasized that in team learning, the focus is to get the people thinking and acting together. The learning team

and teacher training teams in this study demonstrated individual and team learning that promoted whole school change.

Effective professional development training for systemic change should be on-going, job-embedded, and constructivist in design (Bernhardt, 2002; Sparks & Hirsh, 1997). In the high schools of this study, various processes; such as mentoring, sharing best practices about authentic technology integration, and the partnership with the professional development team at the K20 Center; encouraged teacher collaboration in job-embedded professional development opportunities (Wood & McQuarrie, 1999). As teachers collaboratively developed lessons and shared resources in a constructivist manner during the professional development, they were much more involved in the learning and committed to the change process (Fullan & Hargreaves, 1996).

Through the systemic approach to collective learning, there is an emergence of teacher leadership that builds capacity for change for the organization and cultivates the community of practice (Wenger, 1998). The results of the qualitative portion of this mixed methods study indicated the development of communities of practice as the teachers on the learning team assumed leadership roles with their colleagues who were assigned to their group. The varying abilities in technology usage also contributed to this development as teachers worked collaboratively together to teach and learn from each other. Communities of practice were created by the groups who shared common concerns about the integration of technology into the teaching and learning process. As they worked collaboratively together, they deepened their knowledge in the area of concern through interactions and learning together (Wenger et al., 2002).

Several educational researchers (Huffman & Hipp, 2003; Marzano et al., 2005; Sergiovanni, 2001) have indicated the importance of the principal as a leader of educational reform and as being instrumental in providing structures for communities of practice (Wenger et al., 2002). The results of this mixed methods study supported the research and emphasized the magnitude of the principals' roles. In the high school sites, the principal was crucial to the success of the initiative by providing supportive conditions or setting up road-blocks that made learning and implementation extremely difficult. The principal also played a key role in building capacity for learning communities through shared leadership and decision-making processes that established commitment, ownership and responsibility. Newmann and Associates (1996) found that the most effective leaders delegated authority, advanced collaborative decision-making, and refrained from being the central problem solver. As principals at some of the high schools shared leadership with teachers, the opportunity for decision-making and shared responsibility emerged, changing the traditional culture to one that was much more collaborative.

Implications for Preparation Programs

Educational leadership preparation programs should focus on the development of a knowledge base for future leaders in the importance of their role in modeling and supporting technology integration's impact on the development of collaboration in professional learning communities. This study also illustrated that school leaders need to understand and be familiar with the research on professional development and learning; supportive leadership and how to build school leadership capacity; and communities of practice. Additionally, findings from this study showed that university faculty would

benefit from communities of practice and dimensions of professional learning community development with a focus on collective learning to integrate technology into the teaching and learning process of their undergraduate and graduate courses. Professors and students collaborating, sharing knowledge, and learning together will increase the capacity for learning organization development at the collegiate level.

This study added valuable results for preparation programs due to the mixed methods design. This study was an important step forward because its two-phase approach made it easier to understand the complexity of developing collaborative cultures within professional learning communities. The mixed methods design combined quantitative and qualitative approaches to provide meaningful insight into the problem of traditional school isolation by identifying relationships between professional learning community dimensions and technology integration factors and providing a deeper understanding of how schools are developing collaborative cultures in professional learning communities. The mix of quantitative and qualitative data in this study best addressed the problem and answered the research questions, increasing the overall reliability of data gathered (Creswell, 2003).

According to Greene, Caracelli and Graham (1989), there has been an increase of interest in combined methodological approaches since the late 1980's. Because mixed methods research is a relatively new paradigm in educational research, much work and clarification remains to be explained on mixing and integrating procedures, validity strategies, data analysis and designs, and philosophical foundations (Tashakkori & Teddlie, 1998). While many research problems might be suited for mixed methods design, there is also a current need for research training in the appropriate use of mixed

methodology in educational research programs to better inform researchers when designing and implementing a study.

Methodologically, this study added to mixed methods research in education by elaborating procedural issues of the sequential explanatory design and integrating the results of the two sequential phases of the study. It showed how mixed methods research was actually applied to research practice. According to the National Research Council (2002), research claims are stronger and have greater impact when based on a variety of methods. Both quantitative and qualitative approaches have strengths, and an even greater strength can come from their appropriate combination (Gorard & Taylor, 2004), as was exemplified in this study, therefore enriching the research in preparation programs.

Recommendations for Future Research

The results of this study suggested the need to continue to explore various areas of research to develop a deeper understanding of the relationships of data and to determine long-term impact of the grant. All of the grant schools had growth in some component related to technology integration or professional learning community development, but some progressed at a much greater pace than others. Systemic school change and reform is a complex process which typically takes from three to five years (Fullan, 2003). Investigating variables to determine various rates of change and change agents would be beneficial to stakeholders involved in school improvement efforts. A recommendation for additional research would be to continue assessing the schools in future years to determine continued growth and sustainability. With the attrition of staff and/or school

leaders the progress of the initiative could be impacted, and analyzing this process would provide a better understanding of personnel influences.

Supportive conditions for technology integration and professional learning community development were established in this study and illustrated the strongest intercorrelations. Supportive conditions include both structural capacity and the capacity of people building relationships in the community. Research to investigate innovative physical, structural, and social structures to encourage and support a collaborative culture in professional learning community development would be beneficial for school leaders, teachers and students. Peer review and feedback had the most relationships with factors of technology integration in this study and in previous empirical research (Atkinson, 2005) of the grant project. Further investigation of the change processes in this area could add to the contradictory theory that peer review develops earlier in professional learning community development than previously described by the research of Hord (1997).

Research of additional data would provide a deeper understanding of the relationships between the variables. An analysis of the API results for the grant schools was included in this study. The collection of other achievement data would provide validity to the results of this research and determine impacts on the success of the students. Demographic data could possibly impact the research on how collaboration in professional learning communities relates to technology integration. Possible demographic distinctions that may or may not impact the results that could be studied in future research include: the gender of the principal; the size of the school; the location of

the school in rural, suburban or urban areas; and the percentage of poverty or minority representation within the school population.

Several key components were involved in the grants to schools program: acquisition of technology equipment, systemic professional development, building leadership capacity with the establishment of school learning teams, supportive school leaders who had completed the Phase I year-long leadership training, school change, and professional learning community development. The over-arching vision of the grant program was for systemic school improvement that increases student achievement. More research on each of these components would be valuable information for schools. Possible research questions include: Can other change agents, other than technology integration, establish the conditions for substantive school reform? Was the type of professional development a key component of the school changes? How did the administrators create a culture for communities of practice? Was the development of a learning team that provided peer coaches and mentors a key factor in promoting technology integration and collaborative professional learning communities?

Limitations

1. Responses and survey completion were voluntary. Only participating teacher and administrator data could be included in the sample. Those who chose to participate might be viewed as a biased sample of the target population.
2. The sample of the study was purposeful rather than random and only included schools that had received an OETT/OK-ACTS grant during the 2004-2005 school year. Generalizability to other populations is limited due to the uniqueness of the

study within a specific context, making it difficult to replicate exactly in another context (Creswell, 2003).

3. The sample for the study was limited to teachers and administrators. An important component of professional learning communities is stakeholder involvement, but data were not collected for parents, students, community members or other key stakeholders.
4. The schools in the sample for the study range in size from small, rural schools to large, suburban and urban sites. When analyzing school data, the sample size in the small, rural schools may be less than the recommended sample size. In conducting quantitative survey research, Sudman (1976) advocates a minimum of 100 subjects in a major subgroup, using the largest possible sample, and 20 to 50 in a minor subgroup. Dogwood School had a small sample size (n = 5), due to the teaming approach. Instead of including the entire staff, the grant focused on the interdisciplinary group of teachers with the teaming approach. The small sample size would likely cause inconsistencies in the data analysis.
5. There is the potential for bias based on the role of the researcher who served as one of the co-directors of the grant project.
6. There is the potential for different interpretations due to the nature of qualitative research in the second phase of the study.

Summary

This mixed methods study investigated the relationships between collaborative professional learning community development and technology integration in a purposefully selected sample of schools. In the first quantitative phase, correlations and

intercorrelations were computed to determine relationships between the two variables. These results guided the focus of the qualitative research questions, interview protocol and selected sample. Four high schools were investigated further to determine how the schools developed and change. The intervention consisted of professional development that focused on collaboration in professional learning community development and the integration of technology into the teaching and learning process.

The results of the quantitative phase demonstrated a small, positive significant correlation between the variables of the study and nine significant intercorrelations between the collaborative dimensions of professional learning communities and factors of technology integration. The relationships with the greatest number of intercorrelations and highest correlation coefficient included peer review and feedback, supportive conditions, shared practices and shared leadership. The results demonstrated the impact of combining collaborative professional learning communities and technology integration to increase learning and peer interactions within the community and the importance of the administrator in supporting change efforts. Within data analysis for the purposefully selected sample in the qualitative phase of the study, the themes of leadership and learning appeared. The emergence of communities of practice around the common concern of technology integration promoted inquiry and discourse for a collaborative school culture. Through collective learning and sharing practices, teacher leadership surfaced that built capacity for change in the community. The qualitative findings corroborated the quantitative results and demonstrated that collaboration in professional learning community development and technology integration were mutually influential and supportive.

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APPENDICES

APPENDIX A

Appendix A

IDEALS Framework
10 Practices of High Achieving Schools
(O'Hair et al., 2000)



APPENDIX B

Appendix B

OK-ACTS Professional Development Planning
2004-2005

Month	Focus	Proposed Time	Learning Team Training Date	Staff Training Date
August/ September	The Big Picture/Overview/ Professional Learning Community	3 hours	N/A	
September/ October	Authenticity	3 hours	N/A	
November	More Authenticity (Webquests)	3 hours	N/A	
December				
January				
February				
March				
April				
May				

Possible Professional Development Topics:

Shared Leadership
Vision: Core learning principles
Home and community connection
Inquiry and discourse
Equity
Teacher Collaboration
Data-driven decision making
Technology specific training
Lesson Integration
Study group: book study,etc..
Walk-throughs
Cooperative processing,etc..

Discussion Date _____ Decisions by:

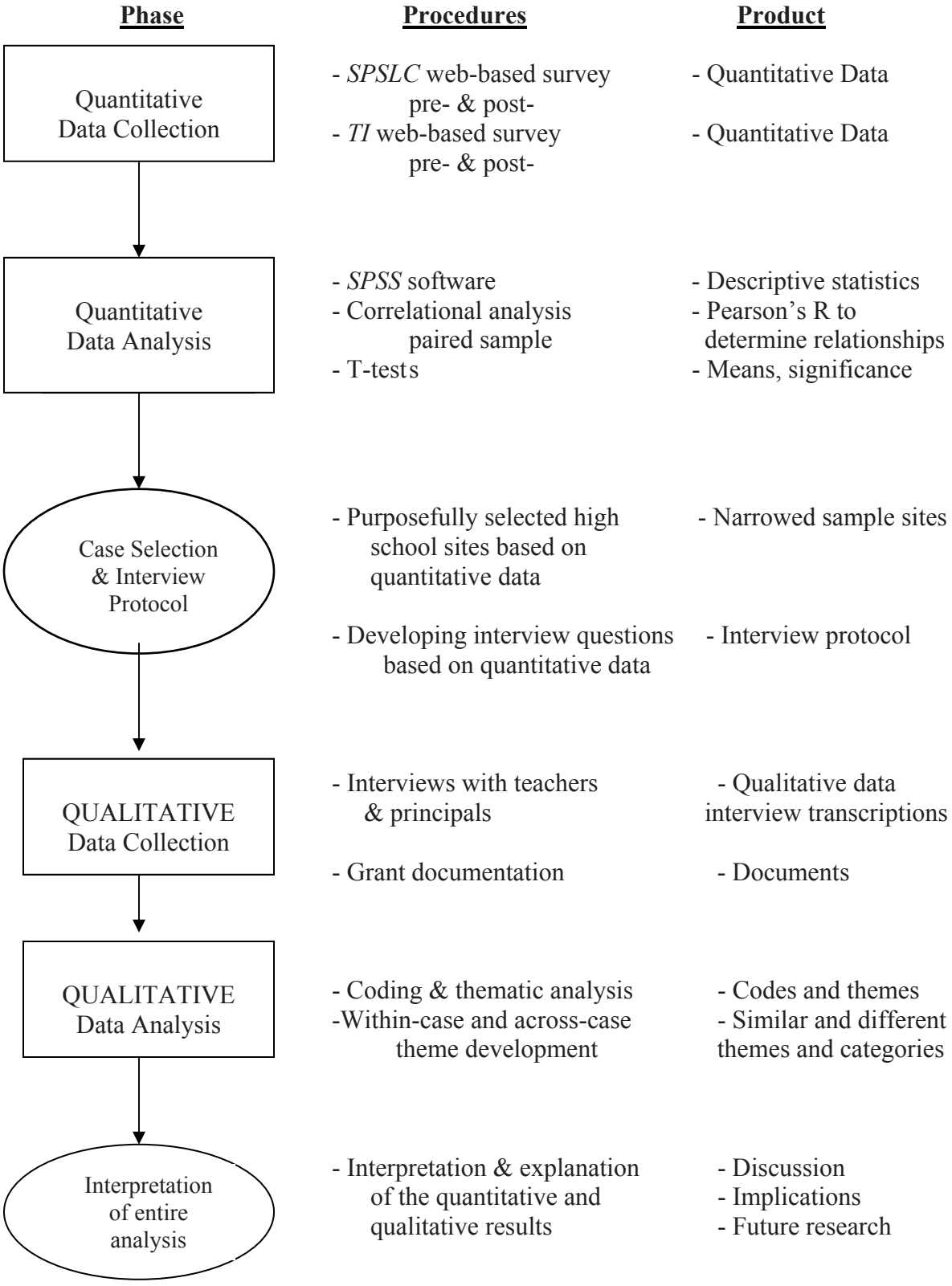
OK-ACTS _____ School _____

OK-ACTS _____ School _____

APPENDIX C

Appendix C

Visual Model for Mixed Methods Sequential Explanatory Design



APPENDIX D

Appendix D

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: _____

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 E

Appendix E

Technology Integration Survey

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. 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**

5. 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**

6. 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**
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**

7. 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**

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**

APPENDIX F

Appendix F

List of Interview Respondents

High School	Interview Respondent	Position	Grant Role	Years at Grant school in Position
Apple	Teacher	History	Member of grant learning team	6 years
	Teacher	English	Not on learning team	2 years
	Teacher	Technology Usage, Web Design, & Yearbook	Member of grant learning team	14 years
	Teacher	Algebra	Not on learning team	1 year
	Principal	Assistant Principal at school: 1 year before principal		8 years
Bartlett Pear	Teacher	Geometry	Member of grant learning team	3 years
	Teacher	Biology	Not on learning team	1 year
	Teacher	English	Member of grant learning team	2 years
	Teacher	History	Not on learning team	16 years
	Principal	Teacher at school: 10 years before principal		8 years
Cherry	Teacher	English	Member of grant learning team	5 years
	Teacher	History	Not on learning team	10 years
	Teacher	Biology	Member of grant learning team	6 years
	Teacher	Algebra	Not on learning team	3 years
	Principal			8 years
Dogwood	Teacher	Algebra	Not on learning team	21 years
	Teacher	English	Not on learning team	10 years
	Teacher	History	Member of grant learning team	6 years
	Principal	Teacher at school: 26 years, assistant principal: 3 years before principal		7 years

APPENDIX G

Appendix G

Interview Protocol

Thank you for agreeing to be interviewed about collaboration and technology integration in your school. The information will be valuable as I research how technology integration and collaboration influence professional learning community development and learning in high schools.

The following questions will be presented to you orally and your oral responses audio taped. Follow-up questions may be asked to probe and/or provide clarification of responses to these questions.

1. Tell me about your background and your experience with the OETT grant.

2. What have you learned about technology integration and how has that impacted your teaching practices?

3. Do you collaborate in your school? If so, what are some examples?

4. What are some things in your school that you think support or hinder collaboration and technology integration?

5. Have collaboration and technology integration impacted your practices in the classroom? Impacted your students? If so, how?

6. Has the grant changed your school in the use of technology integration and collaboration? If so, how?

7. Is there any other information related to collaboration and technology integration that you would like to share?

APPENDIX H

Individual Informed Consent Form for Research

University of Oklahoma, Norman

This survey is part of research being conducted under the auspices of the University of Oklahoma-Norman Campus. This document is intended to provide information so participants can acknowledge informed consent for participation in a research project.

Title: OETT and OK-ACTS: Partnering for Professional Learning Communities (PLC)

Principal investigator: Mary John O'Hair, Ed.D., Center for Educational and Community Renewal

This research is designed to understand perceptions and change processes that are involved within a school community following their one to three-year engagement in practices designed to increase student learning and foster democratic citizenship. Participants agree to complete the Rubric for High Achieving Schools. The Rubric consists of practices linked directly to improved student achievement and involves the participant providing examples of each practice, describing obstacles to each practice, and developing an action plan to overcome obstacles. Practices focus on the following: core learning; authentic teaching and learning; shared leadership and decision-making; teacher collaboration and learning; inquiry and discourse; supportive administrative leadership; caring and collective responsibility for students; connection to home and community; concern for equity; and access to external expertise. Time required to complete the Rubric will vary by school. Most schools connect the Rubric to school and district goals and devote professional development days (approximately 4-8 days per year) to identifying, analyzing, and implementing the Rubric's practices. In addition to completion of the Rubric, selected participants from OK-ACTS Phase II schools and districts agree to surveys, observations, and follow-up interviews (approximately 1-2 hours) based on practices described in the Rubric. Participants will be asked to describe the process involved in developing the practice(s), the obstacles encountered, and how they plan to or have overcome obstacles.

Please read the statements below:

1. My participation in this study is entirely voluntary. Refusal to participate will involve no penalty.
2. I understand I am entitled to no benefits for participation.
3. I may terminate my participation at any time prior to the completion of this study without penalty.
4. Any information I may give during my participation will be used for research purposes only. Responses will not be shared with persons who are not directly involved with this study.
5. All information I give will be kept confidential.
6. I understand that there are no foreseeable risks for participating in this study.

The investigator, Dr. Mary John O'Hair, or other key personnel are available to answer and any questions regarding this research study and may be reached by phone at (405) 325-1267, by e-mail (mjohair@ou.edu), or by contacting the Center for Educational and Community Renewal, 640 Parrington Oval, University of Oklahoma, Norman, OK, 73019. For inquires about rights as a research participant, contact the University of Oklahoma-Norman Campus Institutional Review Board (OU-NC IRB) at 405/325-8110 or irb@ou.edu.

I have read and understand the terms and conditions of this study and I hereby agree to participate in the above-described research study. I understand my participation is voluntary and that I may withdraw at any time without penalty. If selected to be interviewed, I consent to being audio taped.
(Please check: yes___no___)

_____ _____

Signature of Participant Date

_____ _____

Printed Name of Participant Researcher Signature

APPENDIX I

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 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 his 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

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