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A PHENOMENOLOGICAL STUDY OF HOW SECONDARY PRINCIPALS
PERCEIVE THEIR RESPONSIBILITY IN SUSTAINING TECHNOLOGY

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By

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A PHENOMENOLOGICAL STUDY OF HOW SECONDARY PRINCIPALS
PERCEIVE THEIR RESPONSIBILITY IN SUSTAINING TECHNOLOGY

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

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	viii
ABSTRACT.....	ix
CHAPTER	
1. INTRODUCTION	
Problem Statement.....	1
Purpose of the Study.....	2
Significance of the Study.....	5
Research Question.....	8
Organization of the Study.....	8
2. REVIEW OF THE LITERATURE	
Introduction.....	9
Technology: The Nation and the School.....	10
Sustainability of Technological Innovations: Education and Industry.....	22
Role of Secondary Principals and Technological Sustainability.....	29
Technological Sustainability and the Learning Community.....	36
Secondary Principals' Perception of Sustainability and Teachers.....	41
Increased Student Achievement and Technological Sustainability.....	44
Technological Sustainability and Complexity Theory.....	48
Summary.....	51
3. METHODOLOGY AND PROCEDURES	
Introduction.....	52
Participants.....	52
Procedure.....	54
Phenomenological Analysis.....	58
Phenomenology and the Researcher.....	59
4. VIGNETTES	
Introduction.....	62
Table 1 Participation and School Contexts Summarized.....	65
Interview I Principal Brew.....	66
Interview II Principal Dee.....	77

Interview III Principal Nee.....	88
Interview IV Principal Sheen.....	96
Interview V Principal Shay.....	102
Interview VI Principal North.....	112
Interview VII Principal Ali.....	121
Interview VIII Principal Boren.....	130
Interview IX Principal Sky.....	137
Interview X Principal Frater.....	148

5: FINDINGS

Overview of Findings.....	154
Table 2 Literature Review Themes Summarized.....	156
Perceived Accountability.....	157
Value of Financial Assistance.....	159
Transforming Educational Infrastructure.....	162
School Efficiency and Technological Innovations.....	163
Technology Entering the Classroom.....	165
Personal Experiences Shifting Principal Expectations.....	172
Technology and Opportunities.....	173
Successful Staff Development.....	175
Collaborative Practices.....	178
Technology Resources.....	181
Students as Change Agents.....	183
Conclusion.....	184

6. DISCUSSIONS, CONCLUSIONS AND IMPLICATIONS

Discussions, Conclusions and Implications.....	187
Technological Sustainability and Complexity Theory.....	190
Interrelatedness of Societal and Secondary Principals' Expectations.....	190
Interactions between Technology and Schooling.....	191
Ideas Interchanging.....	192
Mutual Actions and Reactions.....	192
Reciprocity between the Student and the School.....	193
Summary of Complexity Theory.....	193
Comparisons, Contributions and Implications.....	195
Perceptions of National and State Expectations.....	195
Leading Toward Post-Industrial Schooling.....	198
Committing to Change.....	200
Evolving Learning Communities.....	202
Students and Technology.....	205
Table 3 Contrasting 'Pac-Man' with Traditional Schooling.....	210
Conclusion.....	211

REFERENCES.....	213
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APPENDIX

A. INFORMED CONSENT FORM.....	225
B. HUMAN SUBJECTS APPROVAL.....	227

LIST OF TABLES

1. Table 1 Participation and School Contexts Summarized.....	65
2. Table 2 Literature Review Themes Summarized.....	156
3. Contrasting ‘Pac-Man’ with Traditional Schooling.....	210

ABSTRACT

A PHENOMENOLOGICAL STUDY OF HOW SECONDARY PRINCIPALS PERCEIVE THEIR RESPONSIBILITY IN SUSTAINING TECHNOLOGY

BY: JESICA ANGELIQUE TURNER

MAJOR PROFESSOR: MARY JOHN O'HAIR

The purpose of this study was to document how ten secondary principals perceived, experienced and defined their responsibility in sustaining technology. Based on interviews of ten secondary principals, with phenomenology as a research method, the study sought descriptions of their self-perceived experiences with sustaining technology. Analysis and reduction of the information resulted in five common themes.

The first theme postulates that the secondary principals believed national and state expectations affected their ability to sustain technology – specifically in the form of NCLB/PASS objectives and grant availability. In the second common theme, secondary principals concurred that technological innovations permitted more time for their schools to pursue core educational missions. Thirdly, secondary principals perceived that their school learning communities were gradually changing – becoming more accepting of new technology. Next, secondary principals agreed that technological sustainability is having a profound impact on the learning community – the role of teachers, principals, and parents had been altered and the learning community had grown beyond a single school. Finally, secondary principals perceived students were affecting the process of education by demanding technology become a permanent fixture in schools. Frequently, it was the level of student participation which often dictated the sustainability of a given technology.

CHAPTER 1

Introduction

In this chapter, the definition, practice and theory of technological sustainability as phenomenon is summarized. The central research question is: How do secondary principals perceive their responsibility in sustaining technology? Successful applications of technology in the classroom will promote equality, excellence, and democracy and will be used to measure aptitude and improvement among individual students as well as demographic models. In a changing age, what role does technology have in Oklahoma schools, and how do secondary principals intend to make the transition - along with teachers, students, and parents - into the tech-driven classroom of tomorrow.

Computers, Smart Boards, broadband Internet access, and other vestiges of modern technology have already made their way into our schools. The challenge is to engage these devices in a meaningful way and to ensure all students have full and equal access to the benefits they provide. Secondary principals must develop plans to help their respective student bodies, staff, and school communities become technologically literate and then to *sustain* this growth into the future as technology and human needs inevitably change.

Secondary principals must understand how to sustain technology in order to graduate students who will increase their intellectual capital and prosper in the future. Some public schools are grossly unequal, and so too will be the future opportunities for their students (McCain & Jukes, 2001).

How soon and how extensively will technology be incorporated into the classroom? What are secondary principals' perceived responsibilities in sustaining

technology in order to increase student involvement and achievement? Are secondary principals barely managing technologies or are they leading technology as a meaningful and transparent component of pedagogy?

Purpose of the Study

The study documents how secondary principals perceive, experience and define their responsibility in sustaining technology. A lack of professional education literature exists concerning secondary principals' perceptions of their responsibility in sustaining technology. Thus, without information, absent is the ability of principals to visualize *how* to achieve technological sustainability.

The United States Department of Education (2003), defines technological sustainability as

...the incorporations of technology resources and technology-based practices into the daily routines, work, and management of schools...Practices include collaborative work and communication, Internet-based research, access to instrumentation, network-based transmission and retrieval of data, and other methods. This definition is not in itself sufficient to describe successful integration: it is important that integration be routine, seamless, and both efficient and effective in supporting school goals and purposes. (p. 75)

Technological sustainability is a phenomenon so complex, that many principals do not satisfactorily address it in a timely fashion and ultimately fail (Romano, 2003). Sustainability is not automatic. As Michael Fullan (2003) states, "I cannot claim that we know exactly how to accomplish sustainability or system transformation, because no one has ever done it before" (p. 33).

Themes of this study are valuable as secondary principals refine and improve their participation in sustaining technology. Guided by the study, future practitioners will successfully sustain technology and, more importantly, sustain a worthwhile education infrastructure for our nation.

Phenomenology as a research design is used to reduce individual textural descriptions of secondary principal's self-perceived experiences with participating in an effort to sustain technology to common themes; thus, resulting in a culminating, clear definition in which every word accurately describes the human experience with the phenomenon. According to the Cambridge Encyclopedia (2000),

Phenomenology...is a descriptive philosophy of experience. Its central method is to describe carefully one's conscious processes, concentrating on subjective experiences and suspending all beliefs and assumptions about 'external' existence and causation. The result is supposed to be a non-empirical, intuitive inquiry into the real essences or meanings that are common to different minds. (p. 851)

Following Moustakas (1994), secondary principals' interview transcripts are examined to identify common themes of principals' experiences with technological sustainability. A structural meaning of the experiences is developed to see the phenomenon from many perspectives. Descriptions are reduced to themes in which the essence of the secondary principal experience is revealed. The findings add to the professional education literature.

Thus, this phenomenological research illustrates some of the changes in perception needed for the full potential of sustainability to be realized. Changes in perception are, for example, that technological sustainability is not an obstacle, but rather

an opportunity to increase student achievement. The conclusion clarifies potentially new and creative ways of understanding one's responsibility in sustaining technology. Now, secondary principals are more likely to realize the consequences of their actions and decisions in relation to technological sustainability.

Secondary principals were asked to describe their responsibilities in refining and improving efforts to sustain technology. The purpose of data collection was to capture secondary principals' perceptions of their responsibility in sustaining technology. Within this study, shared experiences with technological sustainability and the learning community were investigated, and a collective history was created. Secondary principals articulated practices that either advanced or hindered sustainability.

Based on this study, current secondary principals are provided with past experiences with this phenomenon. Thus, principals are more likely to lead their school communities as they now have a shared history of their responsibilities associated with technological sustainability. This is critical as Morrison (2002) states,

A change agent or a leader in a school who neglects the significance of the past (and its contribution to the ethos and culture of the school) risks overlooking a key variable in the successful management of the school...Decisions for the future are informed by decisions made about past experience. (p. 18)

It is accepted that to understand sustainability, secondary principals need examples of experiences with sustainability. Several factors involved with sustainability are described by Carlson (1965),

...the life cycle of educational innovation is...their invention, development, and promotion, adoption, diffusion...along with accounts of the problems encountered

in introducing and maintaining the innovations in specific settings, and the unanticipated consequences growing out of their use. (p. 74)

Unfortunately most secondary principals do not fully understand their role in transformative experiences necessary for sustainability. Without an understanding, mismanagement occurs and hinders success (Fullan, 2003). The study's primary goal is to help secondary principals examine and understand their role and participation in efforts to sustain technology.

Significance of the Study

The secondary principal's ability to plan for technological sustainability is critical in creating a worthwhile education infrastructure. Sustaining technology is associated with increasing student achievement. According to the National School Boards Association (2004)

...400 educators, parents, community members, and business leaders present at the United States Department of Education forum in 1995, the importance of technological sustainability is defined to guide districts and school systems: Learning in the 21st Century requires...a greater dependence on new communication and computing technologies that support new levels of student creativity and research...learners must be able to use technology to achieve new levels of learning and to acquire new information age skills and abilities...new skills required in the information society are: the abilities to quickly adapt to new situations and new technologies and to be able to process vast amounts of information...The only way a school or district will get sustained support for

quality professional development in technology will be when the line administrators and top administrators are active technology users. (p. 1)

What shapes secondary principals' self-description of their overall experiences with participating in an effort to sustain technology? Principals are sustaining technology as their schools are constantly evolving. Their experiences vary greatly from year to year. The literature defines the state of American schooling to be forever in metamorphosis, just as are the needs, resources, and expectations of modern society. Goldenberg (2004) captures the complexity of schools.

The educators moreover, are the ones who daily face the challenge of educating 50 million schoolchildren and contending with the many uncertainties, ambiguities and complexities inherent in their work and exacerbated in this era of unprecedented school reform. And this era *is* unprecedented. (p. xiii)

Endlessly influx, endlessly composed, searching for success, school is the undisputed laboratory experimenting and evolving with society. The vast school experiment is both exhilarating and harrowing. Schools are complex homes to all races, classes, religions and nationalities.

Secondary principals' perceptions and experiences with participating in sustaining technology are subject in terms of these school contexts. To explain this phenomenon is to understand the complex, reciprocal relationship between principal and school. None of us could exist independent of our relationships with each other. Morrison (2002) notes that,

‘Complexity’ derives from the Latin root of the meaning ‘to entwine’; the notion that an organism interacts dynamically with its environment, influencing and, in turn, being influenced by its environment. (p. 5)

The ritual interchange between secondary principals and schools leads to the systematic changes necessary for technological sustainability.

The unpredictable, the free will, the chaotic creates novelty, and novelty is the author of new order. It was unpredictability that made possible The Theory of Relativity, Newton’s Laws of Motion...Correlation and autocatalysis build, but unpredictability is the twist of events that inspires and creates renewal. (Marion, 1999, p. xiii)

Ideas are the genesis of transformation. The transition from ideas to practice to sustainability is complex, intuitive, and involves many uncertainties. Following Fullan’s (2003) suggestions, the study is based upon the premise that,

You cannot get to new horizons without grasping the essence of complexity theory...resist controlling the uncontrollable, and to learn to use key complexity concepts to design and guide more powerful learning systems. You need to tweak and trust the process of change while knowing that it is unpredictable. (p. 21)

Technological sustainability is determined by what principals expect, what they believe is feasible, and what specific values they hold. Leading technological sustainability demands both marked engagement and continuous transformation.

Research Question

The current study was guided by the following research question: How do secondary principals perceive their responsibility in sustaining technology?

Organization

The study is organized in a six chapter format. Chapter one defines and introduces practice and theory concerning the phenomenon of technology sustainability. Chapter two highlights the professional literature as a basis for rationalizing the study's research of sustainability. Chapter three defines the phenomenological methodology used. Chapter four presents secondary principals' interviews as vignettes in which the principals are speaking within their individual school contexts. Chapter five analyzes data revealing emerging themes extending beyond those presented in the literature review. Chapter six culminates in a summary and conclusion of the study's findings, with concern to recommendations and implications.

CHAPTER 2

Literature Review

Accounts of interactions between humans and various emerging technologies over time are compelled within the literature of several disciplines. The integrative literature reveals the economic, historical, political, sociological and psychological realities of technology as it relates to school systems in modern, post-industrial societies.

The saturation of literature describing either the defeat or success of technological sustainability is present. Literature evolving from differing philosophies offers general discussions on the issues of leadership, organizational change, and technophobia as possible explanations as to why schools are not sustaining technology. Respecting the theory of complexity (Morrison, 2002), these probable reasons among others yet to be identified may impact experiences with technological sustainability.

Theoretical perspectives are associated with several disciplines inclusive of business, psychology, and sociology. Perspectives on education, technology, and theories of learning in Australia, Brazil, Denmark, Japan, South Wales, Switzerland, and the United Kingdom are consistent in arriving at shared philosophies. The global educational research base is immense.

One of the particular strengths of the school improvement movement is that it has provided a vehicle for exploring what schools do and identifying ways of improving practice. It is also an international movement, and although there are difficulties in transferring practices from one cultural context to another, there is no doubt that alternative perspectives can be helpful in considering the most

appropriate ways of changing practice in order to improve pupil achievement.

(James & Connolly, 2000, p. 2)

The literature provides secondary principals with global perspectives as guidance toward the stable, technological school.

Within the national literature, societal views are radically varied concerning the value of sustaining technology. Case in point, the Electronic Frontier Foundation claims that “We are in the middle of the most transforming technological event since the capture of fire” (Koch, 1996, p. 2). In contrast, Postman (1992) expresses recriminations regarding the harms inherent in technology or the *Technopoly* of our schools.

Although the literature stresses the importance and success or failure of sustainability, it does not describe how a secondary principal participates in an effort to sustain technology. Michael Fullan (2003), one of the most prolific educational writers contends that research concerning how leaders experienced change is needed. Overall, there is no research creating an historical perspective of collective experiences with technological sustainability as phenomenon.

Technology: The Nation and the School

National expectations and disappointments concerning schools and technological sustainability are defined. Secondary principals’ perceptions with the phenomenon of sustainability are shaped by the national contexts. Thus, the political, societal and economic agendas are provided to better understand the principals’ self-reported, descriptive experiences.

The nation is concerned with the role of public schools and our future. “...It is the public school that this nation has chosen to pursue enlightened ends for all people.

And this is where the battle for the future of America will be won or lost” (Boyer, 1983, p. 6). Our nation’s expectations, hopes, and demands for public schooling are evident in all aspects of our society. Employers, industry, capitalism, and democratic government are dependent on the success of the American public school system. According to the Partnership for 21st Century Skills (2003),

Historically, every generation of Americans, beginning with the Founders, has turned to our public schools to prepare young people for their world. The Founders believed that a free society needed well-educated people who would be active and informed citizens and, thus, sustain the newly established government. (p. 12)

In 2005, as in the beginning of our nation, the populace expects public schools to sustain our national legacy for future generations. Public schools are expected to teach students how to sustain and value self-government. When comparing the general themes of societal expectations of public schools historically and presently, one finds reoccurring expectations (Tyack & Cuban, 1995). Case in point, TheodoreSizer (1996) defines education as

...an idea, not a structure...The idea is that every citizen must have access to the culture and the means of enriching that culture. It arises from the belief that we are all equal as citizens, and that we all thereby have rights and obligations to serve the community as well as ourselves. To meet those obligations, we must use our informed intelligence. Schools for all assure the intelligence of the people, the necessary equipment for a healthy democracy. A wise democracy invests in that equipment. (p. 146)

Thus, the past and present ideas of education resonate. Schools are expected to play a key role in the continuance of our nation's success.

Leaving the Industrial Age and entering the Information Age had a profound impact on our nation and schools. One of the characteristics of the Information Age was the importance it attached to the idea of technology. McCain and Jukes (2001) indicated that "...technology has become the great equalizer, allowing ordinary people to do extraordinary things" (p. 88). The tendency was to regard technology as a necessity for the progression of our nation.

Technological advancements are shifting perceptions of schooling. "The stupendous new access to more knowledge by more people is by itself transforming education" (Breck, 2001, p. 55). Questioning the role of innovations in schools creates a platform for society to re-question the purpose of education.

Public schools *not* meeting the demands of a modern technologically driven society are at risk of collapse (The CEO Forum on Education and Technology, 1999; Partnership for 21st Century Skills, 2003; Pearson & Young, 2002). Schlechty (2001) defines the predicament,

In brief, if public schools in the United States are to continue to play a vital role in the education of our children, educational leaders must learn how to create schools and school systems that are adept at supporting and sustaining innovations while introducing new practices into the system. (p. xi)

Due to national and state pressures, secondary principals have to sustain technology. According to the literature, failure to do so may end public education's central role in our future society. The literature maintains that

...fundamental and pervasive changes are required if we want education to survive, let alone be relevant in the world of the 21st century...If education hopes to meet the challenge of preparing the student of today for the world of tomorrow, it must break out of its current mind-set and move ahead rapidly to embrace the new paradigm of constant and accelerating change. (McCain & Jukes, 2001, p. 75-76)

Successful communities of the twenty-first century require more than ever, an influx of new talent to creatively update current information systems. Given the social context, there is a sense of urgency for schools to more fully implement and sustain technology. In short, innovative citizens are in high demand, and the secondary schools in this country are failing to generate students capable of creating the future (National Science Foundation, 2004).

The literature in its entirety emphasizes innovation, technology and sustainability in relation to increasing student success. Technology as a resource in schools is widely accepted. Based on research, technology

...is the opening to a new and richer culture, one that has instant global reach and enormous flexibility. Given its scale, ultimate low cost and accessibility, it promotes a great deal for democracy. The implications for schools are profound. (Sizer, 1996, p. 28)

The complexity of society and technological skills our graduates need is defined by the North Central Regional Educational Laboratory (2003) as,

A series of components, including the collection of public and private high-speed, interactive, narrow and broadband networks ...the satellite, terrestrial, and

wireless technologies that deliver content to homes, businesses, and other public and private institutions...the information and content that flows over the infrastructure via ...computers, televisions, telephones, radios, and other products that people will employ to access the infrastructure. It is the people who will provide, manage, and generate new information, and those that will help others do the same...the visions are a nationwide, invisible, seamless, dynamic web of transmission mechanisms, information appliances, content and people. (p. 1)

The meaning of the word “technology” is as diffuse as its implications are broad. One significant function of technology, particularly in the realm of education, is that it allows an increasingly efficient transference of raw information.

A chalkboard in the 1890’s permitted a teacher to effectively relate knowledge in a small classroom. An overhead projector allowed a professor in the 1950’s to share notes in a full lecture hall and to maintain the transparencies for future lectures. A Video Cassette Recorder in the 1980’s was a cheap and compelling way to show pre-packaged educational materials to students nationwide, quickly and consistently.

To be clear, the current state of computer science is, alone, not the issue. The power of technology to enhance the broad-based sharing of information will, over time, only become faster, easier, and cheaper. In the past, a computer lab was enough for schools. Too often, scratching that surface reveals no real understanding of relevant technology and certainly not how to sustain it in classrooms.

Alan November (1990) notes the pitfall of using technology to repeat what has been the traditional teaching style for decades.

...many institutions – including education – adopt new technologies to automate,

or mimic the behavior and practice that existed before the technology was introduced. Therefore, the worker's role, and the work itself, have not really changed. Only the tools have. Much of our early educational software, for example, was really direct textbook automation – we called it computer-assisted-instruction...Teachers still instruct in the same manner as before the technological innovation, delivering a content-based curriculum. (p. 1)

If education avoids “automating information” (November, 1990), the World Wide Web could provide immediate access to ever more sophisticated stores of information – delivered affordably and conveniently to schools and homes around the world. A computer linked to the World Wide Web provides a student near-instant, individual access to a multitude of specific information. According to the Columbia Encyclopedia (2000),

The World Wide Web (WWW) or (W_3) is a collection of globally distributed text and multimedia documents and files and other network services linked in such a way as to create an immense electronic library from which information can be retrieved quickly by intuitive searches. The Web represents the application of Hypertext technology and a graphical interface to the Internet to retrieve information that is contained in specifically formatted documents that may reside in the same computer or be distributed across many computers around the world. (p. 3111)

The accessibility, speed, selectivity, presentation, compatibility, and affordability of information are all enhanced as the mechanisms of technology improve. The fusion of technology into public schools is, to many, an obvious and necessary aspiration.

According to the University Corporation for Advance Internet Development in partnership with the Indiana University Knowledge Base (2005),

Internet2 and its members are developing and testing new technologies, such as IPv6, multicasting and quality of service (QoS) that will enable revolutionary Internet applications. However, these applications require performance not possible on today's Internet. More than a faster Web or email, these new technologies will enable completely new applications such as digital libraries, virtual laboratories, distance-independent learning and tele-immersion. A primary goal of Internet2 is to ensure the transfer of new network technology and applications to the broader education and networking communities. (p.1)

Many national authorities advise the government that only the technologically literate will succeed in the future.

According to Federal Reserve Board Chairman Alan Greenspan, there will be an evolving demand for 21st century technological skills in our economy '...workers in our economy must be equipped with the ability to create, analyze and transform information and to interact effectively with others...' (Partnership for 21st Century Skills, 2003)

Clearly, in the legislature, there is an extra emphasis to foster technological literacy. The *No Child Left Behind* (NCLB) law "Enhancing Education Through Technology Act of 2001, Part D, Sections 2401-2402" (United States Department of Education, 2001), includes a goal that by eighth grade all students will be technologically literate and repeatedly pledges the government's support in providing assistance to achieve this goal. The level of emphasis placed on educational technology in the

legislation reflects a growing consensus of national concern regarding the importance of technological literacy.

In Oklahoma, State Superintendent Sandy Garrett's (2004) concern for technology is reflected in aligning the state's Priority Academic Student Skills (PASS) objectives with NCLB. She remarked,

Without state-level funding for technology, the grade specificity of the Instructional *PASS* Objectives were removed under the last adoption of *PASS*.

With the new requirement under *No Child Left Behind* that all students be technologically competent by the eighth grade, all districts receiving federal funding for technology have been instructed to direct their efforts to insure that all their students meet, at a minimum, the Intermediate Technology Skill-levels by the time their students complete the eighth grade. (p. 9)

According to the literature, secondary principals are barely managing technology in order to meet government mandates such as NCLB. Romano (2003) states,

There is ample evidence that the leaders in education lack a full grasp of technology's capacity to make teaching and learning more effective.

Consequently, their potential impact on promoting the use of technology is not fully realized. (p. 33)

Research concerning the culture of secondary principals and their perceived experiences of participating in an effort to sustain technology is needed to assist in understanding how to meet future and current legislation such as NCLB.

In congruence with legislation, national and state entities are providing funds for secondary principals to sustain technology and meet government mandates. On the national level,

Total taxpayer investment in K-12 education in the United States for the 2003-2004 school year is estimated at \$501.3 billion...Federal funding for federal K-12 programs will increase \$9.3 billion under the president's proposed budget for fiscal year (FY) 2005...The president's (FY) 2005 budget would provide \$38.7 billion" (United States Department of Education, 2004).

At the state level, the Oklahoma-Achievement through Collaboration and Technology Support Program (OK-ACTS) is

...a project of the K20 Center for Educational and Community Renewal at the University of Oklahoma. Its mission is to develop leadership for school change with technology as a tool. OK-ACTS Phase I project is supported through a grant from the Bill and Melinda Gates Foundation for \$1.2 million for three years with matching funds from the Oklahoma Educational Technology Trust (OETT), Authentic Teaching Alliance (ATA), and the University of Oklahoma to train 800 head principals and superintendents in the state of Oklahoma.

OK-ACTS Phase II project is supported through a grant from OETT in cooperation with the K20 Center for \$5.25 million over a three year period. It funds technology equipment and professional development for Oklahoma public schools implementing practices of high achieving schools to improve student achievement" (K20 Center for Educational and Community Renewal, 2005)

As stated the government is funding public schools to implement and sustain technology. The federal government and state legislatures place technology at the forefront of conversations concerning education funding. Tax dollars and private resources are prioritized for technology to be sustained.

The potential exists for public schools to be the main resource for American's to learn and interact with evolving technologies. Sustaining relevant and contemporary technology in schools, however, has proven difficult. A full and successful embrace of technology by the schools could be a singular opportunity for the educational establishment to be redefined – less sluggish and bureaucratic, more proficient, streamlined, and cutting-edge.

Although there are some who dismiss technology as overrated or ponderous, there are far more who see the potential, if not the inevitability, of high-tech classrooms. For example, Seal (2003) describes

...High Tech High, a charter school in the San Diego Unified School District where...assignments illustrate the heady potential for technology to fire up kid's desire to learn...These assignments illustrate the tremendous transformation of teaching and learning taking place today at the intersection of 21st century technology and modern educational theory. (p. 25)

At High Tech High, the promise of technology is reality. The students are receiving an education considered worthwhile in this modern era. They are experiencing Breck's (2001) definition of technology's gift.

No more children will be born into a world where the full scope of human ideas is accessible only to the elite. Open to all children will be the grand tour of what is

known, as it radiates into their hands. The privilege of knowledge has ended, and that is digital technology's greatest gift. (p. 102)

However, within the literature, High Tech High is not the typical high school. It is applauded and used as an example; a distant role model of what thousands of high schools should be doing. The reality is that, for most schools, the promises of technology are intriguing, but yet to be fully realized. In an attempt to fulfill these possibilities, school districts and educators constantly reevaluate the roles of education and technology.

The definition of what it means to be educated in the Information Age now includes being technologically literate. Technological literacy is considered a necessity in advancing our nation. "...In our complex society, brute literacy and numeracy will no longer suffice" (Sizer, 1996, p. 35). Schools are under significant pressure to produce graduates that are comfortable with the modern technologies in the American workplace. Failure to produce students with at least a core set of these skills renders graduates (and schools themselves) less productive, less employable, and less relevant.

Graduates who are technologically illiterate will find it more and more difficult to participate in our democracy, economy and education.

"...in the early part of the 21st century, it is likely that we view those who are media illiterate, informationally illiterate, or technologically illiterate the same way we view people now who cannot read or write the printed word" (McCain & Jukes, 2001, p. 89).

Technological proficiency is a requirement for high school graduates who wish to pursue higher education, become employed, or gain access to government institutions.

Advocates for educational change direct their initiatives toward leaders of our nation's public schools, principals. Principals are perceived correctly by the public to play a vital role in advancing the cause and agenda of education. If indeed technology has the power to increase student skill, principals are in a position to fully capitalize upon this opportunity. However, there are plenty of indicators within the literature that too many are not using technology to maximum advantage (McCain & Jukes, 2001; Schlechty, 2001).

The necessity for technological sustainability is widely accepted. Many secondary principals want to sustain technology and yet their ambition is too often met only by complaint and frustration. Thus, the challenge does not rely only in embracing technology, but in sustaining technology. Secondary principals are trying to create a permanency for technology in schools. However, the struggle continues. As Romano (2003) states,

After more than a half century of trial and error, it has been acknowledged at the highest level that there is still no common, coherent vision of how technology is to be used in the classroom; there are essentially only unrealized expectations. (p. 22)

Only when principals understand technology, are they able to lead goal setting for sustaining technology.

The politics of technology implementation presents secondary principals with new challenges. Principals are at the forefront of the nation's educational agenda and therefore evaluate the costs and merits of emerging technologies and their appropriateness in the school setting. Certainly, parents, employers, technology

companies, teachers, and students all have varying opinions on which technologies are best for use in schools. Secondary principals' abilities in sustaining technology are deemed critical in fulfilling democratic promises to our nation. Any perceived failure to utilize and properly sustain technology systems, paid for by taxpayers, only bolster the negative stereotypes of school systems as inefficient, economically ill-supervised bureaucracies (McCain & Jukes, 2001; Schlechty, 2001; Sizer, 1996).

Sustainability of Technological Innovations: Education and Industry

Within the education literature, there is constant reference of antiquated schools as still attempting to serve the needs of an industrial era that no longer exists. Schools emphasize timeliness, the ability to follow directions, and conformity. These industrial skills are most useful for graduates working in production-line factory work. In this era, these industrial skills are no longer relevant. Instead, schools are encouraged to focus on technological skills. The importance of graduating technologically literate individuals is of particular interest to employers. The connection between industrial age vs. post-industrial schooling and employers' interest in education leads to a review of the business literature.

The business literature is saturated with research ranking individual companies that either successfully or unsuccessfully sustained technology. Truly, the experience of one organization or leader does not define collective success or failure. Thus, the literature lacks history of the collective experiences with the phenomenon of technological sustainability. What are leaders' expectations and experiences with this phenomenon and how does the phenomenon affect leaders?

Technologies are rapidly changing both school and industry expectations. Lévy (2001) defines the parallel as,

American education employed technological change as the nation changed.

If the growth of the automobile, which characterizes the twentieth century, corresponds primarily to a desire for individual power, the growth of technology corresponds to a desire for reciprocal communication and collective intelligence.

(p. 104)

For schools, graduating technologically literate students is important on several levels, both politically and professionally. One reason secondary principals want students to be technologically literate is to be capable of advancing our nation's economy (Thornburg, 1992). By comparison, industrial leaders seek graduates proficient in technological skills required to keep our nation competitive with the world. These skills are increasingly desired to maintain a productivity edge.

Both education and industry express an inadequate understanding of how to lead toward sustainability. Among several definitions concerning sustainability it is found that word usage in both education and business are consistent. Examples of usage are: collaboration, integration, routines, management skills and communication skills.

Concerning the business literature,

...companies are under pressure to adapt to a fast changing environment, all have been trying to respond to change, and are less than happy with their results thus far. Their lack of success is provoking internal tensions, and executives are asking themselves, 'What should we do next?' ...Many companies have a long

shopping list of initiatives they wish to be implemented. (Erhorn & Stark, 1994, p. 4)

In most companies, as in schools, leaders struggle with sustainability. Instead of understanding the phenomenon of sustainability, most leaders are only able to rely on specific case studies and inventories of initiatives. These initiatives do not lead to an understanding of how technological sustainability affects and is affected by leaders.

Interestingly, both business and education share the same dilemma of antiquated, obsolete organizations hindering rather than facilitating technological progress. Organizations constructed in the industrial age, have, for the most part, remained the same for decades. Futurists McCain and Jukes (2001) note that "...there will be more discomfort and struggle if they persist in trying to make an Industrial Age paradigm work in the Information Age" (p. 31).

In the education literature, Linda Darling-Hammond (1997), who served as executive director of the National Commission on Teaching and America's Future (1994-2001) and a Faculty Sponsor at Stanford (Stanford Educational Leadership Institute, 2004), explains the problem.

Like manufacturing industries, schools were developed as specialized organizations run by carefully prescribed procedures engineered to yield standard products...The rote learning that satisfied these early twentieth-century objectives still predominates in today's schools...Students move along a conveyer belt from one teacher to the next, grade to grade...In urban areas, such factory-model schools are likely to be huge warehouses... (p. 16-17)

Darling-Hammond (1997) continues,

The application of scientific management to U.S. schools followed the rush of excitement about the efficiencies of Henry Ford's assembly line methods. Schools were expected to be the most efficient means to produce a product whose uniformity and quality could be programmed by carefully specified procedures...Although today's schools are less regimented than this, they carry the marks of their industrial origins. (p. 39-40)

This problem is equivalent in the business literature as well. David Nadler and Michael Tushman (1997), both professors at Columbia University's School of Business, address the concerns of antiquated industries.

In 1918 Henry Ford's new Dearborn assembly plant stood proudly as one of the architectural marvels of the industrial age. Incorporating the latest assembly-line technology, it...was the envy of the industrialized world; but time passed...new technologies emerged, and these factories ...became an anachronism requiring massive overhaul. And yet, incredibly, the fundamental concepts of organizational architecture that found their physical expression in the hundreds of decaying plants that litter the Rust Belt live on. Those early-twentieth-century notions of steep hierarchies, powerful centralized bureaucracies, and narrowly defined jobs have proved more durable than the physical structures they spawned. They are truly anachronisms today in a competitive environment light-years removed from Henry Ford's Detroit. (p. 7)

As reflected in the literature, failure to sustain innovations is due in part, to the massive problem of antiquated, inefficient leadership styles continuing to plague our schools and businesses. According to Marion (1999),

Old networks, with all their commitments and interdependencies, have to be dismantled before new technologies or ideas or movements or cultures can take hold, and that is no trivial task. (p. 310)

In continuance with the general review of the literature, there are commonalities in the supply of long, prescriptive lists of ways a leader must lead. These lists allocate broad leadership advice for the leader. The majority of literature does not focus on “how” leaders use, modify or abandon these lists while attempting to sustain technology. Rather, the focus of the literature contains statements asserting “this is the way you need to lead.”

The literature offers goals and lists. These goals and lists are detailed and in-depth - devoting chapters to each objective related to the overall goal. Credible objectives are offered by several well-recognized, established societies, networks, and educational institutions. For example, the reputable International Society for Technology in Education (ISTE, 2004) has six standards and performance indicators for secondary principals:

- I. Leadership and vision
- II. Learning and teaching
- III. Productivity and professional practice
- IV. Support, management and operations
- V. Assessment and evaluation
- VI. Social, legal and ethical issues

To add this list to the principals’ toolkit is easy. However, how do secondary principals define these objectives? What is the secondary principals’ interpretation of the

objectives? Are they deemed viable? How do they perceive these objectives in relation to their responsibility in an effort to sustain technology? The literature review does not focus on answers to these questions. Once the collective experiences are described, future revisions to standards and performance indicators may be modified and expanded.

Furthermore, the literature provides themes leading to broad managerial skills that have little to do with experiencing sustainability of innovations. Within the vast majority of the literature, leaders are given step-by-step guidelines to follow. For example, in the *School Administrator's Factomatic*, the same themes of teamwork, delegating responsibility, plans of action, and good communication skills are listed as successful leadership traits (Shockley, Tocha & Tracey, 1992). These leadership themes are just as relevant to a floor manager at a paper factory. Some texts not only give advice on good communication skills, they go as far as providing sample letters and speeches. These letters and speeches are so general that the only requirement of the principal is to insert the appropriate names.

Furthermore, literature suggests similar ways a leader should run a successful company/school. For example, it is frequently suggested that leaders “be open to new ideas, focus on the future, listen to employees, have a vision and, create a good public image” Although all of these leadership skills are valuable and should be employed, how and why leaders do or do not employ them is still in question.

The business literature is resplendent with specific, detailed accounts of individual company or manager's ineffectiveness in sustaining innovations (Craig & Stark, 1994; Peters & Waterman, 1982). The majority of literature provides a history of the rise and demise of famous companies. “Mother” companies such as General Motors,

AT&T, Corning, IBM, and Xerox are used as common examples (Collins, 2001). The business literature suggests lessons learned by the survival or collapse of individual companies will help leaders understand technological sustainability as a valid component of a business model.

Again, focusing on one company's or an individual's success does not explain collective, shared experiences. In *The Edge of Organization*, Marion (1999) illustrates the limitations of concentrating on one entity for the sake of explaining the complex connected experiences within our society. For example, Marion (1999) describes the connections within the culture of industry,

Automobile producers are not viable without the support of oil refineries, gasoline outlets, repair shops, highway construction firms, and traffic control agencies...None of these industries supply or consume the product of the automotive industry (except in limited ways, such as purchasing parts), yet automotives is intimately dependent upon them. (p. 123)

The way each of these industries are interconnected relay how important an entire culture rather than individual parts must be researched in order to understand the phenomenon.

In the education literature, Boyer (1983) also conveyed how education is connected with the larger society,

High schools do not carry on their work in isolation. They are connected to...higher education, industry and business, state and federal governments that provide support, and, above all, to the communities that surround them. In the end, the quality of American high schools will be shaped in large measure by the quality of these connections... (p. 251)

It was reiterated that research must focus on the collective culture in order to understand a phenomenon.

Marion (1999) notes that, more often than not, culture has the tendency to focus on one famous innovator and not consider the culture they live in,

Individuals (such as Newton, Einstein, Martin Luther King, and Henry Ford) may be credited with the emergence of new order, but their achievements are possible only within the context of the correlated, autocatalytic dynamics of a system of actors. An individual may be the symbol of change; he or she may even be the catalysis about which change dynamics collapse. The individual within a chaotic system, however, is influenced and delimited by the correlation with the whole.

(p. xiv)

A person is considered part of a complex culture of leaders and followers.

Without this realization, one will never capture the phenomenon of technological sustainability in its entirety. This review reconfirms that the lens of complexity theory (Morrison, 2002) is appropriate in this study to explain technological sustainability.

Furthermore, the dearth of education and business literature concerning the phenomenon of technological sustainability further defines the importance of this study. Conclusively, full descriptions of the collective culture's experience with the phenomenon of technological sustainability are not addressed. This gap in the research provides future researchers an opportunity to study this complex phenomenon.

Role of Secondary Principals and Technological Sustainability

Secondary principals are positioned to be the means of change for so many children on so vast a scale. In less than a single generation – just ten years, on average -

they create the foundation for the future (Thornburg, 1992). Finally, it is the millions of children born between the Industrial Age and Information Age who will sustain a remarkable and irrevocable pace of change, such that the world has never witnessed before. Even still, it is a pace that promises to only quicken as we move into the future.

Children are at the epicenter of the information revolution, ground zero of the digital world...Children have the chance to reinvent communications, cultures, and community. To address the problems of the new world in new ways...Children both represent and quite literally embody our, or at least our societies' future. (Sefton-Green, 1998, p. 1)

Secondary principals are a direct link between children, the education they receive, and the future society in which they will live. With each passing year, technology is increasingly a part of the formula of progress. The future culture of technology is becoming an implacable, self-fulfilling prophecy. "At the beginning of the twenty-first century, we appear to be living in times of unprecedented change, and schools must change rapidly in response" (James & Connolly, 2000, p. 2-3).

Secondary principals are working in shifting environments where they are charged with sustaining technology. Sustainability is associated with steadiness, permanence and inevitable changes (Bothamley, 1993; Bullock, Trombley & Lawrie, 1999). Irony remains in the fact that sustainability presupposes change. As technology marches forward, so too must the operations that make technology relevant and accessible. Collins (2001) writes,

Sustainable transformations follow a predictable pattern of buildup and breakthrough. Like pushing on a giant, heavy flywheel, it takes a lot of effort to

get this thing moving at all, but with persistent pushing in a consistent direction over a long period of time, the flywheel builds momentum, eventually hitting a point of breakthrough. (p. 186)

Technological sustainability is a study of actions and reactions. Experiencing, perceiving and defining technological sustainability as phenomenon has several dimensions. “We cannot base our decisions just on what exists; rather, as we have discussed, what exists today can only be fully understood when seen as part of a continuum that stretches in the future” (McCain & Jukes, 2001, p. 77). The study of secondary principals’ self-reported experiences with participating in an effort to sustain technology has a direct impact on technology’s role in both the present and the future.

Technology alters the role of school leadership. Dreams of secondary principals are more apt to become realities. While it is true that technology can not solve all problems principals face, it does remove or reduce formidable obstacles. Papert (1993) notes that,

Early designers of experiments in progressive education lacked the tools that would allow them to create new methods in a reliable and systematic fashion...Leonardo da Vinci failed inventing the airplane, not because his assumptions were wrong, but because he lacked the technology the Wright brothers had to succeed. (p. 14-15)

Schools fueled by modern technologies are creating opportunities for principals, not previously thought possible.

Present day technologies require secondary principals to learn and change practices with remarkable speed (Barone & Hagner, 2001). A principal’s level of

technological literacy is directly correlated with the ability to recognize sustainability.

“The administrator and teacher understanding of the potential of technology are associated with technology integration” (Zhou, Nicholson, Corbitt & Fong, 2003, p. 2-5).

Their ability to learn just in time allows them to stay in touch with technological sustainability. Schrum and Berenfeld (1997) address areas requiring school leader expertise.

Effective leaders for the next century will be required to understand and effectively use computer mediated communication, including accessing information no matter where it resides or in what form, and understanding the implication of social, educational, and personal interaction that occurs electronically. (p. viii)

Leadership and sustainability work closely together as sound leadership is required for sustainability to occur. Secondary principals are working with several change components on their trek toward technological sustainability. Technological sustainability is multifaceted and requires principals to

...take into account simultaneous changes in administrative procedures, curricula, time and space constraints, school-community relations, and a range of their social and logistical factors. (Hartel, Means & Roberts, 2003, p. 81)

By focusing on all components, secondary principals are creating a culture of technological scholarship within their organizations. Secondary principal's expertise of technology and learning communities creates technological sustainability. Papert (1993) suggests

...to anyone who wishes to influence, or simply understand, the development of educational computing is that it is not about one product after another...Its essence is the growth of a culture, and it can be influenced constructively only through understanding and fostering trends in this culture. (p. 161)

Sustaining technology requires that the community continues to learn.

Meanwhile that same technology provides efficient devices used to accumulate knowledge and facilitate learning. “The process of scholarly investigation never ends...with all of our supposed wisdom, we are only learning how to learn” (Boyer & Hechinger, 1981, p. 36). Exploring new educational frontiers is vital in advancing experiences with technology. Adaptive confidence is a result of increased experience. Experiences lead to experimental inventiveness required for technological sustainability.

Secondary principals’ use of technology leads to communities in realizing the potential impact of technological sustainability. Thus, they are creating learning opportunities for themselves and their communities. This is critical as Dalin (1978) reflects, “It has always been understood that educational change is dependent on the competency of the people involved” (p. 31). Expertise expands in both a gradual and spontaneous way.

Technological sustainability is a product of knowledge development among educators.

Employees have a responsibility for their own learning and also for the learning of others. They must understand how their responsibilities relate to the goals of the organization as a whole. Employees are expected to teach, as well as to learn

from, their coworkers. The entire workplace culture is geared to organizational learning. (Marquardt, 1996, p. 70)

Learning leads to a comparison of modern and traditional perceptions of technology in schools. Traditional practices are disrupted creating spaces for adopting new practices. Technological sustainability inevitably is a product of collective insights and new practices found within flexible learning communities. A flexible learning community is one which allows for inquiry and reflection and which develops a means for sustainability.

Principal expertise becomes a force for advancing technological literacy. Secondary principals gain a perception of their schools as proactive in the ability to use new technological skills. They discover opportunities for expertise to be developed, and provide an example to coworkers and students alike. Thus, the community participation in the school effort to sustain technology is positive. Collins (2001) correlates “A culture of discipline is not just about action. It is about getting disciplined *people* who engage in disciplined *thought* and who *then* take disciplined action” (p. 142).

Leadership expertise then eventually expands throughout the school, the district, and so forth. Thus, education creates a learning community without limits, extending into the future. The learning communities realize that “...Intellectual capital is useless, unless it moves” (Marquardt, 1996, p. 7). The means of shaping and transferring knowledge becomes a pursuit unto itself - establishing a permanent presence and fostering sustainability. As the collective cultures’ knowledge increases, so does the chance of sustainability.

Sustainability of technology requires secondary principals to foster quality collaborative environments.

In order for sustainability to occur, administrators need to help educators realize their role in the success or failure of sustainability. Both policymakers and local practitioners have equal responsibility...The goal is to create new policies, strategies and mechanisms that enable people to enlarge their own worlds in order to provide greater ideas and place the meaning of their work in a much larger perspective. When people do this they have a chance of changing the very context that historically constrains them. (Fullan, 2003, p. 27)

It is deemed important that secondary principals redistribute power so that all individuals have the opportunity to lead. Effective principals do not focus on a few demonstrative personalities, but rather the totality of the school community.

Collaboration provides educators with shared purpose and individual commitment to goals such as school-wide sustainability. With leadership, learning communities integrate goals in a coordinated effort. In accordance with a study of schools in South Wales, it is found that

A key factor in raising expectations had been convincing all of those involved that improvements could be made, and that each and every member of the staff had a contribution to make and would be held accountable. (James & Connolly, 2000, p. 94)

Values secondary principals learn in community settings allow them to strive for a commitment to the common good. In order to understand the level of sustainability, secondary principals seek to understand group dynamics within their school.

Technological Sustainability and the Learning Community

How does technological sustainability affect the learning community? How does it change teaching and learning? What conditions need to be in place to sustain technology in every classroom? In a search for answers, secondary principals are asked to give self-reported perceptions of their learning communities' role in sustaining technology.

According to the literature, making a significant change in the communities' role in the success of technological sustainability requires a coordinated effort of all who belong to that community. It is not enough to only have a percentage of teachers realize the potential of technology. As Collins (2001) states,

People are not your most important asset. The *right* people are. Whether someone is the 'right person' has more to do with character traits and innate capabilities than with specific knowledge, background, or skills. (p. 64)

All involved have to see technology as they see desks, chalkboards, and pencils – part of the natural environment (Papert, 1993). No one teacher or student should be charged with justifying the use of investment in technology. Rather, vigorous community discussion will determine its value and role (Tyack & Cuban, 1995).

Sustaining technology requires secondary principals to address the learning communities' experiences with technology. How does the learning community react to the expectation to sustain technology? How do their reactions and experiences change? The answers to these questions are revealed and were recorded in this study as participating secondary principals provided an open forum to listen.

Within these principal's schools, some individuals are still while others are in motion. Intellectuals are collectively questioning, discovering, learning and inventing. Informal exchanges and reciprocal relationships create the school's society. Increased exchanges, actions, and learning emerge as the pace of technological change quickens.

Nothing is permanent, flux and change creates energy to seek others to comprehend the uncertainties of the future. Similarly, collaboration between theory and practice enables schools to logically move toward sustainability.

Complex adaptive systems possess a capability for self-organization which enables them to develop, extend, replace, adapt, reconstruct or change their inter structure (or *modus operandi*) so that they can respond to, and influence, their environment. A school that is responsive to its environment may reorganize its activities. (Morrison, 2002, p. 14)

By developing, encouraging and supporting a collaborative culture, secondary principals provide a foundation for technological sustainability. Sustainability chances are enhanced in an educational community which integrates the technology at hand with problem solving, decision making and curriculum discussions. Collaboration between students and faculty, skillfully managed over time, keeps the issue of sustainability alive. Moreover, it is that same collaboration – when integrated with technology – that is essentially the *definition* of sustainability.

Historically, philosophers support the notion that people are prone to collaborate for the better of the whole community. Following

The social contract theory...developed by Jean Jacques Rousseau, John Locke, and Thomas Hobbes maintains that individuals make a conscious and deliberate

decision to surrender their individual freedom to the laws that govern a collective whole in the hopes of obtaining a more orderly and profitable (in the philosophical sense) existence. (Westbrook, 1998, p. 47)

However, within the educational literature, it is found that educators have a historical tendency to remain isolated. Under the traditional structure of schools, classrooms are separate entities – reduced to a detached subset of the larger school body.

...teachers retained a fair degree of autonomy once the classroom door was closed; they could, if they chose, comply only symbolically or fitfully or not at all with the mandates for change pressed on them by platoons of outside reformers. Or teachers could respond reforms by hybridizing them, blending the old and the new by selecting those parts that made their job more efficient or satisfying. (Tyack & Cuban, 1995, p. 9)

Sustainability can not proliferate in a non-collaborative environment. Schools conventionally have been adapted for competition and individualism rather than cooperation and interdependence. Successful sustainability is not comprised of individual classroom successes. True sustainability depends upon on the cooperation and collaboration of all individuals who comprise the learning community: “The school is to be viewed as a network of interdependent people, each of whom bears special responsibility for students’ learning” (Houston, 1988, p. 125). The learning community has to acquire, analyze, and interpret information from all individuals.

Through collaboration, individuals gain a more complex view of their role in the larger community. The study of collaboration convincingly demonstrates that intelligence shared is fundamental in achieving sustainability. Lévy (2001) notes,

Indeed, the mobilizing ideal of information technology is... collective intelligence; namely the enhancement, optimal use, and fusion of skill, imagination, and intellectual energy, regardless of their qualitative diversity. This ideal collective intelligence obviously involves the sharing of memory, imagination and experience through the widespread exchange of knowledge... (p. 47)

In sharing knowledge, educators build intellectual connections between technology and pedagogy. These environments thrive "...because of the widespread belief that decisions which incorporate multiple perspectives will be better than decisions made by a single person or from a single perspective" (Hergert, 1997, p. 12). In an open forum, educators monitor group success/failure and internally restructure their group to be more efficient. Fullan (2003) stresses the importance that for sustainability to succeed, community commitment is critical.

Secondary principals as partners in these communities have a clear sense of the level of sustainability. As secondary principals are comfortable with technology, they are more likely to encourage the entire learning community to lead.

When we enter the fundamental state of leadership, we change. We become a source of variation, a jolt of uncertainty in the system. Once that happens, emergent organizing begins. When uncertainty goes up, people create new patterns of relationship. Control systems and status structures melt away.

Leadership shifts from person to person as needed. No one is leading the process in the traditional sense, yet it leads to striking new outcomes. (Quinn, 2004, p. 82)

Social skills educators gain together are the premise for their future actions that either help or hinder sustainability. One of the most important features of cooperation is the sense of commitment and responsibility that each individual feels towards the group (Johnson & Johnson, 1991). Therefore, collaboration practiced in schools lends itself to both the positive futures of each individual as well as the group. Collaboration allows the staff to take a critical look at their strengths and weaknesses, thus leading the way to modify practices.

Faculty members, through effective communication, become trusted peers that are more likely to participate in problem solving effectively (Wood & Caldwell, 1981). Educators solve problems when they publicly speak about technological experiences. Thus, experiences become ongoing conversations. In fact, sustainability can not evolve without informed discourse and inquiry in the entire community (O'Hair, McLaughlin & Reitzug, 2000). As Lambert (1998) remarks,

...principals and teachers alike serve as reflective, inquiring practitioners who can sustain real dialogue and can seek outside feedback to assist with self-analysis. These learning processes require finely honed skills in communication, group process facilitation, inquiry, conflict mediation, and dialogue. Further, these skills are generally not the focus of many professional preparation programs and must be refined on the job. (p. 24)

Educators have to practice technical dialogue within their community. A group of teachers that struggle to overcome a software glitch, or who can laugh together when a freshman prodigy solves a networking SNAFU, are ultimately learning to use technology even if they can not yet fully contribute as individuals. This practical skill of discussing

experiences as a group creates a coherent understanding of sustainability. The invisible barriers erected by embarrassment and ego quickly crumble under the weight of shared experiences. “Language provides the connecting tissue that binds society together, allowing us to express feelings and ideas and powerfully influence the attitudes of others.” (Boyer, 1983, p. 85)

A faculty and student body that is at ease with each other as they interface with new and unfamiliar technologies is indeed a lofty goal. Collaboration is most useful when it creates an atmosphere of knowledge-sharing among peers facing a similar dilemma. The unknown is oftentimes intimidating. Collaboration spreads intimidation more thinly across a group and enables an unencumbered flow of ideas, meanwhile allowing a neophyte to observe and benefit from the group discussion without fully interacting. It can not be overemphasized that collaboration is crucial in supporting technological sustainability. In the end, communities choose activities that either sustain or abandon technological sustainability.

Secondary Principals’ Perception of Sustainability and Teachers

As technology is transforming lives in workplaces and homes, schools no longer have a choice as whether or not technology will be sustained, but rather *how* it will be used in regards to teaching and learning. Consistent use of technology is indicated by daily classroom practice. Teachers have great impact on the use, misuse or abandonment of technology. “It will be the teachers who determine the success or failure of a technology plan. They are the people who connect technology with curricular practice in a way that will enhance student achievement” (Whitehead, Jensen & Boschee, 2003, p. 85). Teachers are the human enablers of technological sustainability.

The most important work of school is carried out in the classroom. Focusing on classroom practices provide secondary principals with an indicator of the level of sustainability achieved (Heide & Henderson, 2001). Teachers have to be knowledgeable, talented, and motivated to use technology in their classrooms. Sustainability depends on these positive, deeply embedded practices.

As teachers become involved with technology on a daily basis, their profession is enhanced and their appreciation of technological possibilities increases. The professional traits of technologically skilled teachers are evident in their ability to experiment and constantly change practices. These teachers are inspirational leaders in their schools and assist in technological sustainability and the modernization of their schools.

When teachers adopt technology in their everyday teaching practices, the cycle of learning became equivalent with the cycle of improvement (Barone & Hagner, 2001). Therefore, a teacher's desire to learn about technology creates a permanency for technology in the classroom. This permanency is synonymous with sustainability. Consistency in using technology as a resource in the classroom creates long-term effects.

Sustainability requires teachers to change traditional beliefs concerning technology and pedagogy. Entrenched technology allows all students to have access to all manner of scholastic information. A teacher who blocks the free flow of information is still clinging to traditional beliefs. These teachers do not consider that "...we should make all knowledge available so as not to impose our own prejudiced views on the next generation" (Papert, 1993, p. 190). Students' access to technology should be neither student-controlled at home nor teacher-controlled at school. Furthermore, for technology

to be used effectively in the classroom there invariably has to be a two-way flow of knowledge.

The Internet need not solely offer the relatively passive experience of observation as the world comes into the classroom. Reversing the flow of information, the computer network can provide the platform to opening the classroom to the world. (Partee, 2002, p. 24)

In part, the sustainability of technology is driven by the students. However, “Until teachers become fluent online learners alongside their students, schools run the risk of becoming increasingly irrelevant to students growing up in the Internet Age” (Hird, 1999, p. 12). When technology supercedes the boundaries of closed minds, crucial combinations between authentic pedagogy and technology are more likely.

According to the United States Department of Education (2000), technological sustainability could promote traditional or authentic pedagogy. “Authentic pedagogy refers to *teaching* students and *assessing* student progress in ways that are connected to the real world – that is, that are authentic (O’Hair, McLaughlin, & Reitzug, 2000, p. 325). Teachers could use technology to inspire students or use it solely as an electronic encyclopedia. The use of technology without an authentic agenda is not empty of education, but it does not serve the purpose of sustaining technology to promote authentic pedagogy.

Teachers have to have a meaningful, long-term affirmation of the authentic role technology plays in their classrooms. Teachers set worthwhile examples as they use technology to create authentic experiences. They are internalizing the beliefs that create

exemplary classrooms. Clearly, teachers are a vital link between technology and sustainability.

Increased Student Achievement and Technological Sustainability

Superintendents, principals and teachers' major concern for our nation's children is the driving force behind trying to understand technological sustainability (Breck, 2001). Boyer (1983) remarks,

To be prepared to live in our interdependent, interconnected, complex world, students must be well informed. They also must have the ability to bring together information from ideas across the disciplines, organize their thoughts, reach conclusions, and, in the end, use knowledge wisely. To expect less is to underestimate the capacity of students and diminish the significance of education. (p. 117)

Students need to be able to connect what they are learning in school with the complex society they live in. Students with access to authentic learning via technology are more prepared for the future.

A causal relationship between technological sustainability and increased student achievement is provided in the literature review to encourage secondary principals to accomplish sustainability (Heide & Henderson, 2001; Whitehead, Jensen & Boschee, 2003). According to the United States Department of Education (2003), the delivery of authentic instruction using technology as a component changes the school climate and improves education. Students with daily access to the Internet outperform peers in technologically ill-equipped districts in the following areas: mapping ideas across the curriculum, exploring new subjects, gathering information and resources, solving real

dilemmas, discovering and implementing solutions, identifying propaganda, and determining the validity of ideas.

Technology allows students to access the most current information and relate this knowledge to their everyday life experiences. “Using the new technologies, students will be able to access learning material 24 hours a day, 365 days a year. This will have a major impact on learning because it can be primarily driven by need and/or interest” (McCain & Jukes, 2001, p. 80). However, if technology is not sustained, students will only have access to the most current information for a short period of time.

Graduates need to possess a mature political view, an understanding of the history of democracy, diversity and freedom. They have to realize the importance of their voice in preserving our society. Boyer and Hechinger (1981) remark that

A new generation of Americans must be educated for life in an increasingly complex world. The quest for new knowledge must be intensified...students of all ages must be prepared to participate more effectively in our social institutions. (p. 55)

Within society, the evolving philosophies of racism, diversity, and class values are critically reexamined with the aid of technology.

Students will benefit from the combined wisdom and experience of many people while they learn new skills and concepts. The new technologies will also create a real-world relevance to the learning process. Students will be presented with different and sometimes opposing views as they research their topics. Learning how to draw their own conclusions from a variety of perspectives in such

situations will undoubtedly become an essential life skill. (McCain & Jukes, 2001, p. 82)

Students are able to consider applications and implications of policies and propaganda as they occur in real time. With technology, exploring the foundation and progress of democracy is now an authentic reality in the classroom. This is not to say that without technology, democracy can not be explored. However, with the consistent availability of technology, students are able to effectively influence global societies with fewer limitations.

Technology enables the gathering and distributing of information at a speed necessary to influence global society. Technology provides an authentic educational media for students to participate in the increasingly complex societal issues. Ideas proffered by demagogues regarding civics, gender equality, education, and alternatives to societal flux are disseminated by millions of students. Democracies rely on the premise that power should lie in the hands of the masses.

Students invent or reinvent contributions within this multidirectional communication sphere. “The students constantly challenged by complex tasks will allow them to start forming knowledge that supersedes all subject areas and answer questions that are rooted in several disciplines” (LeBaron & Collier, 2001, p. 4).

Les Lloyd (2000) in *Teaching with Technology* observes that

...the Web is full of information of various dependability, students learn to consider different aspects of Internet information and also to analyze and synthesize sources of information, and construct their own thoughts. Student motivation to do work is increased. (p. 28-29)

Skills students need to practice in order to affect public policy are the abilities to communicate effectively, interpret information and rationally defend personal decisions. These connections are made throughout a student's life. Responsible, informed decision-making is perhaps the most important life-skill. Therefore, access to technology can not be disconnected from learning.

As stated in the research, there is a positive correlation with authentic uses of technology and increased student achievement. The use of technology for investigating complex and interdisciplinary endeavors is an authentic experience. However, if technology in schools is no more than a word processing class, it is not an authentic application of technology. According to Papert (1983), technology should never be a separate class.

Physically separating technology from the classroom separates it as a tool to use for all subjects in the student's mind. "Inappropriate use of technology makes the technology the focus of the activity, not the knowledge, skills or sensitivities that should be the focus of the learner's attention" (Forsyth, 2001, p. 20). Furthermore, if access to technology is not sustained, it will not be used as a tool. For example, what if schools did not sustain writing utensils? First, it would seem ridiculous and then it would seem difficult for students to learn as they once used "the pencil" (Papert, 1993).

Overall, within the literature, it is found that authentic uses of technology increase student achievement. Technology is seen as a vehicle to promote authentic teaching and learning. Commonalities between the authentic uses of technologies and democratic schooling are: academic freedom, authentic exploration, discovery, and liberation.

Technological Sustainability and Complexity Theory

Complexity theory leads to the study's focus on all of the possible influences that shape the secondary principal's experience with participating in an effort to sustain technology. All experiences influence or are influenced by a myriad of relationships (Marion, 1999). Thus, the study explains technological sustainability as phenomenon from the secondary principals' self-reported experiences in context. The theory is defined by the Encyclopedia of Management (2000) as:

While complexity theory is strikingly similar to chaos theory, complexity theorists maintain that chaos by itself does not account for the coherence of self-organizing complex systems. Rather, complex systems reside at the edge of chaos-the actors or components of a system are never locked into a particular position or role within the system, but they never fall completely out of control... A complex system is defined as one in which many independent agents interact with each other in multiple (sometimes infinite) ways. This variety of actors also allows for the spontaneous self-organization that sometimes takes place in a system. This self-organization occurs without anyone being in charge or planning the organization; rather it is more a result of organisms/agents constantly adapting to each other. The complex systems are also adaptive... (p. 107)

Morrison (2002) continues to explain how complexity theory may be employed in the study of interactions and experiences between leaders, schools, societies and technologies,

In some senses the *ancien régime* of chaos theory has given way to the study of complexity as 'life at the edge of chaos.' It is an attempt to explain how open

systems operate, as seen through holistic spectacles. In complexity theory a system can be described as a collection of interactive parts which, together, function as a whole. (p. 7)

By understanding complexity theory, secondary principals living with unpredictability make better choices concerning the future and progress of sustainability. In turn, their collective choices create novel advancements in how secondary principals view instability as a means to sustainability. According to Fullan (2003),

We know that we cannot ‘control’ complexity, but by understanding better how it works and by using the social attractors we can exploit its enormous natural power. In the course of doing this, guided complexity theory at its best generates, unleashes and puts to great use the energies, passion and commitment of people heaven bent to making a difference and getting more meaning and satisfaction from their daily lives. (p. 106)

These experiences with technological sustainability are highly complex within, and are inter-related with organizations and society. The study of technological sustainability requires the perspectives of the secondary principals’ whole experiences rather than isolated tasks involving technology.

Secondary principals encourage, support and engage individuals in seeing change as a positive force in achieving sustainability. Novelty emerges in complex school systems where connections are made between actors (Fullan, 2003; Marion, 1999; Morrison, 2002). The complex school experiment of this era is unprecedented. Tremendous human forces with immense potential push through ordinary moments without pause.

Constantly changing, searching for success, schools are the undisputed laboratory experimenting and evolving with society (Goldenberg, 2004). Schools are complex homes to great concentrations of intellectual wealth, representative of all races, classes, religions and nationalities (Groat, 1995; Lee & Poynton, 2000). Schools are comprehensive entities that are worthy of Morrison's (2002) characterization of systems.

Systems, however defined, are complex, unstable, emergent, adaptive, and dynamical and – significantly – changing...Complex adaptive systems are constantly modifying and rearranging...they display perpetual novelty. (p. 12)

Modern day technologies allow schools to constantly change, communicate in real time, in multiple perspectives and with limitless geographic barriers creating a futuristic intensity of events.

As researchers emphasize, successful school leaders make relationships between their self and the realities of complexity (Fullan, 2003; Lebaron & Collier, 2001; Morrison, 2002). The realizations of interrelated actions leading to sustainability are to be recognized and promoted. Following complexity theory, a perspective is set for past, contemporary and future leaders.

Successful secondary principals' ongoing courage to live with complexity distinguishes them from other leaders. Taking risks, letting go of preconceived ideas, allows them to set free the tremendous power of collective intellect in their schools. Secondary principals accept the premise that a developing mind with easier access to great knowledge from diverse sources creates a better citizen, innovator, provider, communicator, and intellectual (Allison, 2002).

Summary

If education is a triumph over the unknown, then technology is a worthwhile device toward that end. That is, effective technology creates a bridge between what is known and what is unknown and enables efficient passage for the multitudes on that journey. Just as the needs of society become increasingly sophisticated, so does the technology utilized to address those needs. One could argue that the converse is also valid – that advancing technologies symbiotically perpetuate an ever more sophisticated society. Either way, the mission of education has to encompass not only the mastery of immutable concepts of science and technology but also the ability to engage in the processes of change. Technology is both the process and the result. Sustainability of technology in our schools becomes sustainability of technology in our lives.

Importantly, the principal characteristic of the knowledge revolution is that it allows us to dramatically extend the human mind by introducing a new model of learning...A reality in which the human mind, excluding religion and acts of nature, is now more clearly the most powerful force on the planet. (Jones, 1997, p. xx)

CHAPTER 3

Methodology and Procedures

Introduction

Following Moustakas' (1994) *Phenomenological Research Methods*, the study described self-reported collective experiences of secondary principals with technological sustainability. The goal of data collection was to gather information forming an understanding of the phenomenon. The study contributed to the educational leadership professional knowledge base as there were no phenomenological studies concerning how secondary principals perceived their responsibilities in sustaining technology.

Interviews were the primary source of data. Following phenomenology, all individual interviews were transcribed and compared in seeking shared personal experiences with leading technological sustainability. The interviews highlighted the secondary principals' intentions, perceptions, and behaviors in relation to their responsibilities in sustaining technology. As Rubin and Rubin (1995) explained, "...qualitative interviews are a tool of research, an intentional way of learning about people's feelings, thoughts, and experiences" (p.2). Field notes and observations were secondary sources of information.

Participants

Research began with identifying potential participants to be interviewed. A purposive sample was chosen. The study used "A nonrandom sample because prior knowledge suggests those selected...have the needed information" (Fraenkel & Wallen, 1996, p. 587). The main criteria set for the sample was that all secondary principals participating were experienced in efforts to sustain technology.

The participant selection consisted of ten Oklahoma public school secondary principals. These administrators were chosen by the directors of the OK-ACTS program administered through the K20 Center for Education and Community Renewal at the University of Oklahoma. The directors have worked with over 900 Oklahoma principals and superintendents on technology leadership issues. They are experts and highly qualified to recommend participants. The directors chose five participants that were more successfully leading sustainability efforts and five that represented the average administrators' efforts to lead sustainability. The intent of the directors was to ensure a representative cross section of urban, suburban and rural populations – and varying levels of experience with sustaining technology.

Each of the five leaders' schools were matched contextually (i.e. rural, urban and suburban) with the average administrators' schools. They intentionally did not share participant level of expertise with the researcher to ensure the researcher would not analyze transcripts with a bias. After data analysis was completed, the directors shared participant status and a second round of analysis was completed. All of the secondary principals were affiliated with the OK-ACTS Program. To be considered an affiliate of OK-ACTS, one had to be a head superintendent or principal of a school in the state of Oklahoma. Secondary principals were provided professional development support from peer learning coaches and OK-ACTS staff.

Advanced principal participants were chosen based on the level of participation and leadership in multiple initiatives of the K20 Center for Educational and Community Renewal (K20 Center). Each of the advanced principals were recommended by the K20 project directors because the principal had shown exceptional leadership qualities through

the Oklahoma Achievement through Collaboration and Technology Support (OK-ACTS) Phase I leadership development by serving as a cluster coach, serving as a principal of an Oklahoma Educational Technology Trust (OETT)/OK-ACTS Phase II grant district or school, or serving as a regional network coach offering collaborative support for school leaders in their area of the state.

Through OK-ACTS leadership program, secondary principals shared membership in a state-wide network of over 900 principals and superintendents with focus on improving student learning with technology. Ten OK-ACTS secondary principals were chosen from the population of over 900 principals and superintendents for the sample. Five of the ten secondary principals were 2003-2004 OK-ACTS grant recipients with each school receiving \$79,000 from the Oklahoma Educational Technology Trust for equipment and school-wide professional development.

This study allowed time for secondary principals to reflect upon their leadership practices. Reflection allowed for principals to examine their own perceived responsibilities in sustaining technology. Cunningham and Billingsly (2003) provided an historical perspective on the importance of a leader to reflect,

...the ancient Greeks had two principles on which they based their entire educational endeavor. The first was ‘Know thyself’ and the second was ‘Become what you are.’ (p. 23)

Procedure

Once permission and recommendations were granted by OK-ACTS and the University of Oklahoma’s Internal Review Board (IRB) (see Appendix A), secondary principals were contacted. In order to report on the principals’ perception of their

responsibilities in sustaining technology, the researcher sent an e-mail to each of the participants to set up an interview date and time. Only three of the ten responded via e-mail. The researcher contacted the other seven participants via telephone.

Participants ranged in age, gender, and ethnicity. Geographically, participants' schools were representative of the entire state. Participants' schools ranged from rural, suburban and urban. Schools were representative of both lower socioeconomic and upper socioeconomic populations. School populations were a mixture of Caucasian, African American or predominantly Native American.

The analyses of transcripts lead to structural meanings of the phenomenon of sustaining technology. Field notes and observations were secondary sources of data. The researcher always showed up one hour before the scheduled interview to collect her thoughts and to review the questions as to commit them to memory as to create more of a fluid interview. The most important reason for arriving one hour early was to observe and take field notes concerning the description of the school. The amount of technology that was in the main office was noted. The number of secretaries, student aids and personnel were noted, and it varied greatly in each of the schools visited. Technology being used in the main office and the principal's office was also noted. The amount and type of technology varied, some schools had several land-line phones, others cell phones, some had desktop computers, other laptops, some had monitors, and others did not.

Some principals were more comfortable talking when giving the researcher a tour of their school. As these conversations were not taped, the researcher immediately took notes in her car after the tour of the school. The write up of the field notes and

observations were important as secondary principals gave tours of their schools after the taped interviews.

Secondary principals were interviewed separately by the same researcher. The researcher was a Caucasian, female graduate student, age 31, attending the University of Oklahoma and a full time teacher in a public high school. The researcher was familiar with the phenomenon of technological sustainability as a result of a three year Fellowship with the National Science Foundation, and through practice as a teacher of eight years - teaching advanced technology programming, psychology and Spanish at the secondary level.

It was intended that each principal be interviewed for approximately one hour in length. However, the length of the interviews varied from one to four hours. The school principals were interviewed one time and member checks were used as follow up questions to clarify the secondary principals' spoken words. The interviews were semi-structured, holding open-ended questions. The questions were asked of each respondent in the same order. However, depending upon the conversation, some were deleted. In fact, during four of the ten interviews, the principals were only asked the first question.

Member checks (Maxwell, 1996) were used by the researcher. The member checks were useful as the researcher was not clear about: the definition of a technology given by one male principal, what another principal thought was the most powerful technology in her school, the linear progression of events reported by another principal and confusion concerning the perceived comfort level of the teachers at another principal's school. Member checks answered the researcher's questions and clarified the principals' reports. Direct quotes, field notes and observations of the secondary leaders

were used to arrive at the general themes of the study. All ten interviews were transcribed by hand by the researcher. The end result was 488 pages of transcribed interviews.

The first draft of questions was derived from the literature review. A critical review of the questions to be used were solicited by the researcher from a panel of experts consisting of the director and three co-directors of the OK-ACTS program administered through the K20 Center for Education and Community Renewal. The co-directors all earned Doctorates in Educational Administration, Curriculum and Supervision. Furthermore, the co-directors' vitas listed service in the following professions: public school teachers, elementary principals and K-12 curriculum directors.

Meetings were held with the researcher and expert panel to explore, scrutinize, and improve questions. Questions were rewritten several times until full consensus of the expert panel and researcher was met. The expert panel improved the validation of questions and thus the study's credibility. The interviews were semi-structured including the following open-ended questions. The questions were derived from the literature review and were clustered accordingly.

Role of Secondary Principals and Technological Sustainability

1. What are examples of effective technology use in your school that you would share with other principals?
2. What changes have you seen because of technology in your school? What other changes do you hope to see?

Technological Sustainability and Complexity Theory

3. Who helps you sustain technology? How?

Secondary Principals' Perception of Sustainability and Teachers

4. What support is available to teachers using technology in your school? How do you encourage teacher use of technology?

Sustainability of Technological Innovations: Education and Industry

5. If you had the time and money, what changes would you support to enhance successful uses of technology in your school?

Increased Student Achievement and Technological Sustainability

6. In what ways do you see technology improving teaching and learning in your school that would be difficult or impossible to do without the technology?

Technological Sustainability and the Learning Community

7. What opportunities do you offer teachers to collaborate about technology?

8. How do you stay informed about technology advances and uses in your school?

9. Is there anything I did not ask you that you would like to talk about?

Phenomenological Analysis

Following Moustakas' (1994) *Phenomenological Research Methods*, the research protocol was as follows. Interviews were transcribed by the researcher. From the individual transcripts, each statement was considered with respect to the significance for the description of the experiences with technological sustainability. Each experience with technological sustainability was listed. At this point, all significant statements referring to the phenomenon were deemed equal, "horizontalization" (p. 118).

All statements from the individual transcripts were recorded and labeled. The new, separately labeled lists were compared to see if they could be combined into one

larger list. These larger lists of statements comprised a theme. These themes became the preliminary basis for the school leader's description of the phenomenon.

To bolster the researcher's accuracy in interpretation, themes were checked to make sure they reflected exactly what the secondary principal experienced. This check was to ensure that themes were valid. These validated themes were prompts for the researcher to write up the individual's self-reported experience. Within the textural description, long, verbatim quotes from the individuals were used to further assure validity of themes (Moustakas, 1994, p. 120-121). In the final steps of data analysis, the principals were asked if their quotations were accurate or needed to be corrected or elaborated upon. By including the principals' verification, the study was deemed more valid.

When each participant's textural description of their experience was completed, they were compared to all of the participants' textural descriptions. During this step, commonalities were revealed. These shared common experiences were the foundation for the study's findings and conclusions.

Phenomenology and the Researcher

The researcher in a phenomenological study is expected to put aside all prejudices to accomplish worthwhile research. Moustakas (1994) called the experience of consciously freeing one's mind as "*Epoche*" (p. 86). In theory, the ideal, phenomenal researcher is able to completely fulfill the *Epoche* experience. The literature stressed that this is a difficult experience. So hard is *Epoche* to accomplish, the researcher did not at first believe it was possible and discovered it was a mentality that required an unfathomable amount of discipline.

The research question was driven by the researcher's dedication to uphold the idea of our nation's public schooling. Throughout the entire study, there was a personal intensity to find the truth. The researcher put prejudices aside and disciplined herself to stay focused on the research question.

To read this dissertation with a critical lens, the researcher's personal passion and prejudice are offered. The researcher believes there are problems with the system, but the idea is one of the greatest reasons for choosing to live in the United States. Public schools are defined by her as the great equalizer in our nation. The researcher believes technology in our schools will continue to promote a future equality.

Furthermore, the following are the researcher's beliefs: Public schools battle elitist education. Discriminatory education leads to one segment of the population controlling knowledge. The ability to be free rather than be controlled is a human desire. Public schools promote intellectual freedom.

The researcher contends, for future societies, technological literacy must be a priority for all leaders. Secondary principals who wish to sustain technology and are searching for direction should seek meaningful research, such as this study, to aid them in success. With technological advancements, the global research effort will bring forth understanding of technological sustainability. This research is geared to help secondary principals sustain technology, and thus, a meaningful, equitable education for our children.

Secondary principals must understand how to sustain technology in order to graduate students who will increase their intellectual capital and prosper in the future.

Some public schools are grossly unequal, and so too will be the future opportunities for their students (McCain & Jukes, 2001).

CHAPTER 4

Vignettes

Introduction

The study sought to answer: How do secondary principals perceive their responsibility in sustaining technology? In chapter one, the definition of technological sustainability was established. In chapter two, the literature review identified themes related to technological sustainability and yet did not satisfactorily explain ‘how’ secondary principals perceived their responsibility in sustaining technology. Chapter three detailed the use of phenomenology as a method to answer ‘how’ secondary principals perceived their responsibility to sustain technology.

This chapter presents data collected from each of the principals that will be used to answer the research question. In chapter five, data analysis reveal themes extending beyond those presented in the literature review. These themes serve to fill the void of phenomenological studies concerning how secondary principals perceive their responsibility in sustaining technology. Chapter six presents an overview and discussion of findings.

As stated in chapter three, participants are secondary principals responsible for sustaining technology in public schools. All participants were chosen by directors of the OK-ACTS program. The directors chose ten secondary principals - five deemed successful in sustaining technology, and five representing the average school administrator in regards to technology sustainability. At the time of the interviews, it was not disclosed to the researcher which of the two categories the principals fell into.

Advanced principal participants were chosen based on the level of participation and leadership in multiple initiatives of the K20 Center for Educational and Community Renewal (K20 Center). Each of the advanced principals were recommended by the K20 project directors because the principal had shown exceptional leadership qualities through the Oklahoma Achievement through Collaboration and Technology Support (OK-ACTS) Phase I leadership development by serving as a cluster coach, serving as a principal of an Oklahoma Educational Technology Trust (OETT)/OK-ACTS Phase II grant district or school, or serving as a regional network coach offering collaborative support for school leaders in their area of the state.

The secondary principals' interviews presented are considered to be the main source of data to be analyzed in order to give meaning to the phenomenon. The interviews are presented as vignettes in which the principals are speaking within their individual school contexts. In this framework, observations, field notes, and the principals' interviews are woven together to accurately portray how secondary principals perceive their responsibility in sustaining technology. Vignettes are an effective way to help the reader most effectively understand the phenomenon through the principals' perspectives in context (Miles & Huberman, 1994).

Clandinin and Connelly (2000) consider it essential to include the contexts of the interviews:

The way an interviewer acts, questions, and responds in an interview shapes the relationship and therefore the ways participants respond and give accounts of their experience. The conditions under which the interview takes place also shape the

interview; for example, the place, the time of day, and the degree of formality established. (p.110)

Therefore, brief introductory descriptions of the secondary principals' schools are included in the vignettes to contextualize the interviews.

The research focuses on ten secondary principals' perceptions of their responsibility in sustaining technology. To portray as vividly as possible the self-reported realities and experiences, it is necessary to reveal all information they shared during the interviews combined with observations and the analysis of documents and field notes concerning each principals' school. Throughout the principals' interviews, they constantly refer to their school's web page. Thus, the researcher visited each web page to better understand the principals' perspectives and to further validate the research. Information from the school web pages adds to the context of the schools in which these secondary principals work. With all data combined, the essence of the principals' self-perceived experiences are best understood. Thus, the research meaningfully portrays how and why principals employed strategies to sustain technology.

Ten secondary principals, Dee, Shay, Boren, Ali, North, Brew, Sheen, Frater, Nee and Sky share their perceived responsibilities in sustaining technology. The participants live in the Southwestern United States and were purposively chosen by the directors of the OK-ACTS program. The secondary principals are all currently employed. A table of basic data concerning the principals and their schools is presented, to be followed with brief vignettes.

Table 1

Participants and School Contexts Summarized

Principal	Gender	Technology Leader or Novice	Recipient of OK-ACTS Phase II Grant	School Locale	Number Of (T)eachers and (S)tudents	Free and Reduced Lunch Percentage	Minority/ Ethnicity Percentage
Brew	M	Leader	Yes	Urban	(T) 14 (S) 275	82	64
Dee	F	Novice	No	Urban	(T) 96 (S) 622	100	60
Sheen	F	Leader	Yes	Suburban	(T) 50 (S) 861	18	15
Nee	M	Novice	No	Suburban	(T) 42 (S) 675	16	14
Shay	F	Leader	Yes	Suburban	(T) 25 (S) 319	76	32
North	F	Novice	No	Suburban	(T) 60 (S) 1077	12	30
Ali	M	Leader	Yes	Rural	(T) 23 (S) 294	47	38
Boren	M	Novice	No	Rural	(T) 11 (S) 107	60	9
Sky	M	Leader	Yes	Rural	(T) 8 (S) 120	63	33
Frater	M	Novice	No	Rural	(T) 49 (S) 761	36	11

(Statistics Source: National Center for Education Statistics (NCES), Washington, DC, 2005).

Vignettes of the Interviews

I. Interview of Principal Brew

Faith Charter High School

April 22, 2005

Principal Brew works at Faith Charter High School - a small, urban charter school with a total of 14 teachers and 275 students. Currently, 82% of students are enrolled in the free and reduced lunch program classifying the school as “high poverty” (as designated by the National Center for Education Statistics). Minorities comprise 64% of the student population (NCES, 2005).

On the date of the interview, I sit in a small office waiting for Principal Brew. I take note of the technology available in the office. The room has a student sitting at a desk with a laptop computer. There are no land-line phones in this office. There are two cell phones on the student’s desk. As I sit next to the student, she looks up from her laptop and welcomes me to her high school. She asks if I would like to look around. I politely say no and tell her that I’m waiting for Mr. Brew. She appears to be about sixteen years old. However, her demeanor is one of a college student. Behind her are photographs on a bulletin board with high school students and their families. The bulletin board is titled: “The Pride of Faith Charter High School.” Principal Brew’s door opens and he signals for me to wait a few minutes. I overhear him talking on his cell phone asking if one of his students is doing okay in the hospital.

Unlike other high schools, no bells are ringing followed by announcements telling the students to get to class. The hallways are quiet; the students get to their next class without prompting. This is unusual and impresses me. It is hard to distinguish students

from parents as they stop by the office to say hello to Principal Brew. The environment is very casual as people stop and talk with me.

I leave the small office and enter Principal Brew's office. It is also small. There are two chairs, his desk, a laptop computer and a cell phone. Principal Brew is confident in his speech and mannerisms. He is enthusiastic about the interview topic and constantly paces while talking. When not pacing, he stops to show me something on his laptop. Principal Brew's technical language and knowledge are superior compared to other principals in the study. Before the interview officially begins, he shows me a plot of land on his laptop he is planning to buy for the school. The land owner lives in Texas and Principal Brew explains he is grateful for technology enabling him to make a business transaction without crossing state borders.

We officially begin the taped interview and I ask him to give examples of effective uses of technology that lead to sustainability in his school and Principal Brew answers:

I think practical technology is important as it makes it easier for a school to use everyday applications of technology to run efficiently. For example, grade books on-line not only help with record keeping, but also with communication with parents to become more open and one of the things that I think we're going to see is more involvement. I'm the only administrator, so it would take me forever. That's why I've taken so many mundane tasks and erased them with technology. I don't have to hire a clerk to do this or have the counselor spend time doing this. The sad thing is, counselors should be counseling, but they're spending all of this time doing hand enrollment, for example.

Principal Brew believes technological innovations are a necessity and not just extra add-ons. He believes these innovations must be sustained and he is constantly searching for funding to buy this essential technology. Principal Brew perceives his responsibilities in sustaining technology are helped by national and state funding. He remarks that government funds are directly related to his success in sustaining technology. He shares in disbelief how other administrators are not taking advantage of the “free” money. He comments that during conferences, he is surprised to sit next to another principal who had not taken advantage of federal and state funds.

When I ask, “What is one of the most important things you would share with another administrator?” He states that he would share information about the various funding opportunities available. Principal Brew has very strong feelings about this topic. He paces back and forth in his office as he speaks. He comments that available funds are not being used by other administrators and becomes agitated as he states:

So, any administrator that is not applying for E-RATE is just a very not smart person. It’s free money, it’s guaranteed to your school. I’ll be honest with you Jessica, this is not rocket science!...The ones that are bad, I think they’re either really overworked and can’t get to it, or they’re ignorant which really isn’t their fault, because ignorant means you really just don’t know and then there are some flat out lazy stupid people out there who are like, ‘It’s always worked like this we don’t have to change nothin! You know there ain’t no sense in changin!’ They don’t believe in technology because they’re just too lazy and stupid to find out about it. The world is changing around them and they don’t stir up their

community enough or lead their community into change. They wait until their community compels them to change.

Principal Brew continues to say that he thinks the Oklahoma State Department of Education should make it mandatory for all administrators to attend a class concerning government and state funding and then it should be mandatory for all administrators to apply for this funding. Principal Brew believes more administrators would successfully sustain technology if there were programs in place. He feels that the whole idea of this funding not being used is a total waste and an insult to students. He associates funding with increased opportunities for students.

For example, for all of our seniors, we use the GEAR UP funds. GEAR UP is mountains of money. We've used literally hundreds and hundreds of thousands of dollars for technology like laptop computers, trainers, etc. GEAR UP is just technology rich funding. It's used for the purpose of moving kids up to higher education.

Principal Brew continues to give examples of how students are using laptops to fill out college Financial Aid for Student Assistance (FAFSA) forms, review for the ACT, and study topics that are not currently offered at Faith Charter High School. Principal Brew believes that sustaining technology is critical if his students are going to succeed. He knows his students will have to perform well on college entrance exams and that technology will allow them access to on-line practice tests. He also realizes that the more technology programs offered to the students, the easier it will be for them to practice thinking about abstract concepts. He believes it is his job to be constantly

researching how technology increases quality teaching and learning. Principal Brew speaks of attending OK-ACTS Institutes to increase his knowledge about technology.

Principal Brew maintains that his school has the government funding necessary for adequate technology and that his teachers are responsible enough to spend it wisely. To ensure this, he is always listening to the teachers discuss technology and offers careful suggestions. Principal Brew admits that in the beginning, he would prompt teachers to specifically talk about technology but now the conversations are natural and on-going. He explains that teachers are a strong element of the push toward success in sustaining technology. This type of positive pressure is seen by Principal Brew as an example of top-down administration not being the key to sustaining technology. He recognizes that once teachers see the value in using technology to improve teaching and learning experiences, they would not want to return to a classroom void of technology.

Principal Brew sees his role as introducing technology as a positive tool, but not forcing teachers to use technology. Moreover, he feels that once teachers see other teachers or administrators using technology they will have a desire to learn more. Principal Brew explains that teachers learn about new technologies mostly from casual conversations with one another. He asserts that teachers who learn about technology and are comfortable with technology are more likely to sustain the technology.

Principal Brew reports that the teachers who accept technology eventually see it as a tool that they can not do without. Principal Brew reacts to this type of ‘positive’ pressure:

I think that we’ve found what the best thing is to have our technology driven by our teaching staff. We don’t buy a bunch of SMART Boards and say, ‘Use a

SMART Board.’ We don’t buy a bunch of video projectors and say, ‘Use these projectors.’ I try to expose them to things. If they really get fired up about something, I really try to make sure to acquire that application or software for them to have. See, I think the importance of sustainability has to do with if you can’t live without it, the priorities of the group shifts to make certain things sustainable. If it’s based on a technology, for example, a SMART Board or a laptop, it will go obsolete, which the teachers may or may not have asked for. But if it’s built into a practical application, ‘this is how I communicate,’ they will find a way to keep it. And the pressure comes. If we said, ‘There’s no more e-mail, there’s no more electronic attendance.’ this place would flip out, and they would want to know and ask, ‘What is something we can do to make certain these become a part of our lives?’ They would say, ‘Whatever you need to do, you need to make it happen because things are not going to change.’ And the positive pressure for well-utilized technology will increase sustainability. And I would say this is part of the democratic process, where everybody has a say, ‘We utilize this, and we literally can’t live without it.’ When teachers choose technology and use it, they are excited about using it. If they don’t want to use it, it gets broken or discarded.

The value teachers place on technology is important to Principal Brew. If teachers use technology to sustain worthwhile teaching and learning, he believes his students will succeed. He believes his teachers’ experiences with technology away from school (e.g. home, banking) can assist with their decisions as to what technology the school should buy in order to keep up with the pace and trends of society.

As the interview continues, Principal Brew shares personal stories about his children using technology at home. He uses these stories as examples of the direction he thinks his school should be going. Principal Brew relates his observations at home with what educators need to be doing at his school.

My eight year old and my five year old and my two year old, my two year old can run the mouse. He can turn the computer on. He's two, he can't put together a paragraph, but he's technology savvy. It's part of his life, like turning on a light switch, open the fridge and get something cold, use the mouse and see Elmo, it's easy. He expects technology to be there and here too. I think then as educators, another piece of this is, 'Why did that light come on?' Ask the kids, 'Why does that light come on?' 'Because of electricity.' Where does it come from? Why does it work? How in the world does your phone send an alphabet to somebody across the state? How does it work?' Well, I don't know.' What a string to follow. Our technology is more advanced than the early Apollo flights. In our lifetime, 1969 technology is outdated. There's more technology in our cell phones than on any of the early moon shots. Well they don't know that. They don't know what's behind the screen.

Principal Brew's experiences with technological innovations in his personal life create foundations for what he expects from his teachers and students. He directly makes a correlation between use of technology in society and his expectations he holds for his school. Principal Brew believes it is his job to introduce and sustain technology in his school that is equivalent and hopefully better than the technology the students use outside of school.

Principal Brew believes his teachers know that technological knowledge is important for graduates as they enter the workforce. However, he also believes the eligibility of students to gain employment is not the only reason he must sustain technology. He emphasizes that the future of our democracy to also be at stake. Principal Brew shares that he grew up in the Philippines and compares his education to this nation's education. He offers ideas from national and local perspectives.

We are one of the few cultures that force our citizenry to go to school by law under penalty, fines and imprisonment. Parents go to jail if their kids don't go to school. So, if it's that important, what are we supposed to be doing in our schools? Is it square roots? Is it pushing technology down their throats? No, it's not, so what is it? It's to help somebody become a productive, contributing member of our democratic society. To strengthen who we are. What does that look like? What are the pieces? Why are you a productive member of society? Is it because you're a master geometry student? Maybe, but I think it's the love of learning it, the technology, the passion to communicate and expose new ideas, to become better, to improve, to move forward. In the 50's we'd be fired up about the Xerox machine and in 20 years they're going to be laughing at this technology. It's the love of learning that will sustain technology.

Principal Brew is a visionary. He entertains ideas of our future being an oral society in which we are equipped with technologies to communicate in any language without a written word. He believes that education becomes irrelevant when it is comprised of disconnected facts. He does not want his students to be annoyed by trivial

information. Principal Brew believes to succeed in the future requires imagination to create and employ new technologies.

During his interview he shares what the future might be like.

I think the world we're going to, Jessica, is one where we have to determine as educators what our base expectation on knowledge is. You must be able to read, you must be able to write, at least now. I don't even know if we're going to even know how to write at some point. As radical as this may be, we may go back to an oral society at some point because everything that we say, because writing is communication, if there is a more effective way to communicate be it with some form of literal transference or impulse. I'm not talking about E.S.P. or telepathy. You come up with thoughts before they come out of your mouth. That's a physical process. When we can tap into that without having to use our vocal chords, but even prior to that, there will be a way to speak and just say, 'Find Jessica Turner for me.' 'Hey Jessica this is [Brew].' That's beyond e-mail, that's beyond phones. It's the impulse to communicate at that point. I don't know if we need to focus so much on, 'You need to know how to find the square root.' Why? We must know how to work together, how to communicate effectively...

Principal Brew is not waiting for the future to happen. He is anticipating what a technologically driven society will require of his students. Principal Brew says that he shares his ideas with his staff and he doesn't know if some of them are buying in to his ideas of the future or just think he's crazy. Either way, Principal Brew thinks the most important thing is that the conversations about technology are non-stop. His message of imagination as the key to success resonates throughout his interview. Principal Brew

knows there is a direct relationship between the technology his school sustains and the future success of his students. OK-ACTS defines Principal Brew as one of the five technology leaders in the study.

Virtual Context

Faith High School

To further validate research, each school in the study was visited via their school web page. Upon entering [Faith] High School's web page, the mission statement appears, "[Faith] High School's Purpose is to establish a strong foundation for lifelong learning and provides opportunities for student to thrive in a complex, competitive and diverse society. The school offers a challenging program of education that emphasizes the development of life skills, social responsibility, and self-confidence." In the middle of the page there is a picture of Principal Brew with instructions to "Click here to see a video message from our principal." After clicking, the video begins with Principal Brew stating his school philosophy and welcoming you to the web page. This is the only school in the study to have a video on their web page. The principal's personal web page is also available through a link, including, among other things, pictures of Principal Brew fixing his truck.

[Faith] High School's web page consists of the history of the school and the definition of charter schools. Organizations, Special Events, Staff, Partners, and Future Plans are available to any visitor. There are several links for parents, teachers and students to use. There are over twenty educational links. Examples include: Faith High School Alpha Program offering on and off-line activities building responsible citizenry, high school student electronic portfolio systems, teacher professional learning

communities, information on building web services, advanced laptop tips, site based software proposals, student grades, and direct links to federal and state grants and parent support sites.

II. Interview of Principal Dee

Immaculate Alternative High School

April 15, 2005

Principal Dee works at Immaculate Alternative High School, a medium-sized, urban high school with a total of 96 teachers and 622 students. At present, 100% of students are enrolled in the free and reduced lunch program classifying the school population as “high poverty.” Minorities comprise 60% of all students (NCES, 2005).

On the date of the interview, I approach the school. The brick exterior is weathered and the building appears to be very old. Upon entering, I walk through a metal detector and pass a police officer. The halls are dimly lit and unusually quiet for a high school. I enter a large office with three secretaries. The secretaries have bulky, outdated computers and land-line phones on their desks. The phones are ringing non-stop. The office is decorated with plastic green plants and has one large window. There is a bulletin board with pictures of high school students and their children.

I enter Principal Dee’s office. Her desk has a relatively new desktop computer and a land-line telephone. From behind her desk, she extends her hand and welcomes me to her school. Principal Dee is a well-spoken, matured lady. Without hesitation, she shares her hopes for more technology at her school. Principal Dee sees a direct relationship between sustaining technology and increased student achievement.

Principal Dee perceives her responsibilities in sustaining technology to include the constant search for national and state funding to obtain technology. She relates technology funding with increased opportunities for students. She does not speak in vague terms in reference to government funding, but rather she describes in great detail

the specific funding received and how it is spent to help students. Principal Dee readily and familiarly lists state and federal funding programs.

You know, we've received additional computers through GEAR UP. That has been wonderful, that Federal grant. We were just told that we were picked for an OKC Maps for kids' project which does technology grants for schools and we're in the second round of schools. You know we don't see that state or federal as pressure. You know with the E-Rate, I think they're just giving us the opportunity to see it as a way to have the thing, the technology tools come into our schools. Now, the federal assistance, the E-Rate, the MAPS for kids, the GEAR UP, Title I grants allows, especially our kids, to have the same level of technology as some of the other districts because you know we're a poor district...so if we didn't have that federal assistance, we would have nothing because almost everything technology-wise in this building came from a federal grant. You know if we envision our school without all the grants supporting the technology, buying the technology and training us to use technology and all of that, you know it would be a detriment to our students not to have that. It would be a disservice to our students.

When the money arrives to purchase technology, Principal Dee gauges what should be bought based on what she sees happening outside of school. Principal Dee also engages in conversations with other teachers about what technology they see their kids using outside of school to "get the ball rolling." Principal Dee refers to a child's use of technology outside of school and how that influences her technology purchases.

Principal Dee shares a personal story and relates it to what she thinks her school needs to be doing:

It's planted very early and that's why it's so important that our Pre-K get a lot of exposure at that level. The little ones need to sit down and look at computers, and they can do it. Oh, it's amazing. My mom, just a side note, was visiting with her neighbor's grandson and he is three and you know my mom has just gotten into the computer thing, the e-mail thing and she could not believe he could turn the computer on, he could get to his color program and he would just set there and use the program about colors and shapes and all of that and he was good.

One day I was coming over there and he was just setting there showing me what he was doing on the computer. And he was just three. So it just depends on what you expose them to...that's the mode by which they learn best and they have identified with that and so they progress their education then that's what they're looking for and that's their expectation. So it does, it pushes teachers and administrators to keep that going.

Principal Dee recognizes that her teachers must adapt to technology if it is to be sustained. She asserts that teachers are only able to adapt to technology if they have access to and learn about technology. Therefore, making technology accessible to her teachers is believed to be part of her responsibility in sustaining technology. She believes technology is a part of our everyday life and it is imperative that teachers understand technology in order to help the students.

I encourage them to go and I guess you could say I sign my life away (she laughs) and learn. That's my attitude about it, because you know, I know sometimes

research says that teachers don't use everything they are exposed to, but my philosophy is, if I can expose them to more, then they may use some of it. You know even that idea about the osmosis, you know because you're there maybe you'll absorb it. You might catch yourself doing it unconsciously. So that's kind of my philosophy on where I want them to go and how I want them to participate in it and get as much as they can.

Principal Dee shares that open learning communities help to sustain technology. She believes open communities create optimal experiences for teachers to communicate ideas and/or concerns about new technologies. Principal Dee believes that open dialogues are critical for student success. To create this type of community, Principal Dee says that it takes some work. She says that in the beginning, there were teachers who were technologically savvy and these teachers would separate themselves from the rest when talking about technology. She says that she had to work to get all the teachers involved in the conversation and that this was a slow process.

Teachers who were at first hesitant to join the technology movement at her school received the most support, according to Principal Dee. She believes that supporting all teachers increases the likelihood that they will gain a sense of ownership of technology. Principal Dee sees a connection between a learning community that shares responsibility for student learning and technological sustainability. Her philosophy on shared responsibility is expressed thusly:

It's got to be 'we' and that's what I'm saying. It's not about that old philosophy, 'Oh, we want to make the principal do it.' It's not that, it's about making us look

good. That means we're doing what we're supposed to be doing to help the kids be successful. It's really not about us, it's about the students.

So, really that's the push, what are we going to do to make the student be more successful with this technology. If this kid is not passing or he is having a problem, I ask 'What are you going to do to address that problem?' I feel like my position is to support you [teacher] and in supporting the kid to be more successful. I'm in the positive. I'm not into the negative. Because like I tell them, 'You can beat them with a stick all day, but you're not going to get what you want. You have got to remember the carrots. You have got to use the carrots more than you use the sticks.'

In order to sustain technology, Principal Dee believes she needs to help teachers transition their mindsets from traditional to modern or progressive thinking. Principal Dee believes this difficult transition has to occur in order to sustain technology in her school. As a first step, Principal Dee addresses this problem by introducing new technology slowly, using it herself at first, and then moving it into the classroom. Then, after gauging the comfort level of her teachers, she follows up with staff development as appropriate.

She believes that oftentimes a teacher's age has a great impact on their acceptance of emerging technologies as she relates:

I think one of the areas of technology that has been effective has been having the additional computers in the classrooms for the teachers so that they could, at their own leisure, become more comfortable and familiar with it. I think this works.

You know we have older faculty and that's really the trend right now. We've had

such a decline in young people going into the teaching profession that the faculties are older and the concern is the older teachers ready psychologically to embrace the whole phenomena of technology? So, therefore there's a lot of apprehension there. So, I think it has helped for me to encourage them to use it and for me to take the opportunity to put the computers in the classroom with them, so that they can explore at their own leisure without feeling intimidated and I think that has helped them quite a bit.

Principal Dee candidly addresses her perception of the generation gap and how it affects the comfort level of using technology in an authentic manner and sustaining it over time. She finds it interesting to observe both younger and older teachers using, or in some cases, not using technology. She shares that a particular technology might not, at first, seem worthwhile to an established teacher. Yet repeated interaction with younger co-workers or students often gives older teachers fresh insight into the value of a given technology. When introducing new technology, Principal Dee always tries to create a team-teaching situation that pairs a younger teacher with an older teacher. She cites examples to show how she helps the older teachers see the value of using technology as a teaching tool:

The dynamics in the classroom are tied together. It's interesting to observe the technology in the classroom and then sit back and reflect on it. Then you know, 'That's really what's happening.' Because I can tell the difference between my 30 year old teacher and their use of technology in the classroom and my 55 year old teacher and their use of technology in the classroom. And they're getting there, the older teachers are getting there, it's just a little bit more difficult for

them, and I have to remind them that this is a tool that they can use which will help them engage students, because like you said you know the pencil and paper versus doing it on the computer. You know the students prefer the computer and I have teachers that prefer the pencil and paper. I think it's still generational that the older teachers want to have more control. You know they want just one thing going on. But the kids are able to go on and do what they need to do in their areas as long as they get the direction. Then the teacher starts to facilitate and give them individual attention, but they still want to be in control.

As Principal Dee introduces technology into the classrooms, she sees that teachers are aware that their roles in the classrooms are changing. She believes that to be successful in sustaining technology, she needs to always make a point to talk to teachers about their perceptions of how their roles are changing. She reports that several teachers are ill at ease with their place in a modern, technology-laden classroom. Clearly, this is an issue with Principal Dee and she realizes it is a detriment to properly sustaining technology in her school.

Principal Dee observes teacher uneasiness about losing their traditional roles in the classroom:

The role of technology has had an impact. But you know sometimes the teacher is a little apprehensive about it. I don't know. I think sometimes they don't feel like they have as much control. But they really do. I guess it's because the kids are so comfortable with it. I guess they think it diminishes their role. Well, I don't really think it diminishes it. I think it just causes them to reevaluate their position in the classroom.

Principal Dee acknowledges that staff development helps teachers ease into their new roles. She believes that staff development offered by university partnerships, such as OK-ACTS or district staff development are critical if technology is to be sustained. Principal Dee reports that stipends for staff development are not always given to teachers. Principal Dee's district chooses to train teachers and then at the end of their training, give them the technological tools needed to carry out what they have just learned. The staff development combined with technology granted is perceived by Principal Dee as making it easier for her to sustain technology. Therefore, Principal Dee tries to send as many teachers as she can to district staff development. Principal Dee explains how this program works:

And in our district we have a laptop diplomacy where teachers can go through training and get a laptop... That's been helpful a lot with some of those fears with using technology. Between their own personal laptop and their computer in the classroom, you know they are really able to work on their skills and develop those skills so they don't feel a lot of pressure or any inadequacy of confidence. That's really what it's about. It's about building their confidence and use of technology. Then they can integrate more of what they do everyday... So technology is ongoing and training is ongoing.

Principal Dee believes peer networking is a positive opportunity to learn about new ways to increase teaching and learning at her school. Principal Dee says there are a lot of conventions held in the state and that she tries to attend as many as possible. She shares that through her own networking experiences, she has gained valuable insights into how to sustain technology.

Well you know, sometimes if you go and it's not that valuable what they have to offer, it's still important to be networking with somebody and you find out about other things you didn't know, and then it becomes valuable just because of that contact. You never know who you're going to meet...It may be a networking opportunity where I can find out about something that's going to help our students and teachers to work with, that's even better.

Principal Dee recognizes the importance of sustaining technology as a necessity for her students' future success. Principal Dee believes that, if she were not to sustain technology in her school, it would be an obstacle for graduates to overcome when they enter college or the work force. Therefore, Principal Dee believes she is integrating technology in her school to the point where every teacher is using it daily and her students are using it everyday. Principal Dee shares her strong beliefs:

...not to have that technology would be a detriment to our students not to have that. It would be a disservice to our students. It doesn't give them the skills or exposure that they need to be successful in the world today because they have to have the exposure to at least a basic level of technology... You know it's just taking off, so we have to keep up to give our kids the chance to be on an even playing field. If not, they're behind before they ever get started. You've got to have your laptop and be ready to go when you're on anybody's campus now. So, they've got to be familiar with it, they've got to know how to use word processing programs, they've got to be familiar with the e-mail, they really got to know about PDAs That would be, I think the next step for a lot them because that's where we are going.

Principal Dee also talks about having several conversations with her teachers concerning the importance of technology in order to show them the value of technology in the classroom. She says a lot of her conversations with the faculty are about preparing students to be successful in the future. Since a lot of her faculty are older, she says that some of them did not experience technology in college and do not realize how much technology has permeated college campuses today. Therefore, she feels it necessary to keep the conversation of technology and student success on-going.

Principal Dee commits herself to sustaining technology as she observes it as working in the classrooms as a motivational tool. She witnesses a great difference in the students' interest in writing. She observes that when the students are asked to research and write with pencil and paper, they write a paragraph. However, when they use a computer, they start writing two to three pages. For Principal Dee, this alone is worth sustaining technology:

It really did help the students with their learning because they have a tendency to go right to the computer when they want to do their journal writing, they want to do their research on the computer. In one of the social studies classes, they do their current events and get their information from the computer. They are more motivated.

Principal Dee is concerned with transitioning from the traditional computer lab environment to a school-wide wireless environment. She states that according to research, wireless environments make a progressive (and desirable) step toward sustaining technology.

I know one thing that we're working on that I've asked and I think we're getting it. There is the whole idea about having the wireless more available. Because I think it would be neat for the kids to have a laptop with them and be able to have them when they sit down for lunch and to be able to do some things, just trying to get to that point, to integrate it more into the daily activities, every minute, throughout the day in the classrooms. Just like you see them with a book, you know I would like to see them with a laptop and do those things that they are not doing with their book just because there's so much more information and freedom with technology. That would be my vision of a school that I would want to be.

Principal Dee's vision is inspiring and helpful to all secondary principals trying to sustain technology at their schools. The directors of OK-ACTS did not classify her as one of the five technology leaders.

Virtual Context

Immaculate Alternative High School

As with the other ten schools, the researcher visited [Immaculate] Alternative High School's web page. Upon entering the web page, the school's mission statement appears, "We, the staff of [Immaculate] Alternative High School, pledge to model and provide opportunities, encouragement, and motivation that will prepare all students to become academically and technologically literate adults." There are over 20 links to help parents, teachers and students obtain basic information about the school, its programs and personnel. Examples of links include: college resources, e-mail filtering instructions, tips on web design, career tech services, professional development communities and homework help sites.

III. Interview of Principal Nee

Devout Middle School

April 22, 2005

Principal Nee works at Devout Middle School, a suburban school with a total of 42 teachers and 675 students. Presently, 16% of students are enrolled in the free and reduced lunch program classifying the school status as “high socioeconomic.” Minorities make up 14% of total students (NCES, 2005).

I wait in the main office for Principal Nee. There is one secretary and one student office aid sitting behind a long counter separating me from their space. One computer, three paper copy machines, and two land-line phones are visible. The office is not full of vibrant colors or bulletin boards, nor is it especially busy and the secretary politely chats with me while I wait for the principal. She apologizes for what she is wearing and informs me that today is casual Friday. The student aid is quiet and does not make eye contact. The secretary seems impressed that someone is visiting the school.

Principal Nee, an older gentleman walks down the hall. He is shy and greets me quietly. He invites me into his office. His office has one huge mahogany desk and two leather chairs. There is an older computer on his desk. Principal Nee also apologizes for his attire and like the secretary, explains that it is casual Friday. He looks at the clock and tells me we can start whenever I feel comfortable. I ask Principal Nee if I can tape record our interview. Principal Nee takes his time answering and hesitates before saying yes. As I put the tape recorder on his desk, he studies it. During our interview, he looks at the tape recorder and not at me.

I ask Principal Nee to give me some examples of effective uses of technology in his school leading to sustainability that he would like to share with other principals. Principal Nee thinks for a couple of minutes and then answers my question with an inventory of technology at his school and how the technology is being used.

All of my teachers now have a computer in their classroom and we do everything with computers, grades, class roles, everything and you name it, we've done the training for it. We wanted to make sure it was used and available to the students as well. This makes things flow easier. Time wise, if you let the computers save time and make attendance and grading quicker, then the teacher has time to do more with teaching and every principal loves that.

Principal Nee asks if I would like to see the computers in the teacher's classrooms. We get up from his office and start walking through the hallways. Principal Nee shows me students working on computers in a lab. He is very proud that the computers were available for them to use – as if obtaining the computers was a major goal accomplished.

When we start talking about sustaining technology, Principal Nee believes that if a school has a lot of technology, it is easier to sustain technology in comparison to a school with little technology. He shares the desire that there might be more computers for his students to use. As we are walking, I do not see any laptops or more than two computers in any of the classrooms. In the classrooms, I see the majority of students sitting in rows with a teacher lecturing in the front of the room. The school setting is traditional in the sense that it looks like the high school I attended in the 1980's.

Principal Nee admits that even though computers are good for his school, he does not have time to get all the available tech funding and so the school has a hard time sustaining technology. He tells me that a principal's schedule makes it impossible to apply for all of the federal and state grants. He said that there really needs to be a technology grant writer at his school to help get more computers and that a grant writer is what every school needs if they truly want to sustain technology. Principal Nee tells me that he gets a lot of information and grant applications in the mail - so many that he does not have time to read them all. He is disappointed because he realizes that his school could surely benefit from the purchase of more computers.

We only have the use of the labs right now, so I could see how more could really help. For example, if they [teachers] couldn't book the lab or something like that. I wouldn't want to take everything away from the traditional teaching setting, but that would be a great advantage. It would be great for projects and stuff.

When I ask Principal Nee if technology is improving teaching and learning at his school, Principal Nee gives a history of how his school did not always use technology and how his teachers transitioned from being apprehensive of the most basic uses of technology to becoming open-minded. At first, Principal Nee explains that a lot of his teachers were afraid that the students would break the computers and would not let students touch them. The solution to this came when he decided to make teachers use computers during in-service days.

He believes past in-service days were successful because his teachers started using the computers and realized they were not quite so fragile. Principal Nee sees this

as a major breakthrough in sustaining technology. He shares an example of his teachers' successful transition due to staff development:

That's like when we started opening up the computers to the teachers and we were saying you're going to start putting your grade book on the computer, we had a lot of very apprehensive teachers at the beginning. But now when we come together and we have a new program we want to try, there's no questions asked about participating, we just plug right in and start working on it. We work like an efficient group. Now my teachers started to use the computers in the classroom on a daily basis and let the students use the computers.

Principal Nee continues to talk about how in the beginning students were apprehensive to technology as well as teachers. He tells me that teacher fear led to student fear. He shares that he fixed this by telling the teachers that they had to start assigning projects that would make students use the computer lab. He believes this type of pressure on both teachers and students is also a successful strategy to sustain technology. He feels that due to his positive pressure, students were exposed to computers and, in doing so, erased apprehensions. In the beginning, he explains that the students felt it was a great privilege to use a computer and now it is taken for granted. According to Principal Nee, the students expected computers to be at their school. For him, this is proof that he is successfully sustaining technology.

Principal Nee says that he thinks computers have also improved learning because parents were now able to access their child's grades and attendance through the school's web page.

We started a program last year and it's advanced this year and it's called Parent Connect and that's a program where people can log onto our website and then log onto Parent Connect with their special password and they can check their own child's grades.

He states that student's motivation to learn increases when parents can track them on the computers. Principal Nee believes the Parent Connect program creates a good community connection between the parents and the school computers, and that response has been overwhelmingly positive. He tells me that in this manner, parents help the school to sustain some of the technology. Additionally, as a grandparent of children at the school, he mentions that he likes to keep on top of things using Parent Connect.

Principal Nee brings up Parent Connect when talking to his grandkids and thinks this is a good way to start a conversation with them about their grades and also about technology. Watching his grandkids at their home, he is impressed with how fast they work with computers. This helps him understand how much his high-school students know (or do not know) about technology. He feels that because of his school's web page he now has something to share about technology with his students and grandkids and this makes him feel current.

Furthermore, he asserts that these conversations lead to him using the computers more at school. The teachers notice what he is doing and things start rolling downhill toward the classroom. He feels this helps create a positive learning environment for technology. Principal Nee expects that setting up a positive environment will increase the likelihood of sustaining technology.

When I ask Principal Nee who helps him sustain technology at his school, Principal Nee lists the groups. Parents using Parent Connect, students who are into computers, and the teachers who use technology in their classrooms all help him keep up to date. Principal Nee also explains that the school district shares a “technology person” who helps with computer viruses and hardware. Still another district technology person helps by maintaining software and networking difficulties. Principal Nee credits these groups and individuals with sustaining technology at his school by helping things run efficiently.

Principal Nee believes that sustaining technology is important and correlates technology with higher test scores. Specifically, he sees a direct relationship between the computers and software available to students and improving scores. This belief motivates Principal Nee to sustain technology as follows:

With computers, our test scores are higher. The computer programs we have like Compass Math and Compass Reading, you know these help our scores. These things help students learn abstract math. We always give them a pre and post test and the teacher can check on their advancement at anytime and how they are advancing in that particular program as well as what they’re doing in the classroom. You know, they like working on the computer probably a lot more than with paper and pencil, for example, math problems. It’s hard, we need more computers and I need help getting more. It’s frustrating that there is money for us and I don’t have time to get the money needed. We don’t have grant writers at our school.

Principal Nee also commits himself to the idea of sustaining technology to create a successful foundation for his students to prosper in the future. Principal Nee acknowledges that he needs to talk to the district about getting a technology grant writer so that his school receives more technology for his students to use. He believes technology has to be in place at his school or it would be depriving students of a good, solid high school education.

Taking away computer access wouldn't help students because computers will make them more marketable in the future. You know they won't be as apprehensive to different things if they have them.

However, this was not the case when he went to high school. He tells me that when he graduated, technological knowledge was not necessary to get and hold a decent job. He recognizes that times have changed and describes how his philosophy has changed as well. Principal Nee does not consider himself to be on the cutting edge of classroom technology, but he is positive about its attributes and wants to sustain it in his school for the benefit of the students. OK-ACTS did not categorize Principal Nee as one of the five technology leaders.

Virtual Context

Devout Middle School

As with the other nine schools, the researcher visited [Devout] Middle School's Web Page. Upon entering the web page, the school's mission statement appears, "[Devout] Middle School, through its students, curriculum, staff, facilities and community is committed to excellence. We believe this commitment will provide the opportunity for all students to become successful, contributing citizens."

There are sidebars leading to course descriptions, activities and a school calendar. In a large box in the center of the web page there are instructions for parents to hook up to Parent Connect. There are about ten curricula or professional community links helping teachers, students or parents. Principal Nee's e-mail address is unavailable on the web page; however [Devout] Middle School's main office phone number is available.

IV. Interview of Principal Sheen

White Middle School

April 15, 2005

Principal Sheen works at White Middle School, a suburban school consisting of 50 teachers and 861 students. Currently, 18% of students are enrolled in the free and reduced lunch program, classifying the school as “high socioeconomic status.” Minorities comprise 15% of total students (NCES, 2005).

Waiting for Principal Sheen in White Middle School’s main office, there is much to see. I make my notes hurriedly as if to mimic the pace and atmosphere of this busy space and the wealth of technology available. There is one long counter separating guest seating from the line of secretaries. There are four adult secretaries with three student office aids. There are two desktop computers, three gigantic paper copy machines and five land-line phones. As I wait, a tardy bell rings loudly. An announcement follows, “All students must report to class!” Students casually walk toward the classrooms. The technology of the bell system is apparently failing in this school.

About ten minutes later, Principal Sheen invites me to her office. We walk down a long hallway. As Principal Sheen passes secretaries, she stops to talk four times. She asks one secretary if she had received her e-mail and another if she could pull up the technology budget on her computer. Then she asks another person to check on a teacher’s classroom computer and then she requests one secretary print her newsletter on her printer because it had a prettier ink color.

When we finally enter Principal Sheen’s office, she excuses herself and goes straight to her computer to check her e-mails. She makes a phone call asking if the

school's newsletter got out to all of the parents via e-mail. Before we begin the interview, Principal Sheen says, "As you can see, we *all* use technology at this school *all* of the time."

Principal Sheen believes her district is interested in sustaining technology in order to boost scores on the state's End of Instruction (EOI) exams. She reports that her district believes technology helps students learn and refers to their support several times during the interview. Principal Sheen comments, "Our district's not just, 'I'm going to give you computers.' The district is committed to helping teachers utilize the computers in authentic learning situations and meeting the PASS objectives." Principal Sheen feels that her responsibility in sustaining technology is shared with her district.

Principal Sheen believes that part of her responsibility in sustaining technology is to provide every student with a computer. She does not think that technology can be sustained if there are not enough computers and to that end, she often initiates conversations with district administrators about the technology needed. She is concerned about a low computer to student ratio and feels it poses a problem in terms of what is expected of her by the state. She does not believe that her district will be held accountable for her school's EOI scores but rather that she will alone be judged based on the performance of her students on the EOI. Flustered in speech, she comments that:

It was truly frustrating the other day when we were training our teachers how to do the on-line EOI geography test and we're going to put our kids on there next week to do the practice test and you know I have a limited number of computers, and I've got to test 300 kids. So, I'm in panic mode.

In order to sustain technology, Principal Sheen requires not only district support, but also that the teachers at her school are willing to adapt to new technologies. She explains that she constantly gauges the progress of her teachers' use of technology. Principal Sheen shares an incident revealing how some of her teachers are still not comfortable using technology in an authentic way. This reported incident occurred with a technology in-service held at her school:

We had a phenomenal lady teach a class to our teachers and the teachers asked, 'Well, do you have any handouts?' And she goes, 'No.' She didn't think they needed these handouts. Well, she did this session twice, once in the morning and once in the afternoon. In the morning session she was about to be driven crazy because she had not [brought handouts], and this was my fault and I apologized to her later. I had not prepared her to work with adult learners. She was just going to go in there like with her kids, but the teachers wanted hand-outs. They wanted to take notes. So she had shifted gears with her helper, a veteran teacher and things went so much better in the afternoon.

According to Principal Sheen, although some teachers are still apprehensive of their roles changing in the classroom, many teachers successfully overcame their self-perceived barriers of using technology. She believes that because she supported a lot of the teachers, they were able to overcome several hurdles that they set up for themselves. For example, Principal Sheen tells me about a teacher who used only a typewriter until four years ago and now is probably one of the most highly skilled technologists at the school. The word processor was once unfamiliar and intimidating, but with practice has become indispensable to this teacher such that she feels lost without it. Principal Sheen

understands that teachers overcoming barriers is the key to sustaining technology. In fact, it is common for the most begrudging, traditionally-minded educators, when finally faced with a particular technology, to become the most enthusiastic participants in the end.

Principal Sheen uses both informal and formal staff development on her trek toward helping teachers become more able to sustain technology. Examples of informal staff development include casual conversations about new technologies and students teaching teachers in the classroom. A successful example of informal staff development is given by Principal Sheen:

...and one of the things we saw too was the kids teaching teachers and we didn't plan for this...we took these four students and sent them to a sixth grade teacher who was a very open minded teacher, who was willing to take risks, but just wasn't where she could be technologically. So, we had the kids use the one projector with the computer going to different web sites and kind of teaching and showing her how easy it was and how engaged the kids became. So, I think this was great and I think the students will push teachers to use the computers.

These less formal encounters with technology are often a welcome departure from instruction manuals, development meetings, and scheduled tutorials.

Community investment is seen by her as a motivating factor in sustaining technology. Principal Sheen communicates with parents in the community as part of her effort to sustain technology and affirms that they are supportive and give her positive reinforcement in regard to how technology is being used at her school. She validates this with the passing of bonds in her community for new technologies.

Further, she reports that it is important to her to let the community know how their money is being spent on technology and how this technology is being used by her students:

And like I said, I have a hefty amount of money with the bond issue and I think there are expectations from our community also. They passed the bond issue and that's part of it. We also have phenomenal district support. The district is concerned with the technology they are able to offer students and they are a great help in finding financial resources. I had a phenomenal letter from a parent the other day; she just went through the OK-ACTS and got her computer this fall I think. In one of my PTA newsletters I talked about our grant, talked about technology. So my role also is to keep my cliental not just the ones in the building what we're doing because Middle School kids don't go home and say 'Guess what I did today.' So my whole focus in my letter was to talk about the technology, what we had purchased, about the training the teachers had been doing to encourage parents to ask their students about this. So, I got this phenomenal letter from an eighth grade parent, who is an administrator ...and she was so positive about what we were doing and I got rewarded as she was very, very positive about our school and her child. To have that support, you have got to have your community involved, your district support that shows engagement. We're real fortunate to have a district that is great.

It is very important to Principal Sheen that all visitors wishing to see technology at her school are not disappointed. She explains how she can coordinate teachers and students to use the available technology:

I knew we were having visitors the next week and I wanted to show how the class was using E-Instruction. So, I asked our students, ‘So, I heard that you used the E-Instruction and that’s real cool.’ So I said, ‘how would you like to have it used again next week?’ And the students said, ‘yeah.’ So, the pressure was on the teacher to use it and she made it work.

It is a priority for Principal Sheen that the students and teachers at White Middle School appear to be diligently engulfed in a variety of computer technologies including the internet, email, and educational software. Her interview, materials, and presentations were remarkably well-prepared for this end. OK-ACTS identified Principal Sheen as a technology leader.

Virtual Context

White Middle School

As with all the schools, the researcher visited [White] Middle School’s Web Page. Upon entering the home page, the school’s mission statement appears, “In partnership with the community, we ensure academic excellence; create safe, positive schools; and develop responsible citizens.” There is a [White] Middle School Monthly Newsletter written by Principal Sheen informing parents of current funding and usage of technology at the school. There is also Principal Sheen’s Philosophy page. There are over 20 links to help parents, teachers and students. Examples of links are: On-line learning for teachers to create student lessons, a Math Forum, Project Center for Science and Social Studies projects, classroom connect and global school net.

V. Interview of Principal Shay

All Saints Middle School

April 15, 2005

Principal Shay works at All Saints Middle School - a small, suburban school with a total of 25 teachers and 319 students. Currently, 76% of students are enrolled in the free and reduced lunch program, classifying the school as “high poverty.” Minorities make up 32% of total students (NCES, 2005).

I enter All Saints Middle School into a large, carefully decorated foyer. Windows let the sun illuminate the space. There are several hand-woven Navajo runners over the floor tiles and a grand piano sits in the middle of the room. I enter the main office from a door in back. The office is also spacious and has many paintings and art pieces displayed throughout the room. One secretary sitting behind a large desk looks up from her computer and greets me. She phones Principal Shay and tells her a very important person is here to see her. Principal Shay immediately appears and smiles as she welcomes me to All Saints Middle School.

Principal Shay’s office is comfortable. There are Navajo paintings on the walls. Her desk is large and has a modern desktop computer on it. I sit across from her in a large leather chair. She begins the conversation by thanking me for visiting her school and offers to take me on a tour of the school after our interview. I accept her offer and return thanks.

Before we begin the interview, I ask if I may tape record our conversation. Without hesitation, she says yes. Principal Shay actually begins the interview by saying

that she is excited to share with me what her school has been doing with technology. She is an enthusiastic principal and shares her appreciation for technology.

I ask her for examples of some effective uses of technology at her school leading to sustainability that she would like to share with other principals. Principal Shay smiles as she says, “there is so much; let me think about where I should begin.” Principal Shay states that one of the most important reasons to use technology is to improve state test scores. She is very concerned with her school’s score on the state test. In fact, the majority of her interview deals with how technology helps her boost her state test scores. Principal Shay shares that at her school, “technology is here to stay.” Principal Shay confidently describes how student engagement with technology creates optimism which leads to higher scores:

...with all of the pressures with the state mandated tests and the pressures of the No Child Left Behind ... you know, we just finished those tests yesterday. I think it makes a difference with the scores if kids are used to technology and prefer technology, they will do better testing with technology.

Principal Shay sees a great value in technology and believes that all her teachers are familiar with those principles. Principal Shay contends that technology used as a tool reaches students at all levels of learning from concrete to abstract. Without technology, she believes that the concrete learners in the classroom would be disadvantaged and find it difficult to understand abstract concepts.

The SMART Board has so many visual templates that are built into it. Just as an example in a 7th grade math class, the teacher just had taught and taught and taught equivalent fractions and those kids just couldn’t grasp it. It was so

abstract. But, in the SMART Board they had these visual templates where they could see how $\frac{2}{3}$ is the same thing as $\frac{4}{6}$. Just by clicking a button these pictures rose up and created overlays so they could see. They had that visual to see and so that's something you can't do - overlays in a textbook. It provides that visual learning that so many of the kids need. The concrete learning that 6th and 7th graders are at is what makes this concrete learning tool so valuable.

According to Principal Shay the students are motivated to participate more when they are in a classroom with technology available. She believes student enthusiasm is one of the driving forces in the school and has several examples concerning student motivation before and after technology is introduced. Her earliest observations of classrooms had revealed that students were listening to the teachers and were awake, but rarely participated. The teachers were trying different tactics to get the students to participate and none of them were working. Principal Shay was surprised to see students who were taking notes not be able to read their notes back to the teacher giving her the answer she requested. The tide quickly turned when a new technology was brought into the classroom.

Motivation was important. They would just sit there and look at you and that's a motivation problem. We know that they know it, but they weren't giving it back to us and so we looked for technology that would be motivational for that group of students who would just sit and do nothing. Motivation was important to us. Now you turn on a SMART board and everybody is looking up, paying attention, and raising their hands. They participate because they are interested in technology, it's a new toy. I don't mean it's a toy that doesn't have a serious

purpose, but it's that technology that's motivational to kids because they are used to technology as a play thing. You grow up with a Nintendo and this is how you want to communicate. So when you bring that into the classroom, they sit up and listen and it was just an overnight effect. It is not just one or two students. It has been the most wide-spread effect.... You know when we had them film topics of their choice and you know we have a lot of Native American students, they chose to film Pow-Wows, the students played Indian music, they talked on the videos about real issues like alcoholism. They talked about drug abuse, teenage sex. They handled this very well. The teacher let them express their feelings on these subjects and the teacher got to work very closely with them and those kids just bought into it like wildfire.

Principal Shay always involves her teachers in decisions concerning major technology purchases. She trusts them to know which technology works well because they use it on a daily basis. Teachers at All Saints are becoming more knowledgeable and aware of technology because they are often asked what they might need. Asking her teachers questions about technology is a key component for Principal Shay in sustaining technology. Principal Shay shares how her faculty came to use technology in the classroom:

...and I think even with my teachers there was a great change. Some of us didn't even know about technology. I mean we really didn't. We knew how to e-mail. We knew how to do Word and except for some teachers, like Mrs. Tech who knew a lot, we just didn't know anything and we've learned so much. I just had a teacher say, 'You know I just didn't realize how much I've learned about

technology this past year, because this time last year, I didn't know what a jump drive was or what hyperlink was...I've never used a power point in class.' Now this is all common, we all have a jump drive and we use power points in everything we do. But those things are just becoming second nature now.

Because once you use them they are so powerful, you don't want to go back to the old way.

Principal Shay believes that once technology is adopted by the faculty, they enjoy teaching more as they are encouraged by the amount of student enthusiasm. Principal Shay believes that once the teachers are excited, sustaining technology takes care of itself because at that point, you have an entire faculty that does not want to see technology become irrelevant. Principal Shay gives this example:

I've got the best teacher in the world in there that knows this technology inside out and she gets those kids so pumped up. She's come in several times this year and says, 'I love my job! Have I told you lately thank you for my job?' I mean she just loves it.

According to Principal Shay, OK-ACTS provides her school with authentic technology training. She feels that this training helps in sustaining technology by introducing new tools and new uses for current applications. Principal Shay enthusiastically credits OK-ACTS for training her faculty with the simplest tasks to the more advanced tasks needed to use technology effectively in the classroom. Principal Shay shares her experiences with OK-ACTS and how it helped her teachers:

OK-ACTS provided lots and lots of training. A lot of training right up front and then every month they would be up here and if my teachers said, 'We need just

basic help on the power point.’ They presented the lesson and every teacher went through that training. And they might say, ‘We just need to know how to plug some of this stuff in.’ You know from the very beginning OK-ACTS got out here that day and would start from the very beginning with them. For example, ‘Here is the cord and this is how you plug it, and you push this button...’ and he took them step by step at their comfort level and so they were wonderful people to work with and they made my teachers feel very comfortable and they were able to work at their own speed.

She energetically continues:

And again, I can’t say enough good things about OK-ACTS because they were and they are so good about being right here and answer any question and help us learn. Wherever we are, whatever level we are at, they started there and they helped us. When OK-ACTS would come out, their lessons would be very authentic. Instead of standing up there and saying, ‘This is how you do it.’ they would give a very hands-on lesson. They built a lesson; they built a unit on what we needed. They modeled what the teachers would actually go back and use and give good instruction.

Principal Shay reports that collaboration on a daily basis is one of the most crucial steps in sustaining technology. She says that collaboration began in her school from the beginning when grants were written, approved and followed up with team meetings. She explains that if she did not include teacher input from the beginning, many of the technological innovations introduced to her school would have failed. Principal Shay does not believe that collaboration happens automatically. She believes that it is the

principal's job to lay the foundation for quality collaboration. Principal Shay defines collaboration not as a segmented endeavor led by an elite team of power teachers, but rather an entire faculty effort. Principal Shay illustrates an example of successful collaboration:

We used a lot of collaborative planning. It was not my plan. It was not a few people's plan. It was truly the entire school's plan. We used some professional days to make decisions and we researched what technology can do for student achievement. We asked the staff, 'What do you think we need and to prioritize what we need to improve our student achievement?

Principal Shay emphasizes the importance of making the time for collaborations to occur. In the beginning, she admits that this time was not used by the teachers to talk about technology. In fact, she admits that teachers used this time mainly to grade papers and individually work on their own lesson plans. The idea of teamwork had to be established – that it was not necessarily a naturally occurring phenomenon. She started by encouraging teachers to share ideas concerning curriculum mapping. How to combine their curriculum eventually led to finding resources on the Web. Then, over time, technology became a normal part of the conversations.

While Principal Shay says she supports teachers and does not try to force change because she recognizes that change is seen by several teachers as unsettling or even unnecessary. She believes her role is to present technology as an opportunity for new and better ideas. To be sure, teachers have always faced changes in textbooks or curricula that they may or may not have agreed with.

However, Principal Shay deduces that experiencing change with technology is perceived by the teachers to be more of an obstacle. She illustrates the point:

In the beginning, their conversations, I think talking about technology had to be planned. So, on every Wednesday technology was to be talked about.

Technology talk used to be scheduled because technology was not part of our conversations. It is now. They know that technology is a big part of our school so it is more a part of conversations. But, we're not there yet. I don't want you to think we are a perfect school because we are not. But it's becoming more a natural part of conversations. When teachers are sitting down and talking about lessons and units, it's going to come up more naturally when the teachers say 'Let's go onto Web Quest and see what we can find' or 'Who's going to use the SMART Board on which day?' That's now a part of the conversation. This shows me that technology is here, it's sustained.

Principal Shay talks about positive pressure from the students to sustain technology. She believes that listening to what the students have to say about technology is important. When students experience teaching and learning with technology, she noticed that they do not want to return to the traditional classroom void of technology. Principal Shay says that student exposure to technology in her school also has an impact on the upper level schools in the same district. She offers an example of positive student pressure changing what is expected of school leaders:

I'll tell you that we just have students for two years we are just a sixth and seventh grade school. When they go to [the high school] that doesn't have the technology, the kids are like, 'We don't want to go. They don't have SMART

boards up there; they don't have a Video class up there.' They don't want to go. So, now [the high school] is figuring out, we're going to have to step it up because these kids are going to expect so much more than they used to. So now, they are trying to figure out a way they can get the same technology and keep it going. So the pressure is moving on up. You have a kid who's got all of this and you expect them to go a desk reading a textbook, it's not going to happen. You might as well give them a chunk of stone and a chisel is how they look at it. You know we're still going to have textbooks. There are always going to be those teachers who are tied to their textbooks. But, I think the pressure is going to be not so much from this office, but from the school itself, students and when you've got something really exciting that's happening in a classroom and the kids come over to you, they're going to expect that same level of excitement. That is the type of professional pressure that is there. You have to step up.

Principal Shay believes that once her school had successfully integrated technology in the classroom, All Saints became a role model for other schools in the district. The directors of the OK-ACTS program did identify Principal Shay as one of the five technology leaders in this study.

Virtual Context

All Saints Middle School

As with the other schools, the researcher visited [All Saints] Middle School's web page. Upon entering the web page, the school's mission statement appears, "Where kids in the middle connect their past to their future." Several pictures of students using

technology are also displayed on the page. On the side of the web page, there is a picture of Principal Shay. Beneath the picture is her education philosophy:

The middle school years are ones of transition as students begin to explore their individuality and look towards adulthood. [All Saints] Middle School is served by a highly trained, dedicated staff that strives to meet each child's academic, emotional, and social needs. By integrating proven programs such as Great Expectations and implementing a curriculum that meets or surpasses state and federal standards, and providing state-of-the-art technology and resources...

This web page is unique as it has a technology update section which discusses replacing servers, receiving computers from the IRS, and planned projects. There are over 20 links useful for parents, teachers and students at this site. Examples include: Middle Start website, Wide World Online Courses, China-U.S. Education Conference on Administration & Leadership and Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR-UP).

VI. Interview of Principal North

Pious Junior High School

April 8, 2005

Principal North works at Pious Junior High School, a suburban school with a total of 60 teachers and 1,077 students. Currently, 12% of students are enrolled in the free and reduced lunch program classifying the school as “high socioeconomic status.” Minority students comprise 30% of all students (NCES, 2005).

I wait for Principal North in a large front office – the office, like the school, is brand new and sparkling clean. There are seven secretaries answering telephones and making copies. There are five land-line telephones, two desktop computers and three large copy machines. Parents are waiting in line to check their students out for lunch. Eleven students line the perimeter of the office, slouching in chairs. Six of them are playing hand held video games and one student is text messaging on his cell phone. A student is sitting on the floor as all seats are taken. A piercing tardy bell rings; the students in the hallway are immune. The girl next to me says loudly to no one, “Am I going to be in here all day?” A secretary looks around trying to identify the girl, “Who said that?” All eyes turn toward the girl, yet nothing is said.

A tall lady walks by me glancing at my name tag. She hurries into the hallway to tell students to get to class. A couple of minutes later the lady returns to the main office with a second, professionally-dressed lady and walks down a hallway. A beep, the intercom, a principal asks the secretary if her interviewer has arrived for the 12:00 meeting. The secretary smiles at me, and tells her yes. The secretary brings me to Principal North’s office.

Surprisingly, Principal North is the same lady that hurried past me in the main office with the first lady. I wonder why she didn't introduce herself. Before we begin, Principal North asks if the technology interview is going to be very specific. I reply that the interview only asks for her opinions and observations concerning how technology is sustained in her school. Principal North hesitates and then asks if the school's technology director could listen in on the first part of the interview. Principal North explains that she feels uncomfortable talking about technology "specifics." I say yes. The technology director enters; it is the same lady I just saw with Principal North.

When I ask the first question, Principal North stands up and starts filing folders. The technology director and I wait. At first, I think the interview is going to be between the technology director and myself. However, after Principal North finishes filing, she sits down and begins to answer my question. After Principal North talks for about five minutes, she nods her head at the technology director and the director excuses herself explaining that she has a meeting to attend.

I ask Principal North to share examples of effective technology uses in her school leading to sustainability that she would like to share with other principals. There are so many examples, she explains, but as a parent herself she thinks communication between parents and the school personnel is one of the most effective examples of technology use. While Principal North is talking, she turns her computer on, finds the school's web page and adroitly types in key words that lead her to a site she wants to share with me. Principal North has a daughter attending Pious Junior High School and she shows me how parents could easily find out information about their child's grades and attendance. She quickly types her way through the school's web page without any trouble, showing

me how easy and user-friendly the site is for parents. Principal North says that parents love Parent Connect and she believes they would not put up with the school taking it away from them. She asserts that this type of parental pressure on the school is helpful in sustaining technology. Furthermore, the principal believes that if she has to convince parents that technology is worthwhile, they may not buy in. This would make it difficult to sustain technology as she would have to do it alone - without parental support.

To make Parent Connect successful, Principal North believes it is her job to make sure the content parents seek is on the school's web page. Principal North talks about how she directs her faculty to make parents aware of what is happening in their classrooms:

Every Tuesday and Wednesday teachers are asked to send in what they are doing in their classes, we put that in the e-mail. On our school web site we have a page called School Today, where we list everything that is going on, everything goes home in that patron e-mail goes into that web site. We have pages about the different activities in our school. Any parent that wants to visit our school can just go to the web page; they don't have to physically come here.

Principal North says the majority of communication between parents and her school is through e-mail. She admits that it does take a lot of time to generate and respond to e-mail and yet it is much more efficient than playing "phone tag."

Continuing with other examples of effective technology uses leading to sustainability; Principal North adds that several technology software programs are working well at her school. Principal North says that she and her teachers actively research which software programs have been successful in other schools and then

incorporate them into their school. Spreading the responsibility to research educational technology is part of the process leading toward sustainability. She tells me that the programs they have chosen include reinforcement activities with assessments built in. Her teachers really like the particular software programs that give them statistics on students' test scores. Principal North says teachers also appreciate that technology is helping with students who are home-bound or on suspension, or are home sick for three or four days. Technology allows them to get instruction and take tests on-line.

I then ask Principal North how her teachers have learned to use technology. She pulls out a binder and shows me a faculty handbook and explains that the district technology director put everything a teacher needs to know in the book. Principal North believes that if the teachers do not have access to information needed, they are more likely to stop using technology. She considers part of her duty as principal is to provide every teacher with the information they need.

Principal North shares that she begins each faculty meeting with a set time to talk about technology. Faculty members have used this time to talk about wireless labs, SMART Boards, and DVD players with an LCD projector. Principal North explains that after these faculty meetings, teachers are more comfortable discussing technology and using it in their classrooms.

Faculty meetings are seen by Principal North as a type of informal staff development. Of course, she cites other examples of staff development that she has makes available at her school, including programs offered by the state of Oklahoma and the state's Universities. She also points out that there are several national conferences that offer staff development. Principal North believes providing several staff

development options ensures her school will have teachers helping other teachers' transition into using technology as authentic tools in their classrooms.

Principal North believes some of the most effective staff development programs provide teachers with the technology they need after they are trained. An example she provides is teachers who receive technology as an incentive to complete in-house staff development training. Principal North also shares that teachers receive training outside of the school as well:

As far as sustaining technology as far as training or anything goes, I don't know if you're familiar with House Bill 1815, but a couple of years ago and there were several of us who were master trainers from that and then we have also been trained through SEDL and we train other teachers and the training is cascaded down. Our teachers go and there are levels one, two and three. At level two, they [teachers] get a digital camera and at level three they get a laptop that they use in their classroom. I think that OK-ACTS could help too.

Principal North explains that all of this training could not have come at a better time as her school is preparing to take the on-line state End of Instruction test on geography. She believes that her students will score high as her school had already field-tested the previous year. Principal North also believes her students will perform better on the state test on-line rather than on paper for the simple fact that students are motivated to use computers. "In the past," she explains, "When our students took tests, their attention span was zero, now with a computer...they pay attention."

Principal North is accustomed to having technology; she feels that her school could not go back to the days when technology was not in place. For this reason,

Principal North explains that sustaining technology is no longer a problem and is only getting easier to accomplish. I ask her to explain how sustaining technology is getting easier for her to do and she simply says that parents, teachers and students expect her school to have technology. Principal North also believes that since the state recognizes technology as being responsible, at least partly, for higher test scores, they will also help all schools sustain technology.

Principal North says that when technology in her school is not working, it reinforces the notion of its indispensability. She cites a recent incident where the technology at the school was shut down by a virus that crippled the computer system:

One of your questions about what would be difficult to do in your school without technology, the answer would be everything! It would be like turning off the lights. We had a little virus last year that shut us down for three or four days. I just thought the school was going to shut down. We couldn't do anything. It was a nightmare not only because of the teachers not having their computer, but it pulled some of our teachers out of their classrooms and all day we had to have people cover while we picked up attendance, called home, called teachers that didn't show up, etc...

Principal North believes that the technology already in place is sustained but she expects as new technologies are introduced to her school, she might have to motivate teachers to help sustain it. She believes she could use the above example of how the school almost shut down without technology and how this would not have been the case ten years ago. I ask Principal North what plans she has for new technologies to be sustained at her school in the future and she readily answers:

If we could make changes, this is one thing I would like to see and we have talked about this technology - I would like to see us go to the soft phones so that we could have a phone on every computer and then every teacher could have a phone in their classroom. You would have a hand set, but it would work through the computer. Its telephonia and they are called soft phones. Right now our teachers are using their own phones to let students call their parents. This would be better.

I continue to ask specifically for other examples of how technology may be increasing student achievement. Principal North believes that with technology, students have more electronic resources set in place to help them. She gives an example of all the links her students use on the school's web page such as the on-line Math and English tutorials and the homework help hotline. Principal North believes the students would miss out if these resources were taken away.

Clearly, Principal North feels that burgeoning student exposure to technology is the best long term solution to increasing student achievement. One of her greatest contributions is that she encourages her teachers to teach technology to both students and other teachers. Principal North believes that students are receiving lessons about how to use technology which will enable them to access knowledge throughout their lives. For example, her teachers are being trained to discern Internet fact from fiction and pass that along to students. She expands:

We first teach the teachers how to evaluate websites and then we teach our kids that. How to look at .com, .org, .edu and what each of these mean. For example, if you have something-something.edu, this is going to be more factual more reliable. This will help our students in high school and probably in college. I

think that it helps our school because the students and their parents want our school to have computer skills.

At the end of the interview, Principal North divulges that she still has a lot to learn about technology. She concedes that she learns as much from her teachers at the faculty meetings as they do from her. She also credits the district technology director as a significant resource for her knowledge. Principal North believes that learning about how to sustain technology will be “never ending.” OK-ACTS directors did not classify Principal North as a technology leader.

Virtual Context

Pious Junior High School

When I enter the web page, a large picture of a bird appears; underneath are the words “Welcome to [Pious] Junior High School.” A paragraph giving a brief history of the school is at the bottom of the page. Below is the school’s mission statement:

[Pious] Junior High School is a success-oriented school which strives to provide the Middle level student with exemplary educational opportunities in the core subjects, electives and activities. Educators, parents and the community work together in order for students to acquire necessary knowledge, skills and attitudes to become successful, responsible and productive individuals.”

Alongside the mission statement is a directory listing sites for parents, partners, faculty and students. There is not a message or philosophy statement posted from Principal North. However, her e-mail address is available. On the bottom of the page there is a place for parents to enter the Parent Portal where they can check on their child’s attendance and grades. For each of the subject areas of English, Math, Science, History,

Geography and Reading there are links to educational websites. There are two online software links to TeacherWeb and QUIA and also a reference link to the Oklahoma Technology Association (OTA).

VII. Interview of Principal Ali

Sacred High School

April 2, 2005

Principal Ali works at Sacred High School, a small, rural school with a total of 23 teachers and 294 students. Presently, 47% of the students are enrolled in the free and reduced lunch program defining the school as “middle socioeconomic status.” Minorities make up 38% of total students (NCES, 2005).

I enter through a light colored brick entrance with a large window over the doorway. The high school band is practicing in the adjacent auditorium and fills the hallway with music. I wait in the main office for Principal Ali. I take note of the technology available in the main office. There are two secretaries both with desktop computers, two land-line phones and one paper copy machine. It is morning, and the office is relatively quiet. Principal Ali, a young man, invites me into his office. His land-line phone rings and I ask if he would like me to step out of the office while he talks. He says no and that the secretaries will take a message. Then, Principal Ali’s cell phone rings, and he excuses himself while he answers the call on the second ring. This is the first of several cell phone calls he answers throughout the interview.

I begin with the first question. What are examples of effective uses of technology in your school, leading toward sustainability that you would like to share with other principals? Principal Ali starts by saying that he is impressed with the new educational technologies. He continues to recommend that all principals interested in sustaining technology should research and acquire all that is available. He gives an example:

The SMART Board is a technology helping teachers reach students' unique learning styles and needs as far as understanding abstract concepts. I think the way SMART Boards are set up; teachers have more free time to actually teach the students.

Principal Ali is impressed with SMART Boards and believes all school principals should invest in this specific technology. Principal Ali adds that beyond SMART Boards, the Internet and software programs allow teachers to spend less time presenting and more time engaging the students. Principal Ali believes that technology enhances the pace of student learning. He acknowledges that to sustain technology, principals need to be aware of what technology is available and which grants will allow them to obtain it. He believes that when teachers get technology in their hands, they won't want it taken away. Principal Ali cites a specific example:

In science I have seen a lot of advances in technology and teachers using technology to reach all students. In the past, these same teachers struggled teaching abstract science concepts without technology support. Of course in some instances this did not stop a good teacher from taking the abstract concept and breaking it down to a more understandable concrete level that was appropriate for students. However, this good teacher had to lecture and take up a lot of time drawing on the chalkboard pictures, where now the pictures are already there for the teacher to use. So a teacher can spend more time manipulating these pictures and conversing with the students. The students also have a very realistic image in their mind of what they are actually talking about in class. This helps them remember the material for a longer period of time. The students in the science

classroom also get a lot valuable time hands-on with technology, for example with probes.

Principal Ali emphasizes that, by using technology his school has acquired, his teachers are able to expose students to more information than the textbooks could offer. He says that even if the same information were in the textbooks, most students wouldn't pay attention to it. Because of this, he believes that neither the teachers nor the students will ever let the technology disappear. I ask him to continue with examples of how technology is improving learning and teaching techniques. Principal Ali states that, although his students come to school with a lot of technical knowledge, they are expanding this knowledge at school. He surmises:

Our students know a lot about computers already, I think they always have used computers, but maybe now they are seeing different types of educational uses of computers that they weren't aware of before our teachers started using technology in the classroom to teach and present subjects in new ways. Now, we have to have technology because the students push us. I think it's good.

Principal Ali agrees that all principals should sustain technology in their schools because students need to be confident in their use of technology if they are to gain future employment. He also contends that it is not enough for a school to be satisfied with merely exposing students to available technology. Rather, schools should seek to introduce students to authentic uses of technology as a tool.

These types of hands-on technology projects will help students in future work where they will be expected to perform and use technology in their everyday jobs. So, in this sense I think our teachers are doing a great job with the technology

they are provided with in helping our graduates succeed in the future. I think our students will be more confident out there in the field and truly appreciate the experiences they gained at our high school. So, basically, if principals view technology this way it becomes rewarding for all involved. I talk to other principals and they share similar beliefs about technology as I do.

I ask Principal Ali if all of his teachers are currently using technology in their classrooms daily and he tells me that the great majority of them are. He is very pleased with the progress his faculty is making. Principal Ali is impressed with the momentum of his staff as they are quickly adapting to new technologies. He realizes that this is unusual and he is grateful that his teachers are open-minded. Principal Ali says that he doesn't have to put a lot of effort into encouraging his teachers to talk about technology during in-service workshops. Principal Ali perceives his responsibility in sustaining technology is easier due to the attitude of his teachers:

I think I am really lucky in the fact that the majority of my teachers are very receptive to learning technology. As a principal, I don't have an up-hill battle with my faculty and technology that other schools have. So, again I am lucky to have a great technology faculty. This really helps a school move forward quickly. If there is a lot of resistance from the faculty, the school suffers. These schools have a harder time sustaining technology.

Principal Ali also believes that the drive behind teachers' motivation to use technology is tied in with how principals use technology themselves. Principal Ali explains how leaders are role models for learning communities. He believes technology is best sustained when principals are learning and using new technologies along with

teachers. His theory acknowledges that there is a learning curve to most new technologies. A principal that is willing to navigate that process concurrently with teachers will likely encourage hesitant learners. Principal Ali explains his ideas are at odds with other administrators who believe that teachers should learn new technology themselves and the principal should merely check on their progress. Principal Ali gives instances of how he engages in the learning process to promote sustainability by setting good examples for teachers:

When my teachers see me learning technology through OK-ACTS this helps the teachers. I learn how to use technology mainly through the network they [OK-ACTS] have established. I have met many quality people through the OK-ACTS program, which has helped me grow and learn how to use technology in my school.

Furthermore, Principal Ali believes the staff development a principal offers also affects sustainability. For his school, he believes the OK-ACTS program offers the best staff development. He believes that the authentic training they provide is useful for his teachers. Overall, Principal Ali believes that OK-ACTS offers training that his learning community truly benefits from over time:

OK-ACTS at OU provided a grant for training. This training was very useful and easy for our teachers to incorporate in the daily classroom. The training was presented in many formats and the trainers could train or I really should say teach our whole faculty right down to five teachers. This was probably the best way to get our teachers to learn how to use the most current technology.

Principal Ali further contends that the OK-ACTS network is a means toward introducing teachers to new technology and new ways of thinking, thus increasing the likelihood of sustainability. Principal Ali uses networking as an easy way to gauge his school's success in sustaining technology – that is, he compares the progress at his school with other schools by speaking to other administrators. Principal Ali says that he is constantly looking for technology conferences in order to meet other administrators. Networking, he says, occurs informally at many of the OK-ACTS conferences and training sessions. According to Principal Ali, conversations lead to innovative ideas that he employs at his school. He perceives this sort of networking and the exchange of ideas, to be vital in learning how to sustain technology at his school. It is a critical aspect of his job.

Principal Ali believes that peer teaching among principals is as helpful and vital as that between teachers. A good idea at one school is likely to be a good idea at another school. He believes the commonalities he has with other leaders helps him learn about successful and unsuccessful ways of approaching technological sustainability at his school. Principal Ali recalls how OK-ACTS provides a crucial network that he deems valuable:

I cannot overemphasize how much I learn from the network of principals OK-ACTS has set up for us. I am constantly talking to other principals about what's working and what is not working at their schools. A lot of these principals are very experienced with implementing technology into the curriculum. I share a lot in common with these principals and I think we use each other as resources. I also am involved with OTA and CCOSA. These two associations provide a lot of

workshops for principals. I make it a priority to attend all of these workshops so that I can continue to participate in networking.

Principal Ali encourages networking in his own school. He considers peer teaching to be networking and believes it is successful in helping his school sustain technology. Principal Ali uses peer teaching as a method to teach the entire faculty. He knows it is impossible for him to personally coach the entire staff single-handedly, thus peer teaching is not only useful, but also necessary. Principal Ali does not foresee peer teaching adhering to a formal, administrative agenda. Rather, he believes that if he sets up the time for networking, peer teaching occurs spontaneously. According to Principal Ali, peer-teaching more often than not is a direct result of time allotted for staff development where teachers share their individual experiences with technology.

Our teachers have some workshops. We have even had Saturday workshops at our school. A lot of the staff development occurs as the teachers are helping each other. Right now we have many vertical teams between our departments. Each week these vertical teams, let's say Math, English, and History discuss what is going on in their classrooms. Of course with these discussions, there will be some talk concerning technology.

I ask Principal Ali, "Considering all that you have told me about your students and teachers helping you sustain technology, what might you change, if anything?" Principal Ali shares his desire to involve his community more. Principal Ali answers that when he looks back, evaluating his performance, there are many things he wishes he had done differently. However, he focuses on what he believes to be the most important, which is involving the community more with his school.

I ask him to define community. He replies that community is parents and businesses. He believes that time constraints do not allow him to properly invite the community into the school. I continue to ask how he would involve the community to help sustain technology and Principal Ali answers that the community businesses could help set technology expectations for both the teachers and students.

We already know that without technology our students would not be prepared to enter the future workplace. It would be excellent for the businesses to come into our school and be more specific on the different computer skills needed for different jobs. Right now our technology is broad in its uses and this could be refined with the help of future employers.

Principal Ali believes that if the community businesses share with teachers and students the benefits of being technologically literate, then sustaining technology would become even more inevitable. Principal Ali supports the idea that the more people that are involved with using and promoting technology at his school, the easier his job will be to sustain technology. The OK-ACTS directors define Principal Ali as a technology leader.

Virtual Context

Sacred High School

Upon entering the web page, the school's mission statement appears, "[Sacred] High School is preparing each student for the demands of tomorrow by proving him/her with the best, most appropriate education of today." There is a picture of [Sacred] High School in the middle of the page with links directing one to activities, faculty, academics, athletics and a school calendar. Principal Ali does not have a message or philosophy

statement posted. His e-mail address is available. At the time of the interview, there were no resources offered on the school's web page directing visitors to technology themes.

VIII. Interview of Principal Boren

Holy Hill High School

April 1, 2005

Principal Boren works at Holy Hill High School, a rural school with a total of 11 teachers and 107 students. Currently 60% of the students are enrolled in the free and reduced lunch program defining the school as “middle socioeconomic status.” Minorities make up 9% of total students (NCES, 2005).

The main office of Holy Hill High School is very small. There is one secretary working on a desktop computer, behind her is a large paper copy machine and a land-line phone. The reception area consists of two chairs. The secretary walks around the corner to tell Principal Boren that I have arrived. She returns, excuses herself and leaves the office for about thirty minutes. I am now the only person in the office. A student walks in and asks me if I know where lost and found is. I tell her that I am just visiting. She looks around and leaves. I hear Principal Boren through the office door visiting with parents. I wait an hour and a half before their meeting is over. Principal Boren escorts the parents out and invites me in. He is an older gentleman. His office is small. There are two chairs in front of his desk and a desk in the corner with an old desktop computer.

Principal Boren is very curious about why he was chosen to be interviewed and starts by asking me questions about the OK-ACTS program. He tells me that he has telephoned several other principals in the OK-ACTS program to see if they were being interviewed and found that he was the only one. Principal Boren explains that he values OK-ACTS as the information he has gained from the program has been beneficial. I explain that the OK-ACTS directors chose him and it is most likely because he must have

important information to share concerning how to sustain technology. Principal Boren seems very pleased and becomes anxious to start the interview.

Without my asking the first question, Principal Boren begins talking about the amount of technology he has purchased and how his students are benefiting tremendously from this technology. He gives an example of his science department being technologically driven and successful, motivating him to purchase and sustain more technology. He explains that a new building separated from the main school was constructed for the science classroom. Principal Boren describes the classroom as modern and wants all of his classrooms to be as technologically equipped in the near future.

Principal Boren describes the science classroom as having several computer modules surrounded by floor mats for students to complete hands-on activities aligned with the software programs. Principal Boren also explains that attached to the modules are dissection tables and live animals in glass cases for the students to observe. Principal Boren reports that each of the lessons presented through the software programs are directly tied to Oklahoma's PASS objectives. He believes learning the state's objectives have increased tremendously since the science technology lab has been in use. Principal Boren perceives it is his job to sustain technology in order to meet state objectives. He says that he has researched the software programs thoroughly to make sure they are geared toward helping his students score higher on the state's End of Instruction (EOI) exams. He suggests that other principals in the OK-ACTS program visit his school to see technology sustained and "in action."

Our science technology lab is very effective and it has really helped our PASS scores and it has helped the students to develop an understanding of the abstract principles that are taught in the science classroom because the principle is presented to them as a hands-on activity to learn from. This helps our students now and will continue to help them throughout their life.

I ask him if other departments at his school have similar success with technology. Principal Boren remarks that the other departments do not have the technology they need. He states that he has found there to be massive funding for science and math technology than there is for the humanities. He believes that government funding for the humanities, in time, will become more readily available for schools. For now Principal Boren says that he is working on one department at a time and that the science department is the first to fully incorporate technology. He comments that he does have future plans to find funding and incorporate technology across the entire curriculum.

As the interview continues Principal Boren starts talking about funding available for staff development. Principal Boren believes that quality staff development is necessary if he wants to sustain technology. As the amount of technology varies, Principal Boren believes that it is his job to vary staff development topics tailored specifically to each teacher's needs. He believes this is a more appropriate way to lead staff development at his school and a means toward sustainability. Principal Boren shares a specific example:

We try to provide a lot of in-service or opportunities about everything from the simplest things like taking attendance on-line and using grading software programs, to the more complex topics such as integrating technology with

pedagogy. All of my teachers vary in how much training they need in each of these areas. As our school gets more technology, our staff will get more opportunities to learn about the new technology. We never have the same technology topics at all of our in-services.

Principal Boren reports that during staff development his teachers talk to him about getting more technology for their rooms. Principal Boren says that his teachers are interested in creating a technological environment similar to the science department. Principal Boren shares that his teachers in other departments have seen the level of student motivation to learn science increase and wish they could offer the same technology for their subject areas. He continues to explain that there is technology available in their classrooms, just not as much and not as fully incorporated. Principal Boren says that as he listens to teachers, he realizes that he must acquire more technology and quickly.

Principal Boren explains that the students also want more technology available in all of the classrooms. He states that students needs make him sustain technology. Principal Boren reports that students do have access to the Internet in some rooms and benefit from this as they learn how to apply to colleges on-line and most importantly fill out their Financial Aid for Student Assistance (FAFSA) forms. Principal Boren believes that without access to the Internet, the school would be limited in helping students transition into higher education. He reports that students and teachers are helping him sustain technology as they believe it provides opportunities to access crucial information.

Beyond the examples already given, Principal Boren continues to share more instances of authentic uses of technology. He shares that his students give a media presentation to the community at the end of each school year.

Our seniors create a multi-media presentation for their graduation ceremony. This project takes them all year to complete. They learn how to take senior pictures with a digital camera, scan them, put them into power point, create a sound component and insert video clips. The entire community sees this presentation at graduation and I receive many compliments from parents who are impressed with their kid's ability to put this type of presentation together.

Principal Boren believes it is important to show the community, whenever possible, what the school is doing with technology. He believes that the ties between the community and the school are strengthened if the community believes his school is teaching students to be prepared for the future. When ties are strengthened, Principal Boren says that the community also wants technology sustained at their school. He believes that principals who wish to sustain technology should always invite the community into the school. Principal Boren sees his community becoming more interested and as a result investing more time and money for the school to sustain technology.

Principal Boren says that, not only is it important for the community to invest in technology, but according to him, it is important that the whole community benefit from using technology. In Principal Boren's opinion, technology would be more likely sustained if the entire community benefits.

We have to keep our community involved and as technology comes and grows and you asked me what we would use to advance our technology if we had all the

time and the money we wanted, you know I think we have to invest some time and money into educating our adults also in our district. It would be good if we could keep a facility open at night. This would broaden both the students' and adults' abilities to use technology.

Principal Boren believes that it is important to increase the parents and students' ability in using technology, as this is a skill they will need for life. He enthusiastically supports the use of technology, as he believes technology is the way of the future. He strongly believes that if his students are unable to use technology, they will not succeed in college or be able to find a job. He perceives it is his job to keep current with what colleges and business are looking for and make sure his students are capable of meeting their demands. Principal Boren also believes that he need not only look at what is expected today, but what may be expected tomorrow. Principal Boren comments that no one knows what technology will be like in the next twenty years, so it is important that his students leave his school with basic concepts so they can apply to a broad range of new technologies.

In the last 20 years technology has changed far beyond our expectations and in the next 20 years it will continue to surpass our expectations. In the next 20 years it is going to be important that they [students have a solid base of diverse skills and have a feeling of 'I can be competent in this if I have some more basic training.'

Principal Boren is not defined as a technology leader by the OK-ACTS directors.

Virtual Context

Holy Hill High School

The researcher visited [Holy Hill] High School's web page. The school's web page does not have a mission statement. There is a picture of high school students holding an award, yet there is no description of what the award is for. On the side of the page there are links to the school board, when clicked on a list of school board members appear. The next link lists all of the district administrators and faculty with their e-mail addresses. Student Council, 4-H, and F.F.A. are listed, however when they are clicked on, they lead to blank pages. The school's web page does not offer any technology resources and shares little information about the school with a visitor.

IX. Interview of Principal Sky

Blessed High School

April 29, 2005

Principal Sky works at Blessed High School, a rural school with a total of 8 teachers and 120 students. Currently there are 63% of the students enrolled in the free and reduced lunch program defining the school as “middle socioeconomic status.” Minorities comprise 33% of all students (NCES, 2005).

Blessed High School is a large campus consisting of several detached buildings. The buildings are not labeled and I have a difficult time locating Principal Sky’s office. I go into one of the unmarked buildings and the hallway lights are off. I do find one classroom lit with a student working on a laptop. I ask her where Principal Sky’s office is and she gives me directions.

I enter the main administrative building. It looks like a soda warehouse. There are dozens of soda cases stacked all over the main office. It is difficult to take note of the technology available. I work my way forward to the secretary. She is in a small cubicle and is working on a laptop. She calls Principal Sky on a cell phone to tell him that I have arrived.

About 20 minutes later Principal Sky, a younger man, enters the building and invites me to his office. His office looks like a technology warehouse. There are several computer parts and computers obviously being repaired. There is also a table of several laptops. A large T.V. monitor hangs from the ceiling. Principal Sky apologizes for his attire and explains that it is casual Friday. He offers me a chair. Behind me, a man starts speaking from the T.V. monitor and says hello. Surprised, I turn around and Principal

Sky introduces the T.V. man as his technology assistant. They talk for a few minutes about a parent meeting to be held later that afternoon. Then Principal Sky gives me his full attention. However, before we begin his laptop beeps and he checks it quickly.

When we try to begin again, his cell phone rings and he answers, his conversation lasts less than a minute. Throughout this entire interview, his cell phone was ringing, his e-mail was beeping and people were stopping by the T.V. monitor to ask quick questions.

When we finally begin, I ask Principal Sky what are the most effective uses of technology leading to sustainability that he would share with other principals. Principal Sky says that most principals would probably want to know how sustaining technology helps his school score higher on the state's EOI exams and meet NCLB. Principal Sky says his teachers use on-line practice tests to give pre and post tests as preparation for state testing. He also shares that teachers use several software programs helping students understand state objectives. Principal Sky suggests that principals interested in sustaining technology will be successful if they create a clear purpose for technology by aligning specific technology with NCLB and PASS objectives.

We are coming to that point in time with NCLB, which requires us to emphasize technology. Are we knocking the ceiling out? No, but we feel like we're better prepared because of these experiences afforded to us through the use of technology... We use a lot of on-line programs such as UNITED STREAMING, which is basically a data bank of videos, curriculum, it's aligned to national and Oklahoma PASS objectives that are segmented up helping to reinforce teaching.

Principal Sky believes technology as a tool enables his teachers to think about content and how it's related to national and state objectives. He says that technology

should not be used as a tool to teach to the tests, however, if a school is focusing on PASS objectives, they are teaching to the test. Principal Sky believes a lot of his teachers look at a PASS objective and then use technology to find resources to reinforce the objective. He remarks that by incorporating the Internet testing resources, his school has been able to boost test scores. Principal Sky explains that these on-line assessments he uses have a similar feel as the state mandated assessments. He reports that he has already seen an improvement with his students' ability to test well.

We're already seeing it with our seventh grade. We just spent a week testing; you know the paper, pencil test. The students looked at that test as pointless, they were not interested. Then we do another geography test on-line and they're 100% engaged. The teachers didn't even have to explain it to them they were ready to go. They were far more engaged and I think that just proves the point that the technology keeps them engaged. I don't think the students would let us get away with not having technology available.

During the interview, Principal Sky is very enthusiastic about technology. However, he does not seem amused when talking about the state-testing program. Off the tape, he makes it clear that he is not impressed by the state test and refers to it as a "game" his school has to play. Principal Sky does not perceive the imposed state test is worth the time allotted to prepare for it.

Continuing with the interview, Principal Sky shares how he introduces technology to his teachers. He uses in an informal, even indirect, manner. He shares an example of how this method works. Confident in the success of his method, he believes all principals should introduce technology in a similar manner. He believes how you put

technology into teachers' hands is directly related to sustainability. Principal Sky stresses that principals should never give technology to teachers with mandates. Rather, he believes principals need to help teacher's transition from using technology in their personal lives to eventually using it in a classroom setting:

We gave them this stuff and started with, 'wouldn't you like to get some digital photos of your grandkids? Wouldn't you like to make a little video of your dog?' We threw these ideas out there that met them where they were. We didn't start in heavy with the curriculum. Then their eyes started to light up and they had an excellent comfort level with it. The process worked because a teacher is not going to push anything out that makes them look like a dummy. If they feel like, 'Well, Johnny knows more than I do, there is no way I can do this because he's going to ask some question that I'm not going to be able to answer.' But, no, at this point they're thinking, 'you know I can do this. I can e-mail. I can make videos.'

Principal Sky believes that by taking the time to introduce technology slowly and following up with ways to help teachers become confident in their abilities is necessary to sustain technology. Principal Sky believes that if principals do not follow through, teachers will put technology aside. Thus hindering the changes needed for technology to become a permanent, useful tool in the classroom:

The laptops truly became the tool to get teachers over that obstacle of, 'Okay that was really cool, but I don't have time.' and eventually the equipment gets pushed aside. Now the teachers have that laptop open everyday, every hour. They're keeping data they're keeping their grade books. They're becoming more

comfortable with the technology. This didn't happen overnight, I still had some teachers dragging behind, and you know 'I'm not going to do this. I really dread this.' And now if you talk to those teachers that just said, 'I don't want to deal with this. I want to avoid this, retire, squeak out and hopefully never have to do this.' They love it. I've had teachers say, 'I'm one of the ones who went behind your back and said I don't want to do this, and now I can't imagine what I would do if I didn't have this.'

Principal Sky believes that when technology is used correctly and teachers become more enthusiastic, sustaining technology becomes easier. Principal Sky shares that some teachers are successful with technology and as a result are enjoying their jobs more. Principal Sky recaptures a conversation that shows the enthusiasm of a teacher who once avoided technology and now appreciates it. He tells me that the other day he ran into one of his teachers in the hallway. The teacher stopped to talk to him. She first thanked him for her job and then explained that in the last two month she has had two job offers and turned them both down because they did not have the technology she needed to teach with. Principal Sky explains that this is not an uncommon discussion between his teachers and him.

It's where they're turning down opportunities to move upward financially because with technology, they see the opportunities they have to reach students in an on-going effective way that integrates into the classroom, into the curriculum. It's not just a warm-gooshy. If it's a warm-gooshy, it's time for me to move on. What we're doing is creating educational authentic experiences through technology.

Principal Sky then brings up another element needed to sustain technology, staff development. He shares how his perception of staff development has evolved over time. Principal Sky notes the traditional format of staff development was flawed and ultimately unsuccessful. He admits that he did not support staff development until he discovered value in it just recently. Principal Sky believes that the new staff development format is now helping him to sustain technology. Principal Sky shares that he thinks some administrators look at staff development as he once did, a waste of time. He agrees it is a waste if it's one-hour snippets introducing technology without showing teachers how to implement it. However, he believes that if the principals are able to use a new staff development approach, they may find it beneficial.

Principal Sky shares that since NCLB staff development requirements were put in place, he has learned what sustained on-going professional development is and he sees this new format as working for his school. He also reports that OK-ACTS has changed his point of view concerning staff development. Principal Sky believes it is his job to provide worthwhile staff development for his teachers, if he wants to see technology sustained. Furthermore, Principal Sky shares that it is important that he learns alongside teachers during staff development sessions. Principal Sky believes his presence influences teachers' belief in the worthiness of staff development.

You can't give teachers a three-hour snippet and say, 'Go get it tiger.' You can't just expect success there. You have to introduce it. You have to personally engage in it. You have to come up and do follow-ups to get them to the next level. Then they get hungry and ask for more. At that point, you give them more. That's what staff development is.

Principal Sky believes that principals should create more opportunities for teachers to learn exceeding the minimal amount of staff development required by the state. Principal Sky shares how he increases attendance at optional, extra staff development sessions. He rewards teacher attendance by giving them technology:

We didn't have stipends for professional development to put money into the teacher's pocket. What we committed to was training teachers and giving [teachers] tools. So we offered training for technology.

I ask him if teachers not attending these training sessions not only get less technology, but get less attention as well. Principal Sky shakes his head no; he firmly believes that all teachers must be given attention if sustainability is to occur. When talking to his teachers that are less inclined to use technology, Principal Sky finds that many of these teachers' perceived failures to use technology are sometimes false, due to the claim that conditions are not ideal. That is, teachers complain of a lack of the latest, fastest computers running the most up-to-date software – as why they are unable to make the effort to transition. In general, Principal Sky is not stirred by this excuse.

I think in talking to educators, one of the main faults I see is that they [principals] keep replacing these computers that are sitting on their desks that are lab type things and the teacher's mentality is, 'We need more student computers.' If they have 40 students, they want 40 computers, but the bottom line is this, each teacher can teach no matter what the quantity is. The teachers needs to make content come alive at a different level, it's not just let's get each student on their own computer so they can do their own on-line review and than I can sit and grade papers. That's not the process here.

Principal Sky is tackling this issue with staff development. He believes that teachers are becoming empowered and learn that it is not about technology, but how they use technology. Principal Sky uses this as an example of how staff development is directly related to sustaining technology. Principal Sky believes that successful staff development leads to increased use of technology leading to increase authentic teaching and learning.

Principal Sky reports that technology enhances student achievement, as it becomes a tool to adjust to students' learning styles and increases motivation. He explains that sustaining technology applies to all students' educational experience in a positive sense. Principal Sky believes that technology is directly related to student performance as it immediately connects to students' needs interests, and learning styles. He talks about a presentation titled, 'Teaching to the Nintendo Age,' and how this was a useful presentation for his school.

This post MTV generation learns with technology, not with books. They learn better watching videos. They demand technology. We do interactive things on-line. Most of our guided instruction comes through the instructor utilizing technology. With instruction being developed around the senses, it's far better than the traditional instructional platform. New technologies addresses auditory and visual, it's more kinesthetic. Video presentations are far more engaging. Students are on task more than what they would be otherwise. They're engaged more often than not. Kid's still are sometimes bored or sometimes daydreaming, but I think what you would find is that they are not doing this as often.

Principal Sky tells me that if students are not prepared to use technology after high school, they are at a loss compared to other high school graduates. He expresses

that it is important for his students to not only be able to use computers in the future, but also in their present schooling experience. At his school where textbooks are being replaced by laptops, students have to adapt quickly:

Once they reach that point where they're in the business class or they go to a class where the laptops are in front of them day in and day out where the laptop is their textbook they adapt to that technology far easier and I think that's what will transfer with them beyond high school and into college or when they are in the world of work, they are going to be ready for their work environment.

Principal Sky shares that student recognition for their use of technology continues to support their motivation to learn. He reports that local, state and national attention focusing on the students' use of technology makes them realize their ability to use technology in the educational setting is important. Principal Sky relates that the national attention his school gains increases student and parent motivation to sustain technology at their school. He uses the example that some schools have a football team that wins a state football championship every year and the thing they brag about every year is that they're football state champions. Other schools have basketball, some schools have track. Our students have technology and they are widely recognized in this region as technology leaders.

They [students] noticed other schools to starting to visit, other teachers visiting, the Tandberg representatives visiting here. They see these people coming and going. For example, they see Apple executives from Oklahoma visiting and suddenly we get a magazine spot and see this all as positive. So, I think they've embraced it because suddenly this is one of our platforms.

Principal Sky believes recognition creates a positive pressure for sustaining technology from both students and parents. Principal Sky believes that it is important to not only communicate to the community what is happening at your school with technology, but also making sure that the community understands. Principal Sky talks about the value of two-way conversations between the school and community. He recognizes that parents in the community do not always understand the technology being used, as it was not part of their public schooling experience. Overall, Principal Sky is well versed and is able to communicate effectively his ideas concerning technological sustainability. The OK-ACTS directors define Principal Sky as one of the five technology leaders.

Virtual Context

Blessed High School

The researcher visited [Blessed] High School's web page. The school's web page mission statement scrolls across the top "We are focused on providing the highest quality education possible by actively utilizing technology throughout our district." There is a principal's message and several links for parents, faculty, students and administrators to use. Some example links are MarcoPolo, Virtual Field Trips, Video Resources, the Oklahoma State Department of Education and a link to a virtual professional development center. The faculty has several on-line resources available through the school web page such as DVD production with IDVD, Video Conferencing, Digital Music with iTunes, and Digital Photography with IPhoto and Digital Movie-Making with IMovie. There is a link for parents to give the school feedback. There is a Tandberg

ERate Webcast-Live discussing funds for learning. Besides the technological resources listed, there are over 20 more resources available to the community.

X. Interview of Principal Frater

Divine High School

April 8, 2005

Principal Frater works at Divine High School, a rural school with a total of 49 teachers and 761 students. Presently, 36% of students enrolled in the free and reduced lunch program 36 defining the school as “high socioeconomic status.” Minorities make up 11% of total students (NCES, 2005).

Divine High School is a modern building. Walking into the high school, I notice several students in the parking lot talking on their cell phones. I enter the main office; there is one secretary with a desktop computer, two paper copy machines and a land-line phone. I sign the high school’s visitor roster and receive a visitor nametag. The secretary tells me it will be about 15 minutes before Principal Frater will be able to visit with me. The office is busy with several students asking permission to see the principal. They all wait in line with me.

Principal Frater enters, says hello and tells me to follow him. His office is larger than the main office. There is a conference table with several chairs and his desk. He has two desktop computers turned off. His phone rings and he doesn’t acknowledge the sound. Principal Frater waits for me to start talking. I ask him, “What are some effective uses of technology leading to sustainability that you would like to share with other principals?” He answers, “There is a lot of technology at my school.”

I ask him how this technology is useful, Principal Frater tells me that it helps teachers and improves learning. I ask him to give an example. Principal Frater says; “I

try to get as many LCD projectors as I can into the teachers' classrooms because I believe projectors help students learn".

You can take your computer, connect it to the projector and there are so many kids today that are such visual learners due to the video games, etc. We're trying to promote the usage of the visual learning aids by projecting it instead of reading the book. We may take a clip and paste it on our computer and then project it onto the room and then it's a lot easier for them [students] to pick it up. They know what's going on in the classroom.

Principal Frater says in general, technology helps his school perform better on tests. He states that without technology, his school would not meet NCLB and PASS objectives. Although Principal Frater is interested in meeting these objectives, he does believe there are too many government mandates placed on his school. Principal Frater is obviously annoyed with imposed mandates. However, although he is irritated he believes his school must meet these demands and he is grateful that technology is helping his school meet these directives:

...We're asked to do so many things for these kids and there are so many stipulations and regulations put on by the state government, the federal government, and the local board. You know we don't have time to do everything we need to do but one by one we're using technology to help. One of our focus points this year is reading here and we found a new reading software program that's strictly a visual reading program - it's visual through a projector, coming off the Internet through the computer. We also have two computer labs, which my ACT prep teacher uses it for practice, getting her kids ready to take the ACT test.

You hope these programs tie to your PASS objectives and you hope you can improve your EOI scores. You know those are our two big measuring points.

To help the teachers use technology, Principal Frater believes that staff development is the answer. Principal Frater enthusiastically supports staff development. For Principal Frater, when teachers learn about technology, they start motivating the entire faculty, which results in sustainability. Principal Frater does not believe it is his job to introduce staff development topics, he believes that teachers need to find these by themselves. He admits that although OK-ACTS may have good staff development, he only suggests it as an option. Principal Frater shares his philosophy of staff development and how it helps sustain technology throughout his school:

We pretty much allow them to go to anything they want to go to. I'm a big believer in professional development. You know if there's something out there that a teacher wants to go to that would better them, I'll let them go. They are given so many days a year, but if they go over that because they're trying to make themselves better which in turn is going to make the students better, I'm going to let them go. And I think it spreads. When a teacher sees what another teacher has done, they think 'Man, maybe I need to do that.'

Although Principal Frater believes there have been a lot of successes with staff development, he reports that there are still teachers who use the computer inappropriately as they are just adding the technology on to their traditional teaching methods. Principal Frater believes this must be addressed if he wants to sustain technology. He gives an example of one teacher who has students first take pencil and paper tests and once they're finished, they enter their answers into the computer.

Principal Frater shares that the majority of his teachers are adapting to their new roles in the classroom using technology to teach to several different learning styles. The idea of the learning community's comfort level is important to him as it pertains to sustaining technology. Principal Frater gives an example of how teachers overcame barriers to using technology. His story shows teachers' progression in thinking.

Well, I think the big change that we've seen is breaking down the barrier. We had so many teachers who were absolutely afraid of the computer. I mean, 'I just don't want one. I don't even know how to turn one on.' But I think the biggest change is the acceptance. Now they are using them.

Principal Frater believes students have a large part in helping teachers overcome barriers to use technology. In this manner, Principal Frater states that students are helping him to sustain technology. He shares that a lot of his students are using the skills that they learned in computer class, for example power point, and creating presentations for teachers. He gives an example of one girl who is heavily involved with Future Farmer's of America (FFA) and how she gave a power point presentation to a biology class breaking down the nutritional value of a bag of feed. Principal Frater says that the girl's presentation left an impression on the biology teacher that technology needed to be incorporated into his classroom.

Principal Frater continues telling me that the same student presented her power point presentation at the FFA banquet and that many parents were impressed with the ability of this student to use technology. Principal Frater believes the student's presentation at the FFA banquet was a pivotal step in trying to sustain technology. According to Principal Frater, parents, teachers, administrators and other students at the

banquet all became very interested in technology and were motivated to keep the technology at the school. Principal Frater believes this is the point in time where sustaining technology became more of a shared responsibility that he was a part of, rather than in charge of. Principal Frater is looking forward to future community involvement and says that the school's radio station currently being developed should further involve the community in sustaining technology at the school.

Principal Frater uses the school's web page as another example of how technology motivates parents to sustain technology. He explains that all of the students' grades are available to parents through the school's web page. He shares that before grades were available on-line there were few parent- teacher contacts. Now that the grades and the teacher's e-mails are available, he says that communication has increased tremendously.

Principal Frater tells me that the best advice he could give another principal trying to sustain technology would be "don't limit yourself."

Always be open to new ideas, regardless of who they are from. You know it may be a parent, it may be a teacher, it may be a student, and it may be an advertisement you saw on T.V. You're only limited to time and money. They are the only things that are holding us back. You know if you had an endless amount of time and money, you know there's no telling in how much you could incorporate into your teaching and lessons. And that's what kids are about. They don't go home and play football or baseball like they did in the old days. They want to play video games and surf on the Internet. So, schools have to change. If they don't put technology in, the students will go to another school.

The OK-ACTS directors do not define Principal Frater as a technology leader.

Virtual Context

Divine High School

The researcher visited Divine High School's web page. The school's web page states the mission statement, "Because we believe all children can learn, our mission is to educate each child through a partnership of home, school and community to become a productive citizen of society who will make good life choices in a world of change." When you click on the administration box, the principal's name and e-mail address appear. There are boxes to access the school calendar, district information, job postings, student grades, children's nutrition and the school's technology department. The technology department provides a monthly newsletter sharing its goals, accountability system and successes. There are links useful to faculty concerning technology integration, national and state standards, grants and teacher tools and templates. There are also several resources for students such as homework connect, career planning, a writing tutorial and links to on-line resources.

CHAPTER 5

Findings

The study sought to answer: How do secondary principals perceive their responsibility in sustaining technology? In chapter one, the definition of technological sustainability was established. In chapter two, the literature review identified themes related to technological sustainability. Chapter three detailed the use of phenomenology as a method to inform ‘how’ secondary principals perceived their responsibility to sustain technology. Chapter four presented secondary principals’ interviews as vignettes.

This chapter analyzes data revealing five emerging themes extending and deepening those presented in the literature review. The secondary principals not only identified these five themes as impacting their responsibilities in sustaining technology, but were also able to discuss in great length *how* they dealt with the five themes.

Theme I: Perceptions of National and State Expectations

Theme II: Leading Toward Post-Industrial Schooling

Theme III: Committing to Change

Theme IV: Evolving Learning Communities

Theme V: Students and Technology

These five themes serve to reduce the void of phenomenological studies concerning secondary principals’ perceptions of their responsibility in sustaining technology.

Secondary principals were asked to describe their responsibilities to refine and improve efforts to sustain technology. Secondary principals’ collective experiences were the foundation for the study’s findings and conclusions. In continuance with the current review of the literature, the importance of technological sustainability was stressed as a

function of its success or failure. Several elements within the literature review recognized the value of sustaining technology and yet did not present research concerning secondary principals' perceived role in this endeavor. Within the literature, there was certainly an abundance of objectives, standards, and performance indicators for secondary principals to use as a guide in leading sustainability. What the literature lacked, however, was a description of how secondary principals defined and interpreted these objectives and moreover how they perceived, if at all, their responsibilities to sustain technology.

The literature in its entirety emphasized technology and sustainability as a necessary element of increasing student performance and success – and that secondary principals had the important job of obtaining and maintaining the technology. This study went a step further and specifically defined how secondary principals perceived their role in sustaining technology and what value technology would have in long-term student success when it was properly implemented. An overview of integrated themes detailed in the literature review is summarized in Table 2.

Table 2

Literature Review Themes Summarized

Theme I National & State Expectations	The Nation & the School 1) NCLB 2) Oklahoma PASS E.O.I. Test Scores 3) Student Success to Pursue Higher Education/Employment 4) Graduating Responsible Citizens
Theme II New Technologies & Society	Technological Innovations 1) Industry Expectations of Level of Technological Literacy 2) Comparison of Technology in Society & in Schools
Theme III Desirable Leadership Traits	Secondary Principals' Role 1) Life-long Learner 2) Models Positive Behavior 3) Visionary 4) Change Agent
Theme IV Characteristics	The Learning Community 1) Collaborating 2) Accepting Change
Theme V Practices	Teachers 1) Use Technology Daily 2) Use Technology Authentically 3) Adapts to Change
Theme VI Skills	Increased Student Achievement 1) Comprehending Abstract Concepts 2) Solving Real Dilemmas 3) Evaluating Facts
Theme VII Components	Complexity Theory 1) School is a complex open-system 2) Instability co-exists with change

As outlined in Table 2, the literature review discussed what components affected technological sustainability. In this chapter, how secondary principals perceived or dismissed these components in their effort to sustain technology was revealed.

Theme I: Perceptions of National and State Expectations

Perceived Accountability

All of the secondary principals in this study expressed in detail how national and state expectations were perceived and how these expectations affected their responsibilities in sustaining technology. The secondary principals' understandings of national and state agendas were well thought out. Secondary principals consistently referred to the No Child Left Behind (NCLB) law and Oklahoma's Priority Academic Student Skills (PASS) objectives in their interviews. For interviewees, technology was considered helpful in meeting legislative NCLB demands and the Oklahoma State PASS objectives.

Principal Shay was very concerned with her school's score on the state test. In fact, the majority of her interview dealt with how technology helped her boost her state test scores:

...with all of the pressures with the state mandated tests and the pressures of the No Child Left Behind ... you know, we just finished those tests yesterday. I think it makes a difference with the scores if kids use technology and prefer technology, they will do better testing with technology.

Principal Frater stated that without technology, his school would not meet NCLB and PASS objectives. He believed his school must meet these demands, and acknowledged that technology was helping his school meet these directives:

...We're asked to do so many things for these kids and there are so many stipulations and regulations put on by the state government, the federal government, and the local board... You hope these programs tie to your PASS objectives and you hope you can improve your EOI scores. You know those are our two big measuring points.

In this study, as reported by secondary principals, motivation to sustain technology rose from their desire for their schools to score high on the Oklahoma State End of Instruction (EOI) exams. Principals used on-line practice tests as preparation for exams. Principals aligned specific technology, student engagement, NCLB and Oklahoma PASS objectives, thus creating a clear purpose for perceived roles in sustaining technology.

Principal Sky stated that sustaining technology helped his school score higher on the state's EOI exams and meet NCLB mandates. Principal Sky believed that sustaining technology was more likely if one created a clear purpose for technology by aligning specific technology with NCLB and PASS objectives:

We are coming to that point in time with NCLB, which requires us to emphasize technology... We use a lot of on-line programs such as UNITED STREAMING, which is basically a data bank of videos, curriculum. It's aligned to national and Oklahoma PASS objectives that are segmented up helping to reinforce teaching.

Principal Sky believed technology as a tool enabled his teachers to think about content and how it was related to national and state objectives. Principal Sky believed many of his teachers looked at a PASS objective and then used technology to find

resources to reinforce the objective. He remarked that by incorporating the Internet testing resources, his school was able to boost test scores.

Value of Financial Assistance

Federal and state funding was reported by the secondary principals as a necessity in order to meet current legislative mandates. Secondary principals related technology funding with greater prospects for students. Principals perceived their responsibilities in sustaining technology were helped by national and state funding. Principals did not speak in broad terms in reference to funding, but rather they described in great detail specific funding received and how it was spent. Principals readily and familiarly listed state and federal funding programs. Principal Brew associated funding with increased opportunities for students:

For all of our seniors, we use the GEAR UP funds. GEAR UP is mountains of money. We've used literally hundreds and hundreds of thousands of dollars for technology like laptop computers, trainers, etc. GEAR UP is just technology rich funding. It's used for the purpose of moving kids up to higher education.

Secondary principals reported that government funds were directly related to increased opportunities for students as it allowed for purchasing essential technology and paying for critical staff development. Principal Dee confirmed this statement:

... Now, the federal assistance, the E-Rate, the MAPS for kids, the GEAR UP, Title I grants allows, especially our kids, to have the same level of technology as some of the other districts because you know we're a poor district... You know if we envision our school without all the grants supporting the technology, buying

the technology and training us to use technology and all of that, you know it would be a detriment to our students not to have that.

Throughout the interviews, it was evident that the secondary principals believed it was their responsibility to search for grants, be awarded grants and manage a budget for technology. All secondary principals considered writing for, receiving and budgeting federal grant money a fundamental step in successfully sustaining technology. Although all of the secondary principals reported that applying for technology grants was critical, they did not all claim to be successful with this task. According to the interviews, five of the ten schools had more than one assistant principal (or professional grant writers or district technology support) and often secured grants. Conversely, the other five schools had only one secondary principal and no aid from professional/district grant writers and did not secure grants nearly as often. The following two examples illustrate the drastic differences in district resources available to help principals write grant proposals.

At Devout Middle School, Principal Nee admitted that although computers were good for his school, he did not have time to get the available tech funding - making it difficult to sustain technology. He told me that a principal's schedule makes it impossible to apply for all of the federal and state grants. He said that a technology grant writer was needed at his school to help get more computers. He believed grant writers were essential for a school to obtain and sustain technology:

It's hard. We need more computers, and I need help getting more. It's frustrating that there is money for us, and I don't have time to get the money needed. We don't have grant writers at our school.

Principal Nee told me that he received a lot of information and grant applications in the mail - so many that he did not have time to read them all. He was disappointed because he realized that his school could surely benefit from the purchase of more computers.

In contrast, Principal Sheen at White Middle School consistently referred to her district's financial support several times during her interview:

And like I said, I have a hefty amount of money with the bond issue, and I think there are expectations from our community also. They passed the bond issue, and that's part of it. We also have phenomenal district support. The district is concerned with the technology they are able to offer students, and they are a great help in finding financial resources.

Principal Sheen's school district has a technology planning committee, district technology team, technology sites contact team, an instructional technology center, a district computer center, a technology warehouse, technology site contact person, a director of technology purchasing, a technology purchase secretary, two technology support specialists, a network manager, and a technology support manager. Furthermore, there are technology integration rubrics a principal can use to assess and evaluate their site's technology planning and design. Principal Sheen has a multitude of resources available and is more likely to successfully secure grants for her school than Principal Nee can for his school.

Theme II: Leading Toward Post-Industrial Schooling

Transforming Educational Infrastructure

The emphasis placed on post-industrial schools was defined as graduating technologically literate students. Graduating students to succeed in the future was a shared concern for both educators and employers. The connections between industry, education and society as a whole were a common theme reported by the secondary principals' as motivation to sustain technology.

Principal Ali believed all principals should sustain technology in their schools because students need to be confident in their use of technology if they are to gain future employment. He also contended that it is not enough for a school to be satisfied with merely exposing students to available technology. Rather, schools should seek to introduce students to authentic uses of technology as a tool.

Principal Ali shared:

Hands-on technology projects will help students in future work where they will be expected to perform and use technology in their everyday jobs. So, in this sense I think our teachers are doing a great job with the technology they are provided with helping our graduates succeed in the future. I think our students will be more confident out there in the field and truly appreciate the experiences they gained at our high school. So, basically, if principals view technology this way it becomes rewarding for all involved.

Principal Boren commented that no one knows what technology will be like in the next twenty years, so it is important that students leave his school with basic concepts they can apply to a broad range of new technologies:

In the last 20 years technology has changed far beyond our expectations and in the next 20 years it will continue to surpass our expectations. In the next 20 years it is going to be important that they [students have a solid base of diverse skills and have a feeling of ‘I can be competent in this if I have some more basic training.’

Principal Sky reported that if students are not prepared to use technology after high school, they are at a loss compared to other high school graduates. He expressed that it is important for his students to not only be able to use computers in the future, but also in their present schooling experience. At his school where textbooks were being replaced by laptops, students had to adapt quickly:

Once they reach that point where they’re in the business class or they go to a class where the laptops are in front of them day in and day out, where the laptop is their textbook, they adapt to that technology far easier. I think that’s what will transfer with them beyond high school and into college or when they are in the world of work. They are going to be ready for their work environment.

School Efficiency and Technological Innovations

In a strictly administrative context, many secondary principals reported technological innovations helped their schools to run more efficiently and enabled them to move away from the industrial rigidity of the past. They were grateful that mundane, managerial tasks were reduced or eliminated by technology. The principals reported that without technology, their schools would not have time for more important discussions related to student achievement.

Principal Brew stated:

I think practical technology is important as it makes it easier for a school to use everyday applications of technology to run efficiently. For example, grade books on-line not only help with record keeping, but also with communication with parents to become more open and one of the things that I think we're going to see is more involvement. I'm the only administrator, so it would take me forever.

That's why I've taken so many mundane tasks and erased them with technology.

I don't have to hire a clerk to do this or have the counselor spend time doing this.

The sad thing is, counselors should be counseling, but they're spending all of this time doing hand enrollment, for example.

Specifically, secondary principals agreed that technology such as cellular phones, parent-connect portals through the school's webpage, and e-mail were dramatic innovations. All of these helped schools to communicate better and to connect with stakeholders. The principals were accustomed to having and using technology; they believed that they could not go back to the days when these technological innovations were not in their schools. They explained the devastation of having technology taken away from their school – if only temporarily. This embrace of technology is a description of technology sustained.

Principal North reported that when technology in her school was not working, it reinforced the notion of its indispensability. She cited a recent incident in which technology at the school was shut down by a virus that crippled the computer system:

One of your questions about what would be difficult to do in your school without technology, the answer would be everything! It would be like turning off the

lights. We had a little virus last year that shut us down for three or four days. I just thought the school was going to shut down. We couldn't do anything. It was a nightmare not only because of the teachers not having their computers, but it pulled some of our teachers out of their classrooms and all day we had to have people cover while we picked up attendance, called home, called teachers that didn't show up, etc...

Principal North used the above example of how the school almost shut down without technology and how this would not have been the case ten years ago to argue that the technology already in place was sustained.

Theme III: Committing to Change

Technology Entering the Classroom

Secondary principals shared how technology was introduced, implemented and sustained by their school communities. As their schools evolved, change was reported as constant. Change was seen by several teachers as unsettling, and principals believed their role was to show change as opportunities for new possibilities. Examples were given to illustrate growth of the school community and their gradual acceptance of technology. Although teachers experienced change with new curriculums, principals reported that experiencing change with technology was perceived by teachers as more of an obstacle. Principals supported teachers and said that they did not try to force change.

Secondary principals reported it was their responsibility to help teachers transition from using technology in their personal lives to eventually using it in the classroom setting. In the literature, an emphasis on value beyond school and relevance existed to ensure student learning was worthwhile and applicable to students' everyday life

(Newmann, & Wehlage, 1995). In this study, there was an emphasis to make sure the technological innovations outside of school were considered worthwhile and applicable in classrooms.

It was reported that once teachers entered their classrooms, they would put aside their use of technology in their personal lives and become reluctant to integrate technologies for teaching and learning. Technology for student learning at school was not necessarily more difficult to use. However, for the teachers, it was seen as more difficult as it was in a school rather than personal setting. Secondary principals' all shared how both personal and educational experiences with technology shaped their perceived responsibilities. Concurrently, secondary principals believed that by taking the time to allow teachers to see that technology was an asset in school as it was in their personal lives was necessary to sustain technology.

Principal Sky shared how he introduced technology to his teachers. He used an informal, even indirect, manner. Principal Sky stressed that principals should never give technology to teachers with mandates. Rather, he believed principals need to help teacher's transition from using technology in their personal lives to eventually using it in a classroom setting:

We gave them this stuff and started with, 'wouldn't you like to get some digital photos of your grandkids? Wouldn't you like to make a little video of your dog?' We threw these ideas out there that met them where they were. We didn't start in heavy with the curriculum. Then their eyes started to light up and they had an excellent comfort level with it. The process worked because a teacher is not going to push anything out that makes them look like a dummy. If they feel like,

‘Well, Johnny knows more than I do, and there is no way I can do this because he’s going to ask some question that I’m not going to be able to answer.’ But, no, at this point they’re thinking, ‘You know I can do this. I can e-mail. I can make videos.’

Principal Sky believed that by taking the time to introduce technology slowly and following up with ways to help teachers become confident in their abilities was necessary to sustain technology. Principal Sky believed that if principals did not follow through, teachers would put technology aside, hindering the changes needed for technology to become a permanent, useful tool in the classroom.

In order to sustain technology, Principal Dee believed she needed to help teachers transition their mindsets from traditional to modern or progressive thinking. Principal Dee believed this difficult transition had to occur in order to sustain technology in her school. As a first step, Principal Dee addressed this problem by introducing new technology slowly, using it herself at first, and then moving it into the classroom. Then, after gauging the comfort level of her teachers, she followed up with staff development as appropriate.

I think one of the areas of technology that has been effective has been having the additional computers in the classrooms for the teachers so that they could, at their own leisure, become more comfortable and familiar with it. I think this works....there’s a lot of apprehension there. So, I think it has helped for me to encourage them to use it and for me to take the opportunity to put the computers in the classroom with them, so that they can explore at their own leisure without feeling intimidated. I think that has helped them quite a bit.

Principal Dee recognized that her teachers must adapt to technology if it was to be sustained. She asserted that teachers are only able to adapt to technology if they have access to it. Therefore, making technology accessible to her teachers was believed to be part of her responsibility in sustaining technology. She believed technology to be a part of our everyday life and it was imperative that teachers understood technology in order to help students.

Transitioning from Traditional to Modern Thinking

Secondary principals all shared how teachers were using technology in their classrooms. The principals observed teachers use of technology frequently and gave examples of both successful and struggling teachers. Secondary principals shared their observations of teachers existing between traditional and modern thinking and how this affected their individual responsibility in sustaining technology.

Principals reported that as technology was introduced into the classrooms, teachers knew their roles in the classrooms were changing. Several teachers were uncomfortable with their place in a modern classroom. The secondary principals believed it was important for teachers to understand some discomfort is normal when encountering new technology and that there is often a learning curve. In their preliminary efforts to sustain technology, principals noted that there were some teachers who were non-cooperative or reluctant to incorporate new technology. In every school there were teachers who considered technology merely as an add-on to their traditional teaching methods. Each of the principals spoke of how they worked with these teachers.

Principal Dee shared:

The role of technology has had an impact. But you know sometimes the teacher is a little apprehensive about it. I don't know. I think sometimes they don't feel like they have as much control. But they really do. I guess it's because the kids are so comfortable with it. I guess they think it diminishes their role. Well, I don't really think it diminishes it. I think it just causes them to reevaluate their position in the classroom.

The secondary principals believed it was their responsibility to help these teachers progress and move away from thinking of technology as an add-on, but rather an essential teaching tool. Although the principals' methods varied, a common theme among all the secondary principals was to introduce technology through a structured program and then follow up by helping teachers become confident using the technology. They believed that if they did not follow through with allotted time to absorb the technology, it would be put aside by teachers. Obviously this would hinder the chances of the technology becoming a useful tool in the classroom - and its sustainability.

Although some teachers were still apprehensive of their roles changing in the classroom, it was made clear that many teachers successfully overcame their self-perceived barriers to using technology. Secondary principals shared that it was common for the most traditionally-minded educators, when finally faced with a particular technology, to become the most enthusiastic participants in the end. Secondary principals also reported that some teachers were not only successful with technology but were also enjoying their jobs more because of technology.

Principal Shay shared how her faculty came to use technology in the classroom:

...I think even with my teachers there was a great change. Some of us didn't even know about technology. I mean we really didn't. We knew how to e-mail. We knew how to do Word and except for some teachers, like Mrs. Tech who knew a lot, we just didn't know anything and we've learned so much. I just had a teacher say, 'You know I just didn't realize how much I've learned about technology this past year. Because this time last year, I didn't know what a jump drive was or what hyperlink was...I've never used a power point in class.' Now this is all common. We all have a jump drive, and we use power points in everything we do. But those things are just becoming second nature now. Because once you use them they are so powerful, you don't want to go back to the old way.

Principal Shay believed that once technology was adopted by the faculty, sustaining technology took care of itself because at that point, you had an entire faculty that did not want to see technology disappear. Principal Shay gave this example:

I've got the best teacher in the world in there that knows this technology inside out and she gets those kids so pumped up. She's come in several times this year and says, 'I love my job! Have I told you lately thank you for my job?' I mean she just loves it.

The attitudes of most teachers were changing. The ten secondary principals interviewed perceived teachers as increasingly motivated to use technology – although it was unclear whether teachers were truly upbeat about the process or simply convinced that they must face the inevitable. At any rate, principals did make a direct correlation with technology and student participation in the learning process. In agreement with the

literature review, the secondary principals did perceive the teachers to be a vital link between technology and sustainability.

Principal Sky shared:

The laptops truly became the tool to get teachers over that obstacle of, ‘Okay that was really cool, but I don’t have time.’ and eventually the equipment gets pushed aside. Now the teachers have that laptop open everyday, every hour. They’re keeping data. They’re keeping their grade books. They’re becoming more comfortable with the technology. This didn’t happen overnight. I still had some teachers dragging behind, and you know ‘I’m not going to do this. I really dread this.’ And now if you talk to those teachers that just said, ‘I don’t want to deal with this. I want to avoid this, retire, get out and hopefully never have to do this.’ They love it. I’ve had teachers say, ‘I’m one of the ones who went behind your back and said I don’t want to do this, and now I can’t imagine what I would do if I didn’t have this.’

Further, Principal Sky believed that when technology was used correctly and teachers became more enthusiastic, sustaining technology became easier. Principal Sky shared that some teachers were successful with technology and this reinvigorated their teaching:

It’s where they’re turning down opportunities to move upward financially.

Because with technology, they see the opportunities they have to reach students in an on-going effective way that integrates into the classroom, into the curriculum.

It’s not just a warm-gooshy. If it’s a warm-gooshy, it’s time for me to move on.

What we're doing is creating educational authentic experiences through technology.

Personal Experiences Shifting Principal Expectations

Principals' experiences with technological innovations in their personal lives created foundations for what they expected from their teachers and students. They made a direct correlation between use of technology in their homes and the expectations they held for their schools. The complexity of the secondary principals' self-reported interconnectedness of education and personal experiences was seen as a crucial theme in defining the phenomenon of technological sustainability.

Principal Brew's experiences with technological innovations in his personal life created foundations for what he expected from his teachers and students. He directly made a correlation between use of technology in society and the expectations he held for his school:

My eight year old and my five year old and my two year old can run the mouse. He can turn the computer on. He's two. He can't put together a paragraph, but he's technology savvy. Its part of his life, like turning on a light switch, open the fridge and get something cold, use the mouse and see Elmo. It's easy. He expects technology to be there and here too.

Principal Brew believed it was his job to introduce and sustain technology in his school that was equivalent and hopefully better than the technology the students used outside of school.

Principal Dee gauged what technology should be bought based on what she saw happening outside of school. Principal Dee referred to a child's use of technology

outside of school and how that influenced her technology purchases. Principal Dee shared a personal story and related it to what she thinks her school needs to be doing:

My mom, just a side note, was visiting with her neighbor's grandson and he is three. She could not believe he could turn the computer on. He could get to his color program and he would just set there and use the program about colors and shapes and all of that and he was good. One day I was coming over there and he was just setting there showing me what he was doing. So it just depends on what you expose them to...that's the mode by which they learn best and they have identified with that and so they progress their education then that's what they're looking for and that's their expectation. So it does, it pushes teachers and administrators to keep that going.

Secondary principals' personal experiences and observations changed their expectations concerning technology and their schools. Based upon these experiences, their perceptions concerning the learning curve of both teachers and students were shaped. An awareness of the environment outside of the school affected the classroom.

Theme IV: Evolving Learning Communities

Technology and Opportunities

The secondary principals varied in their methods as far as creating a technologically literate teaching culture. However, they all believed creating a technology-driven learning culture was an important objective. They believed it was their responsibility to create opportunities for teachers to learn technology, and especially to encourage the less enthusiastic teachers. To this end, they were all committed to learning about new technologies before introducing it to teachers – that this was an

important prerequisite to sustaining technology. Principals stressed that technology should never be given with mandates, rather with opportunities.

Secondary principals recognized that open learning communities created optimal experiences for teachers to communicate ideas and/or concerns. Principals believed that open dialogues were critical for student success. They agreed that supporting teachers increased the likelihood that teachers would gain a sense of ownership of technology investments. Principals made clear connections between a learning community that shared responsibility for student learning and technological sustainability.

Principal Shay reported:

We used a lot of collaborative planning. It was not my plan. It was not a few people's plan. It was truly the entire school's plan. We used some professional days to make decisions, and we researched what technology can do for student achievement. We asked the staff, 'What do you think we need and to prioritize what we need to improve our student achievement?'

Secondary principals did not perceive the responsibility of sustaining technology were theirs alone. Secondary principals readily explained how the entire learning community had to have a voice and be included for sustainability to occur. Inevitably, there were differing philosophies within the learning community regarding new technology. The principals categorized individuals in the learning community into one of the following: traditional, transitional, or forward thinking. Thusly, the principals were faced with various knowledge, awareness, and cooperation levels as they sought to initiate interest in new technology and move to sustain it.

Principal Boren shared:

We try to provide a lot of in-service or opportunities about everything from the simplest things like taking attendance on-line and using grading software programs, to the more complex topics such as integrating technology with pedagogy. All of my teachers vary in how much training they need in each of these areas. As our school gets more technology, our staff will get more opportunities to learn about the new technology. We never have the same technology topics at all of our in-services.

Successful Staff Development

Secondary principals perceived that it was their responsibility to provide worthwhile staff development to the faculty as a whole. They believed successful staff development led to increased use of technology to improve authentic teaching and learning. Specifically, principals reported that OK-ACTS helped not only in the purchase of technology, but also with staff development - a crucial factor for sustainability.

Principal Shay reported:

OK-ACTS provided lots and lots of training. A lot of training right up front and then every month they would be up here and if my teachers said, 'We need just basic help on the power point.' They presented the lesson and every teacher went through that training. And they might say, 'We just need to know how to plug some of this stuff in.' You know from the very beginning OK-ACTS got out here that day and would start from the very beginning with them. For example, 'Here is the cord and this is how you plug it, and you push this button...' and he took them step by step at their comfort level and so they were wonderful people to

work with and they made my teachers feel very comfortable and they were able to work at their own speed.

Principal Sky shared that since NCLB staff development requirements were put in place, he has learned what sustained on-going professional development was, and he believed this new format as working for his school. Principal Sky believed it was his job to provide worthwhile staff development for his teachers, if he wanted to see technology sustained. Furthermore, Principal Sky shared that it was important for him to learn alongside teachers during staff development sessions. Principal Sky believed his presence influenced teachers' belief in the worthiness of staff development:

You can't give teachers a three-hour snippet and say, 'Go get it tiger.' You can't just expect success there. You have to introduce it. You have to personally engage in it. You have to come up and do follow-ups to get them to the next level. Then they get hungry and ask for more. At that point, you give them more. That's what staff development is.

Secondary principals used both formal and informal staff development on their trek toward helping teachers become skilled in sustaining technology. Examples of informal staff development included casual conversations about new technologies and students teaching teachers in the classroom. The less formal encounters with technology were often perceived as a welcome departure from instruction manuals, development meetings, and scheduled tutorials for teachers.

Principal Sheen reported:

...and one of the things we saw too was the kids teaching teachers and we didn't plan for this...we took these four students and sent them to a sixth grade teacher

who was a very open minded teacher, who was willing to take risks, but just wasn't where she could be technologically. So, we had the kids use the one projector with the computer going to different web sites and kind of teaching and showing her how easy it was and how engaged the kids became. So, I think this was great and I think the students will push teachers to use the computers.

The principals' theory acknowledged that there was a learning curve to most new technologies and that teachers would be heartened by a principal who was willing to learn alongside them. Secondary principals believed all teachers in their schools needed to transition from out-dated modes of instruction and adapt to using technology in their classrooms.

The principals believed it was important to constantly research how technology increased quality teaching and learning. They perceived that principals who were willing to learn alongside teachers were more likely to encourage even the most hesitant teachers to progress - leading to technological sustainability. Secondary principals explained how they, as leaders, were role models for learning communities. Interviewees explained that it was their role to personally use new technology as an informal introduction, and then to expand its use into the classrooms.

Principal Ali believed that the drive behind teachers' motivation to use technology was tied in with how principals use technology themselves. Principal Ali explained how leaders are role models for learning communities. Principal Ali explained his ideas were at odds with other administrators who believed that teachers should learn new technology themselves and the principal should merely check on their progress.

Principal Ali gave examples of how he engaged in the learning process to promote sustainability by setting good examples for teachers:

When my teachers see me learning technology through OK-ACTS this helps the teachers. I learn how to use technology mainly through the network they [OK-ACTS] have established. I have met many quality people through the OK-ACTS program, which has helped me grow and learn how to use technology in my school.

Collaborative Practices

Collaboration was reported by the secondary principals as a critical step toward technological sustainability. Secondary principals encouraged peer-teaching as a positive opportunity for teachers to help each other individually. Secondary principals believed it was impossible for them to teach the entire staff on their own, thus peer-teaching was not only useful, but necessary. Secondary principals agreed peer-teaching was a way to introduce teachers to new technology and new teaching methods - thus increasing the likelihood of sustainability. Although peer-teaching was reported as another avenue to teach the entire faculty, it was not considered part of an administrative agenda. Rather, principals reported that coordinating time for collaboration encouraged peer-teaching to occur spontaneously.

Principals' reports varied concerning how they coordinated time for collaboration. For some, OK-ACTS in-house professional development sessions were used as time allotted to encourage peer-teaching. After an OK-ACTS session, principals would give time for teachers to reflect. Principals reported that OK-ACTS had a large role in training their faculties from the simplest tasks to the more advanced tasks needed to use

technology effectively in the classroom. Secondary principals felt that this training was instrumental in sustaining technology.

Principal Ali explained:

OK-ACTS at OU provided a grant for training. This training was very useful and easy for our teachers to incorporate in the daily classroom. The training was presented in many formats and the trainers could train or I really should say teach our whole faculty right down to five teachers. This was probably the best way to get our teachers to learn how to use the most current technology.

For other secondary principals, it was scheduled blocks of time during the school day for teachers to share their individual experiences with technology. At first, secondary principals often had to actually set a formal agenda for teachers to have time to talk about technology. However, as technology became a natural teaching tool, conversations about technology became spontaneous and no longer had to be scheduled. This was considered a sign that the technology was becoming ingrained and sustainable. Furthermore, it was expressed that as teachers became more comfortable with using technology, they were interested in obtaining new technology for their classrooms.

Principal Shay shared:

In the beginning, their conversations, I think talking about technology had to be planned. Technology talk used to be scheduled because technology was not part of our conversations. It is now...it's becoming more a natural part of conversations...This shows me that technology is here, it's sustained. This study's findings created a detailed account of how secondary principals perceived their responsibility in creating a learning community that directly aligned with

technological sustainability. In this study, secondary principals not only defined learning communities as solely consisting of teachers within their schools, but also a learning community of principals at the national and state level.

Peer-teaching among teachers at individual schools and principals at national and state conferences were both cited as valuable in sustaining technology. Secondary principals praised organizations such as the Oklahoma Association for Technology (OTA), the Cooperative Council for Oklahoma School Administration (CCOSA), the Southwest Educational Development Laboratory (SEDL) and OK-ACTS for presenting opportunities to learn about current research and collaborate with other principals.

Principal Ali shared:

I cannot overemphasize how much I learn from the network of principals OK-ACTS has set up for us. I am constantly talking to other principals about what's working and what is not working at their schools. A lot of these principals are very experienced with implementing technology into the curriculum. I share a lot in common with these principals and I think we use each other as resources. I also am involved with OTA and CCOSA. These two associations provide a lot of workshops for principals. I make it a priority to attend all of these workshops so that I can continue to participate in networking.

Although these were different networks, they all provided a convenient means for administrators to learn new ways to use technology at their schools – often with financial assistance to make it a reality. Secondary principals also reported that peer-teaching occurred informally or was a direct result of the conferences held by OTA, CCOSA,

SEDL and OK-ACTS. Peer-teaching was seen as invaluable to secondary principals as an exchange mechanism leading to initiatives soon to be used in their schools.

Seeking opportunities to learn from other principals was considered a critical aspect of their job. Secondary principals believed it was their responsibility to attend workshops so they could better lead their schools toward sustainability. They believed the commonalities between principals and teachers enabled the learning community to share successful and unsuccessful ways of approaching technological sustainability.

Theme V: Students and Technology

Technology Resources

Secondary principals expressed that their motivation to sustain technology was first and foremost driven by the desire to increase student achievement. Test scores were, overwhelmingly among the principals, the very definition of student achievement. Secondary principals gauged increased student achievement by improved test scores and greater motivation to participate in the classroom. Secondary principals explained that Internet testing resources helped students to excel in current academic challenges, as well as increasing future opportunities for entrance into higher education. As students used the Internet to practice for the ACT, apply for college entrance and scholarships, and fill out scholarship and financial aid forms, technology became more sustainable as students perceived technology as increasing their chances of transitioning into higher education.

In a traditional school setting, there would be one guidance counselor as the main resource for information concerning college entrance requirements. A single, dedicated counselor could not provide a large number of students the individual attention or the depth of information they are able to obtain from the Internet. Secondary principals,

along with parents, teachers, students, and counselors, helped sustain technology as they believed it provided opportunities to access crucial information, especially as it pertained to higher education.

Secondary principals in this study recognized the importance of sustaining technology as a necessity for their students' future success. Principals believed that, if they were not to sustain technology in their schools, it would be an obstacle for graduates to overcome when they entered college or the work force – and that fewer students were likely to proceed to college. Furthermore, all principals shared the belief that authentic uses of technology supported authentic pedagogy. Authentic pedagogy was defined by O'Hair, McLaughlin and Reitzug (2000) as “Growing out of our knowledge of constructivist learning is authentic pedagogy. Authentic pedagogy refers to teaching students and assessing student's progress in ways that are connected to the real world – that is, that are authentic” (p. 325). The driving force behind principals' motivation to sustain technology to improve student achievement with authentic pedagogy permeated all ten interviews.

The interviewees believed that it was their responsibility as principals to sustain technology at their schools. They perceived technology as a means to increase teaching and learning opportunities at their schools and therefore to increase student achievement. They gave examples of a great difference in the students' interest to use laptops versus texts when researching or writing. With technology available, students were apt to not only complete a given assignment, but also to perform beyond the minimum requirements. Observing these motivated students - and linking their increased performance to technology - compelled principals to sustain the technology.

Students as Change Agents

The educational literature review did not identify students as a powerful, positive influence on secondary principals in terms of technological sustainability. The principals, however, strongly believed that students pushed them to transition from the traditional school environment to a modern, technologically advanced setting. Students encouraged principals to make progressive (and desirable) steps toward sustaining technology. Thus, students became a significant factor in changing the technological culture of their schools.

Principal Shay talked about positive pressure from the students to sustain technology. She believed that listening to what the students had to say about technology was important. When students experienced teaching and learning with technology, she noticed that they did not want to return to the traditional classroom void of technology. Principal Shay said that student exposure to technology in her school also had an impact on the upper level schools in the same district. She offered an example of positive student pressure changing what was expected of school leaders:

I'll tell you that we just have students for two years. We are a sixth and seventh grade school. When they go to a high school that doesn't have technology, the kids say 'We don't want to go. They don't have SMART boards up there. They don't have a Video class up there.' So, now the high school is figuring out, we're going to have to step it up because these kids are going to expect so much more than they used to. So now, they are trying to figure out a way they can get the same technology we have at our school and keep it going. So the pressure is moving on up. You have a kid who's got all of this technology and you expect

them to go to a desk and read a textbook. It's not going to happen. You might as well give them a chunk of stone and a chisel is how they look at it.

Principal Frater agreed:

And that's what kids are about. They don't go home and play football or baseball like they did in the old days. They want to play video games and surf on the Internet. So, schools have to change. If they don't put technology in, the students will go to another school.

Ultimately, secondary principals perceive student expectations as a positive pressure pushing for schools to sustain technology. The secondary principals believe student expectations are directly related to successful sustainability. Thus, students are change agents in the school culture. They have a powerful voice that demands their schools use and sustain advanced, modern technology.

Conclusion

Secondary principals' interview transcripts were examined to identify common themes of principals' experiences with the phenomenon of technological sustainability. A structural meaning of the experiences was developed to see the phenomenon from many perspectives (Moustakas, 1994). The individual textual descriptions of ten secondary principal's self-perceived experiences with participating in an effort to sustain technology were reduced to five themes in which the essence of the principal's experience was revealed. These five themes were pervasive throughout the ten secondary principals reported perceptions of their role in sustaining technology. The secondary principals not only identified these five themes as impacting their responsibilities in sustaining

technology, but were also able to discuss in great length *how* they dealt with the five themes.

In the first theme, *Perceptions of National and State Expectations*, all of the secondary principals expressed how these expectations were felt and how they affected their perceived responsibilities. Principals perceived that their responsibilities in sustaining technology were augmented by national and state funding. Technological sustainability was determined by what principals expected, what was expected of them, and what they believed was feasible. Leading an effort to technological sustainability demanded engagement and empowerment.

In the second theme, *Leading toward Post-Industrial Schooling*, technological innovations were reported by secondary principals as helping their schools run more efficiently. Technological advancements shifted perceptions of school efficiency and ultimately effectiveness. Sustaining technological innovations was associated with increasing student achievement. The principals reported that without technological innovations, their schools would not have time for more important discussions related to graduating students to succeed in the future. The role of innovations in schools created a basis for secondary principals to refocus on the purpose of education.

In the third theme, *Committing to Change*, secondary principals shared how their school communities were growing and gradually accepting technology. Secondary principals focused on several influences that shaped their ability to lead change in an effort to sustain technology. Principals believed changes needed for technology to become a permanent, useful tool in the classroom required working with all involved in

the change process. Secondary principals encouraged, supported, and engaged teachers in seeing change as a positive force in achieving sustainability.

In the fourth theme, *Evolving Learning Communities*, secondary principals gave self-reported perceptions of their learning communities' role in sustaining technology. Secondary principals reported technological sustainability had a profound impact on the learning community as it changed perceptions of teaching and learning. According to the principals, making a significant change in the communities' role in the success of technological sustainability required a coordinated effort – representative of the many facets that make up the community.

In the fifth theme, *Students and Technology*, secondary principals reported that students encouraged them to progress and create advanced technological schooling. Students committed principals to accept possibilities of transition and constant change. They contributed to the change process by creating a multidirectional push for sustainability. Students were reported as revolutionizing the whole structure of education by demanding technology become a permanent part of the teaching and learning process. Inevitably, it was the student's enthusiasm (or lack thereof) which often metered the sustainability of a given technology.

CHAPTER 6

Discussions, Conclusions, and Implications

The central research question was: How do secondary principals perceive their responsibility to sustain technology? The role of secondary principals to acquire, implement, and update technology in Oklahoma schools was investigated. The purpose of this study was to document how secondary principals perceived, experienced and defined their responsibility in sustaining technology.

Within this study, shared experiences with technological sustainability were examined, and a collective history was created. The focus of the study was to report commonalities in experiences associated with the phenomenon of technological sustainability. Ten secondary principals' experiences with technology in their schools were compiled and compared in order to study the principals' perceptions of the phenomenon of sustainability. The commonalities of what secondary principals expected and what they believed was feasible led to several shared perceptions of their responsibility in sustaining technology. The principals developed plans to help the student body, staff, and school community become technologically literate and then to *sustain* this growth into the future as technology needs inevitably will change.

The study was organized in a six chapter format. Chapter one defined and introduced practice and theory concerning the phenomenon of technology sustainability. Chapter two highlighted the professional literature as a basis for rationalizing the study's research of sustainability. Chapter three defined the phenomenological methodology used. Chapter four presented secondary principals' interviews as vignettes in which the principals' perceptions are provided within their individual school contexts. Chapter five

analyzed data and revealed emerging themes – deepening and extending themes found in the literature review and identifying new themes in the context of sustaining technology:

Theme I: Perceptions of National and State Expectations

Theme II: Leading Toward Post-Industrial Schooling

Theme III: Committing to Change

Theme IV: Evolving Learning Communities

Theme V: Students and Technology

These five themes were pervasive throughout the ten secondary principals reported perceptions of their role in sustaining technology. The secondary principals not only identified these five themes as impacting their responsibilities in sustaining technology, but were also able to discuss in great length *how* they dealt with the five themes.

The secondary principals not only identified these five themes as impacting their responsibilities in sustaining technology, they further discussed in great length *how* they dealt with the five themes.

In this conclusive chapter, secondary principals' perceived definition, practice and theory of technological sustainability as phenomenon are summarized. The connectedness of the study's findings seen through the theoretical lens of complexity (Morrison, 2002) is presented. In addition, deviations and parallels with this study's findings and those themes provided in the professional literature review are considered. Finally, the potential of the study's findings to contribute to the educational leadership professional knowledge base and possible implications for future research, preparation programs, and communities of practice are provided.

Secondary principals were asked to describe their responsibilities to refine and improve efforts to sustain technology. Secondary principals' collective experiences were the foundation for the study's findings and conclusions. In continuance with the study, the central question became how and if the study's results created an understanding of the phenomenon. Furthermore, considering the study's results, three central questions were to be answered. What extended and deepened the literature review? What themes were added to the professional literature? What additional questions could be derived from the study's results?

The review of the professional literature introduced questions to be studied further. In its entirety, the literature review presented thematic units used as directives in this study's investigation of how secondary principals perceived their responsibilities in sustaining technology. In the current review of the literature, the importance of technological sustainability was stressed as a function of its success or failure. The literature certainly contained an abundance of objectives, standards, and performance indicators for secondary principals to use as a guide for leading sustainability. What the literature lacked, however, was a description of how secondary principals defined and interpreted these objectives and moreover how they perceived, if at all, their responsibilities to sustain technology. The most interesting components of the literature review emphasized the value of sustaining technology and yet did not present research concerning secondary principals' perceived role in this endeavor.

The literature recognized technology and sustainability as a necessary element of increasing student performance and success – and that secondary principals had the important job of obtaining and maintaining the technology. This study went a step

further and specifically defined *how* secondary principals perceived their role in sustaining technology and what contribution they thought technology would make to long-term student success when properly implemented.

Deviations and parallels with this study's findings and those themes provided in the professional literature review are considered. How did secondary principals perceive their role as being responsible for sustaining technology? Who and what helped them accomplish this goal, and what were the advantages and opportunities for students, teachers, and the secondary principals themselves? These questions are addressed, along with the implications for future research on secondary principals' roles in sustaining technology.

Technological Sustainability and Complexity Theory

Using phenomenology as a research method, the study removed pre-conceived notions and thus, revealed the true nature of technological sustainability as phenomenon. Complexity theory (Morrison, 2002) as a theoretical lens was employed to understand and explain the secondary principals' self-reported experience of influencing and being influenced by societal, structural, organizational and cultural changes that had to occur in order to sustain technology.

Interrelatedness of Societal and Secondary Principals' Expectations

In the first theme, Perceptions of National and State Expectations, the secondary principals perceived, experienced and defined their responsibility to sustain technology as interrelated with societal expectations. Secondary principals' perceptions with the phenomenon of sustainability were shaped by national contexts. Thus, the political, societal and economic agendas were reported as motivational for secondary principals.

They perceived their responsibility in sustaining technology to include the needs, resources, and expectations of both society and their schools.

Secondary principals' self-description of their overall experiences with the effort to sustain technology always included the constant push and pull of the school and the state. How soon and how extensively technology was incorporated into the classroom was reported as both a societal and personal goal. Interviewees believed the state of connectedness between society and principals produced a shared platform to propel technological sustainability. Morrison's complexity theory (2002) was employed in the study of interactions and experiences between leaders, schools, societies and technologies. Secondary principals did not believe their schools functioned in isolation - separate from national and state demands - but rather they worked with society. Collaboration between the schools and society were emphasized and encouraged by secondary principals in order to promote technological sustainability.

Interactions between Technology and Schooling

In the second theme, Leading toward Post-Industrial Schooling, the secondary principals connected industry and technological advancements to transitioning their schools into the modern era. The secondary principals acknowledged that as the needs of society became increasingly sophisticated so too did the technology utilized to address those needs. It was believed that the converse was also valid – that advancing technologies symbiotically perpetuated an ever more sophisticated society. Either way, the secondary principals' mission encompassed not only recognition of basic concepts in science and technology but also the ability to engage in the processes of change. For the secondary principals, sustaining technology became both the process and the result.

Ideas Interchanging

In the third theme, Committing to Change, the secondary principals believed the transition from concept to practice to sustainability was complex, intuitive, and involved many uncertainties. In accordance with the literature, Morrison (2002) defined complexity as separate beings interacting, influencing and in turn, changing their environment. The secondary principals explained the ritual of ideas interchanging between teachers, students and themselves. This process was the main determiner of the success or failure of sustainability. Secondary principals believed committing to change did not mean understanding the complexity of change, but rather realizing that change is necessary for progress, thus necessary for technological sustainability.

Mutual Actions and Reactions

In the fourth theme, Evolving Learning Communities, secondary principals correlated the momentum of the entire learning community with the success of technological sustainability. In an effort to sustain technology, secondary principals influenced, and were influenced by, teachers – some hesitant and others confident in their use of technology in the classroom. Systematic changes necessary for technological sustainability were believed to be the result of actions and reactions toward the use of technology in the classroom. Individuals made separate contributions which together fulfilled the potential to sustain technology. Secondary principals' explained that letting go of preconceived ideas allowed them to harness the tremendous power of collective intellect in their schools.

Reciprocity between the Student and the School

In the fifth theme, Students and Technology, secondary principals believed the premise that a developing mind with easier access to great knowledge from diverse sources created a better citizen, innovator, provider, communicator, and intellect (Allison, 2002). The secondary principals believed the success of technological sustainability was related to the reciprocal positive pressure between students and their schools. Secondary principals recognized the power of students as powerful change agents expecting schools to be as modern as the society they lived in. The interconnected relationship between the student and school created the energy needed to sustain technology.

Summary of Complexity Theory

By understanding complexity theory, secondary principals living with unpredictability make better choices concerning the future and progress of sustainability. In turn, their collective choices create novel advancements in how secondary principals view instability as a means to sustainability. According to Fullan (2003),

We know that we cannot ‘control’ complexity, but by understanding better how it works and by using the social attractors we can exploit its enormous natural power. In the course of doing this, guided complexity theory at its best generates, unleashes and puts to great use the energies, passion and commitment of people heaven bent to making a difference and getting more meaning and satisfaction from their daily lives. (p. 106)

A person is considered part of a complex culture of leaders and followers. Without this realization, one will never understand the phenomenon of technological

sustainability in its entirety. This review reconfirms that the lens of complexity theory (Morrison, 2002) is appropriate in this study to explain technological sustainability.

As the research emphasizes, successful school leaders make relationships between their self and the realities of complexity (Fullan, 2003; Lebaron & Collier, 2001; Morrison, 2002). The realizations of interrelated actions leading to sustainability are to be recognized and promoted. Following complexity theory, a perspective is set for past, contemporary, and future leaders.

Comparisons, Contributions and Implications

Theme I: Perceptions of National and State Expectations

Discussion of Findings and the Literature Review

National and state expectations of principals and for technological sustainability were defined within the review of literature. Yet, the extended question of how these expectations were *perceived* by secondary principals was non-existent. In congruence with the literature, all of the secondary principals in this study did believe government expectations played a large role in their motivation to sustain technology. However, in this study, the interviewees expressed in detail how national expectations were felt and affected their mission to sustain technology. For example, all of the secondary principals described how NCLB and Oklahoma's testing of PASS objectives on the EOI exams sharpened their focus on sustaining technology.

Secondary principals reported that government funds were directly related to increased opportunities for students as they allowed for purchasing essential technology and paying for the associated staff development. Furthermore, secondary principals specifically listed grants and how they were used to help students. They frequently referred to a critical need for all principals to be aware of the funding sources available. The justification for sustaining technology was to ensure student success and the national and state funding initiatives were seen as avenues to help them succeed as leaders. Interestingly, all of the secondary principals reported that while applying for technology grants was critical, they did not all claim to be successful with this task. However, the perception was that the funds were generally available for technology if principals could only write for the grants.

In this study, secondary principals' motivation to sustain technology arose from their desire to meet the demands of national and state expectations. Specifically, secondary principals believed sustaining technology would increase their chances to meet the demands of NCLB and improve their school's scores on state administered exams. NCLB goals required administrators to increase their ability to use technology and correspondingly increase student achievement. On the state level, the PASS objectives were aligned with NCLB, thus the state's EOI exams were testing student achievement based on their performance on the exams. Secondary principals' perceptions of how national and state expectations affected their responsibilities in sustaining technology led to a further review of the literature.

Prompted by the study's findings, further review of the professional literature discussed how high-stakes testing was used to measure students' academic achievements necessary to meet NCLB mandates. According to Meier, Kohn, Darling-Hammond, Sizer & Wood (2004), this would then pressure administrators to re-think their curriculum decisions with a bias toward improving students' test taking strategies. A secondary principal's ability to plan for technological sustainability was seen as a critical element of successfully reaching national and state standards. Peterson (2003) wrote that districts were spending more time applying for technology grants - a direct result of administrators who believed that technology would increase student achievement and help meet NCLB mandates.

Implications for Preparation Programs

Currently, professional development programs such as OK-ACTS include how to research for and write proposals for state and national grants. For future preparation

programs, secondary principals would benefit from a national or state grant reviewer leading a session concerning their job and how they review grants. An entire session might be worthwhile in directing secondary principals how to write for just the NCLB grant.

Preparation programs for future secondary principals responsible for sustaining technology should include successfully *completing* the following objectives by the end of the professional development series. All secondary principals will:

1. Search for and locate government funding sources and list at least three that specifically apply to their schools.
2. Complete at least three applications for grant money.
3. Create at least three technology budgets for successful technology implementation.

It should be mandatory for secondary principals to complete these objectives before they advance to the next level or phase of the preparation program.

Implications for Future Research

In terms of future research for sustaining technology, this study revealed all of the secondary principals knew the importance of receiving funding and yet some believed it was impossible to find the time to write grants for technology. Thus, research is needed to define how secondary principals without the aid of professional/district grant writers are successful in finding the time, resources and know-how to efficiently write for and secure technology grants.

Theme II: Leading Toward Post-Industrial Schooling

Discussion of Findings and the Literature Review

The literature review was re-examined with consideration to this study's results. There were many insights concerning technology leadership in the contexts of both education and industry. Within the literature review there were consistent references to school systems as out-dated, industrially driven organizations hindering leaders' abilities to sustain technology (McCain & Jukes, 2001, Schlechty, 2001,Sizer, 1996).

In accordance with the literature review, this study proposes that post-industrial schools, by definition, place an emphasis on graduating technologically literate students. Standardized test scores are, among the principals, the accepted measure of student technical achievement. In fact, they largely *defined* achievement. Graduating students with enough skills to succeed in the future was a shared concern throughout the learning and labor communities. The connection between modern schooling and the ability to graduate technologically skilled students was a common theme reported by the secondary principals. Yet, the extended question of how secondary principals in post-industrial schools used technology to enhance the ability to graduate technologically literate graduates were not presented.

In this study, secondary principals praised the technology that abated some of the mundane, administrative tasks that once distracted them from more important educational issues. Principals believed that technology helped their schools run more efficiently. They agreed that without technology, there would be more clerical tasks to perform which would reduce their time and ability to lead effectively. While the secondary principals believed technology removed from their school would create a disruption in

the administrative efficiency of their schools, they did not all agree that the teachers believed this to be true.

Implications for Preparation Programs

Preparation programs for future secondary principals responsible for sustaining technology should include conversations concerning teachers' perceptions of technology as either disrupting students or creating efficiency in their classrooms (or the school overall). For example, consider the possibility that teachers presumed technology only benefited the secretaries and administrators in the front offices. Secondary principals must overcome this impression if technology is to be implemented and sustained in the curriculum.

As preparation programs lead secondary principals through the process of grant writing, there should be consideration and discussion given to the technology requested on their grant proposal: Are secondary principals requesting technology that benefits both the administration and teachers equally?

Implications for Future Research

Future research should investigate whether technology not only erases mundane administrative tasks but also increases teachers' productivity in the classroom. For instance, on-line attendance and compiling grades on a spreadsheet are utilities which make it possible for a teacher's clerical work to be accomplished efficiently. However, does this translate to more time for teachers to spend creating authentic lessons? Given more time, would teachers actually develop new lessons? Do teachers, in fact, believe that administrators and administrative assistants are the chief beneficiaries of technology? If so, secondary principals may find the skepticism of teachers to be an obstacle to

sustaining technology. Preparation programs need to focus on who benefits from the technology involved in streamlining clerical tasks. With technology, it may be seen that other departments in the school benefit more than the students in the classroom.

Theme III: Committing to Change

Discussion of Findings and the Literature Review

There were commonalities between this study's findings and the literature review's description of the change process in education. Consistent with the literature review, the principals believed it was important to constantly evaluate the contribution of technology to the learning experience. As new technology became available, principals often chose not to navigate the learning curve alone. Rather, the perception was that principals willing to learn alongside teachers were more apt to encourage even hesitant teachers, by example, to progress - leading to technological sustainability.

The secondary principals' theory prompted further investigation of the professional literature. According to the Consortium on Chicago School Studies,

It was no surprise that we found a similar association between teachers' perceptions of their principal as an instructional leader and teachers' instructional approaches. In schools where teachers feel that the principal demonstrates strong instructional leadership, the use of interactive instruction is more common and didactic instruction and review less so. (Smith, Lee & Newmann, 2001, p.31)

Secondary principals in this study commented on how technology was introduced, implemented, and sustained by their school communities. Change and debate were the only constants. This change was unsettling to many teachers, and principals believed their role was to emphasize that change was merely an opportunity for new successes.

Students were seen as more accommodative of new technology in general, but their familiarity with it varied widely. Ultimately, the principals were optimistic. They cited several examples of the growth of the school community and the gradual acceptance of technology.

Secondary principals specifically discussed how teachers were using technology in their classrooms compared to their use of technology outside of the classroom setting. Oftentimes, teachers would set aside their experiences with technology in their personal lives and be oddly reluctant to use similar technologies at school. The technology available at school was not necessarily more difficult to use. Still, teachers resisted – almost as if it were a matter of pride. In order to sustain technology, secondary principals believed that they needed to convince teachers that technology was an asset in school just as it was in their personal lives. Teachers were encouraged to use their knowledge of whatever technology they were comfortable with, from ATMs to PCs to DVDs, and extend it into the classroom. The principals simply emphasized how many of the common household technologies were similar in scope to those in use at school.

Implications for Future Research and Preparation Programs

Future researchers should consider how teachers reconcile technology used everyday at home with what is available in schools. Technologies with equivalent levels of complexity are embraced in the car, the living room, and the kitchen, but often ignored in the classroom. Why do some teachers choose not to participate in the tech-education revolution? One possible explanation is that teachers feel changing technologies are continuously thrust upon them – only later to be abandoned by district administrators, eviscerated by budget constraints, or rendered obsolete by newer technologies. These are

all valid concerns, and barriers to sustainability – but not grounds for inaction.

Technology, like a budget or a faculty, tends to change over time. Philosophically, change is the enemy of sustainability. Collaborative, vibrant learning communities are necessary to absorb inevitable changes and ensure that the most effective, useful tools are integrated and sustained in schools.

Theme IV: Evolving Learning Communities

Discussion of Findings and the Literature Review

There are several meaningful parallels between this study's findings and the literature review of Technological Sustainability and the Learning Community. However, this study surpassed the available literature because it provided a more detailed account of how principals *perceived* their responsibility in creating a learning community, particularly as that related to technological sustainability. According to the professional literature base, technological sustainability required the coordinated effort of an entire learning community. The literature characterized learning communities as individuals working together in a single school setting. In this study, secondary principals broadened the definition of a learning community to include principals at the national and state level, citing them as valuable sources of information.

Secondary principals reported that strong relationships within their learning communities were required for them to lead their schools into the 21st century. They detailed the process of introducing technology, gauging the learning community's comfort level and then following through with proper staff development. Of course, these steps were fundamental to sustainability. Several secondary principals spoke warmly of teachers who overcame learning barriers that once prevented them from using

technology. However, the principals also reported that there were still teachers that did not use accepted technology, often on the premise that their past methods of teaching had been working just fine. Researchers in the future should investigate how secondary principals are able (or not able) to accommodate these teachers. Furthermore, preparation programs should help secondary principals with one of the most difficult aspects of their job – identifying and assisting teachers who are disinclined to use new technology or who otherwise do not facilitate student achievement.

Based on the findings of this study, further examination of the professional education literature led to Becker & Reil's (2000) study. They investigated technology integration and its impact on student achievement. They reported that teachers working beyond the isolation of their classrooms were more likely to use computers to increase authentic teaching and learning experiences. Furthermore, these teachers were leaders in their learning communities helping others transition from novice to expert in teaching with technology. Thus, based on this study, it is in the secondary principals' interest to promote teacher collaboration within and beyond their learning communities to promote technological sustainability.

Conclusion of Theme IV: Implications for Future Research and Preparation Programs

This study used the interviews to find common themes among the secondary principals' accounts of their perceived abilities to sustain technology. In the interviews, several of the principals freely used specific technical language which indicated a certain familiarity with technology. Others were less able to do so. This was particularly apparent in the secondary principals' vision statements. There were also variations in their abilities to articulate a definition for technological sustainability or a learning

community. However, it became clear that all of the secondary principals realized that they had a tremendous responsibility to sustain technology and generally understood what it entailed.

Future research into the use of modern technological vocabulary and its relationship with technological sustainability would be worthwhile. For example, would a basic course in computer terminology lead members of a learning community toward sustainability simply by learning a common vocabulary? Preparatory programs for secondary principals may wish to include a lesson on technological vocabulary or an assessment of their current technical knowledge.

Theme V: Students and Technology

Discussion of Findings and the Literature Review

In accordance with the literature concerning increased student achievement and technology, secondary principals expressed that their motivation to sustain technology was based on increasing student achievement. However, further review of the professional literature must be considered to this study's findings. Waxman, Lin, & Michko, (2003) reported that there are some quality quantitative studies concentrating on the weighted affect of technology integration with consideration to pedagogy and yet, there is a lack of studies concerning how technology may or may not increase student achievement. Their meta-analysis study concluded that technology integration did increase student achievement however the impact was relatively small.

This study's findings reported that secondary principals were often able to refer to more than vague and general goals, but rather to specific steps necessary to increase student achievement. All of the interviewees were mindful of the importance of technology and its coexistence within the curriculum. Moreover, they articulated the need to determine the effectiveness of various technologies as learning tools. They had an understanding of how properly sustained technology could advance their schools from industrial to post-industrial organizations – if not exactly in those terms. Furthermore, in congruence with the literature review, the secondary principals in this study recognized the importance of sustaining technology for their student's future success.

The educational literature review did not specify students as a powerful, positive influence on secondary principals in the context of technological sustainability. The principals in this study, however, strongly believed that students pushed them to

transform the traditional school environment into a modern, technologically advanced setting. Students encouraged these principals to take progressive action toward sustaining technology. Students became a significant and consistent factor in changing the technological culture of their schools.

This study's theme, Increased Student Achievement and Technological Sustainability revealed a symbiotic relationship between the students and sustained technology. As computers, networks, and learning tools were implemented in the classroom, students responded. They thrived with the new and improved technology. In fact, the secondary principals reported that their efforts to sustain technology were naturally bolstered by motivated, energetic students and improved test scores. As the sophistication of technology increases over time, future research should consider the relationship between new technologies and student achievement.

The principals often referred to their students as part of a new generation with new expectations concerning technology and their schools. Principals occasionally identified students as part of the "Nintendo" or "MTV" generation not inclined to learn (or even participate) in traditional school settings. Students were familiar with much of the latest gaming and computer technology. They expected schools to offer information-retrieving utilities and video delivery systems similar to systems they had grown accustomed to outside of school. They questioned why schools were not using the most current technologies, which they perceived as relatively inexpensive and superior to what was in the classroom. Secondary principals took these criticisms seriously but lamented that budget constraints held them back. Still, student expectations stiffened their resolve to obtain and sustain technology.

Implications for Preparation Programs

Preparation programs must not only introduce new technologies, but also gather information regarding student perceptions of how these new technologies affect the teaching and learning process. Any preparation program which would seek to train secondary principals to sustain technology should include a lesson on addressing student concerns and recognizing their contributions to the modern school. In this study, high school students were a positive, powerful influence on secondary principals. Preparation programs would surely benefit by allowing high school students to be guest speakers or presenters at workshops and technology conferences. Currently, professionals, professors, administrators and teachers are overwhelmingly the leaders at these events and there few opportunities for students to attend or present a point of view.

Implications for Future Research

Future researchers should continue this study of how student opinions motivate secondary principals (and teachers) to sustain technology. Student expectations are certainly a factor in how principals obtain and sustain current technology. A common theme in education is the necessity to teach students how to influence and contribute to public affairs – to get involved. Sustainability provides an opportunity for principals to include the student voice in decisions regarding the school's technological culture.

It is important that secondary principals become familiar with the technology students are using outside of schools. A working knowledge of console game boxes (i.e. X-box, Play station), computer games/simulations, MP3 players, chat rooms, and text messaging would give secondary principals some insight on which technologies might succeed in the classroom. An evaluation of X-boxes is in line with recent studies

suggesting the field of education should study and possibly re-assess the value of video games and their potential to create better teaching and learning experiences (Shaffer, D., Squire, K., Halverson, R., & Gee, J., 2005).

Further Review of the Literature Prompted by the Study's Most Significant Finding

According to the most recent research (as of November 2005) conferences are currently being sponsored by cutting edge research institutions and scholars. In particular, the Education Arcade 2005 conference sponsored by MIT's Games-to-Teach Project Director Henry Jenkins (<http://www.educationarcade.org>, 2005) and the Games + Learning + Society 2006 Conference directed by Kurt Squire at the University of Wisconsin at Madison (<http://www.glsconference.org/submissions.htm>, 2005).

Primarily, these conferences introduce video games to researchers, professors, administrators and teachers. They focus on researching and debating the use of commercial video games and educational video game prototypes currently being developed. Sustainability requires that secondary principals know how and where to obtain this technology. What is the cost? Are specific grants available?

As each generation of faster, more powerful computing *hardware* is introduced, it is soon joined by increasingly sophisticated educational and gaming *software*. It is a persistently upward spiral. This fact insures that a computer or program purchased today will be relevant only for a short time. Therefore, to properly sustain technology, updates are continuously necessary. Secondary principals must consider the changing needs of their students and teachers when making the decisions on what technology to purchase with the funds allotted.

Furthermore, there are many hurdles associated with purchasing and installing hardware and software. For example, several competing platforms (PC/Windows, Mac, PS2, X-box...), genre options (action, driving, puzzle, strategy...), and contexts (sports, fantasy, historic, realistic, sci-fi...) are available. Oversight is necessary. Software should be age appropriate – history programs exist for both 2nd and 12th graders. Moreover, video games can be too vulgar or violent for a classroom setting. Buying and maintaining computers, software, and networking equipment is not at all straightforward. Larger schools and districts hire qualified professionals just to manage these issues.

In order to substantiate recommendations for future preparation programs, a further review of the professional educational literature base revealed a topic of potential interest for secondary principals. For example, similarities between video games and education, as introduced by Table 3, could be a valuable theme increasing the potential of sustaining technology.

Table 3

Contrasting 'Pac-Man' with Traditional Schooling

Pac-Man

Player controls how much she plays and when she plays.

Students are actively engaged in quick and varied activity.

Players play and practice until they master the game; players can take all of the time they need to master Pac-Man.

Players have feeling of mastering the environment, becoming more powerful, knowledgeable and skillful in the environment.

Video game players work together, sharing tips and trading secrets.

Performance is criterion based; each student competes against his/her ability to master the game, to reach new goals. Every student can reach a state of 'mastery' over the game.

Games are played for the intrinsic reward of playing them, for the emotional state they produce (Herz, 1997).

Traditional Schooling

Groups of students learn at one pace, and are given very little freedom to manage the content and pacing of their learning.

Students passively absorb information in routine activities, such as lecture.

Students must all go at the same pace, regardless of achievement. As Reigeluth (1992) describes, traditional schooling holds time constant, allowing achievement to vary, instead of holding achievement constant (ensuring that all students master material) and allowing time to vary.

Students learn knowledge abstracted by teachers and regurgitate this knowledge on pencil and paper tests, rarely applying it in any dynamic context.

Students perform in isolation, and cannot use one another as resources.

Students are graded normatively, graded against one another's performance and encouraged to compete against one another.

Schools are structured around extrinsic rewards, such as good grades or a fear of failure (flunking).

(Kurt Squire, 2003)

Conclusion

Wi-fi, iPod, XP, HDTV, XBox, blog, Google - these are the buzzwords in the current culture of technology. Ten years ago, these terms did not exist. Ten years from now they will probably seem trite. Technology permeates many facets of our everyday lives, but it has encountered some resistance on its way into the American classroom. The literature is clear on this point. The idea of this study was to discover how secondary principals perceived their role in sustaining technology in the classroom.

In separate interviews, ten secondary principals described their perceptions of their responsibility to sustain technology as a means to increase student achievement. The secondary principals spoke of not only their awareness of expectations, but also how these expectations shaped their motivation, reaction and action in leading technological sustainability. The secondary principals not only identified expectations as impacting their responsibilities in sustaining technology, but were also able to discuss in great length *how* they dealt with these expectations.

Several principals were able to distinguish what their job required of them both before and after modern, computer-age technology permeated the classroom.

Entering a new era of American schooling, secondary principals witnessed educational infrastructure and philosophies transforming from industrial to post-industrial structures. With this transformation, and the challenges of change, the principals changed and broadened their expectations of how learning communities can contribute. Students living in a technologically advanced society, for example, became powerful change agents - demanding schools effectively utilize technology that students employ in their lives outside of school. The secondary principals reported their responsibility in

sustaining technology had become a permanent and vital element of their jobs as school leaders.

Modern secondary principals are challenged to integrate proven educational strategies with efficient and engaging new methods of transferring knowledge made possible with the tools of technology. The findings of this research will help identify paths to successful sustainability. The findings clarify potentially new and creative ways members of a learning community might comprehend their responsibility to sustain technology. Now, secondary principals in particular are more likely to realize the consequences of their actions and decisions in relation to technological sustainability. Based on this study, current secondary principals are provided with past experiences with this phenomenon. Thus, principals are more likely to lead their school communities as they now have a shared history of their responsibilities associated with technological sustainability.

The mission of education should encompass not only a grasp of immutable concepts of science and math, the humanities, social studies, and music but also the ability to engage in the processes of change. Technology is part of both the process and the result. Sustainability of technology in our schools becomes the sustainability of technology in, and the capacity to change, our lives.

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APPENDICIES

APPENDIX A: INFORMED CONSENT FORM

**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 survey and interview respondents 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., K20 Center for Educational and Community Renewal
Co-Principal investigators: Mark Nanny, Ph.D., Civil Engineering and Environmental Sciences
Randy Averso, M.Ed., K20 Center for Educational and Community Renewal
Jean Cate, M.Ed., K20 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 10 practices designed to increase student learning and foster democratic citizenship. Participants agree to complete the Rubric for High Achieving Schools. The Rubric consists of the 10 practices linked directly to improved student achievement and involves the participant to give examples of each practice, describe obstacles to each practice, and develop an action plan to overcome obstacles. Practices focus on the following: core learning principles; 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 10 practices. In addition to completion of the Rubric, selected participants from OK-ACTS Phase II schools and districts agree to a follow-up interview (approximately 1-2 hour) based on practices described in the Rubric. Participants will be asked to describe the process involved in developing the practice, 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 investigators, Drs. Mary John O'Hair, Mark Nanny, Randy Averso, and Jean Cate or other key personnel are available to answer any questions regarding this research study and may be reached by phone at (405) 325-1267, by internet at www.k20center.org, or by contacting the Center for Educational and Community Renewal, 640 Farrington Oval, University of Oklahoma, Norman, OK, 73019. For inquiries 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.

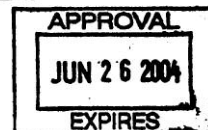
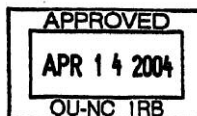
*I have read and understand the terms and conditions of this study and I hereby agree to participate in the above-described research study. I understand my participation is voluntary and that I may withdraw at any time without penalty.
If selected to be interviewed, I consent to being audio taped. (Please check: yes ___ no ___)*

Signature of Participant

Printed Name of Participant

Date

Researcher Signature



APPENDIX B: HUMAN SUBJECTS APPROVAL



The University of Oklahoma

OFFICE OF HUMAN RESEARCH PARTICIPANT PROTECTION

April 14, 2004

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

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

Dear Dr. O'Hair:

The Institutional Review Board has reviewed and approved the requested revision(s) to the subject protocol.

Please note that this approval is for the protocol and informed consent form initially approved by the Board on June 27, 2003, and the revision(s) included in your request dated 12/08/03 to add the following persons to this project:

Mark A. Nanny	Jo Ann Pierce
Randy S. Averso	Ron Myers
Jean Cate	Dan Allen
Dennis Gentry	Jesica Turner
Leslie A. Williams	Craig Stevens
Linda Atkinson	Robert H. Kinsey

If you wish to make other changes, you will need to submit a request for revision to this office for review. If you have any questions, please contact me at 325-8110.

Cordially,

E. Laurette Taylor, Ph.D.

Chair

Institutional Review Board - Norman Campus (FWA #00003191)
FY2002-443

cc: Dr. Mark Nanny, Civil Engineering & Environmental Sciences
Dr. Randy Averso, Educational Leadership & Policy Studies
Dr. Jean Cate, Educational Leadership & Policy Studies
Ms. Linda Atkinson, Educational Leadership & Policy Studies

