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TECHNOLOGY INTEGRATION: A STUDY ON THE IMPACT OF INCREASED TECHNOLOGY ACCESS

A Dissertation

Submitted

in Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

Approved:

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Dr. Victoria Robinson, Chair

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Dr. John Henning, Committee Member

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Dr. Michael Waggoner, Committee Member

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Gina Kuker

University of Northern Iowa

July 2009

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DEDICATION

This dissertation is dedicated to my family, friends, and students. Without their love and support, this dream would never have been completed.

To my students, may you accomplish things you never thought possible. Believe in yourself.

To my friends, may you value true friendship.

To my family, thank you for being there for me.

To my parents, you taught me persistence!

To my husband, Brent, may this all be worth it someday!

To my children, Jocelyn, Braxton, and Brayden. And if ever I get wrapped up in my title, may I remember Jocelyn's quote from the back of the minivan "I don't want you to be a doctor, I don't want you to be a doctor, I don't want you to be a doctor, I just want you to be my mommy" (Jocelyn, 2005).

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"It takes a village to raise a child" is an African proverb that is frequently quoted in education. I feel I was this child as I went through the dissertation process. I have many, many people to thank for their support and encouragement.

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Dr. Victoria Robinson, Committee Chair

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July 2009

ABSTRACT

Colleges with teacher education programs have struggled to integrate technology into the curriculum. While access to technology has increased and support for technology usage is present, technology integration has not dramatically changed within the majority of classrooms (Cuban, 2001; Opperheimer, 1997; Stenson & Bagwell, 1999). Education faculty members should model effective technology integration within their classrooms in order for their preservice educators to see examples of how to incorporate technology into teaching and learning. Teachers tend to teach the way that they were taught (Judson & Swanda, 2001; Lortie, 1975). Without seeing how to integrate technology use across content areas, preservice educators struggle to make meaningful connections about how to integrate technology to enhance student learning (Hammond, 2007).

The primary focus of this study was to investigate how effectively one small, private university integrated educational technology into the classroom setting after the access to technology increased. It was believed that a new facility with accessible and high quality technology had the potential to enhance technology being incorporated throughout the professional core. Therefore, this study examined if the actual teaching methods were affected after access to technology increased. The researcher examined the change in how professional core courses were taught from the professors' points of view. Then preservice educators were asked if the increased access to technology altered how education faculty members' manner of instruction.

Increased access to education technology impacted faculty members' teaching methods. While their syllabi did not demonstrate how the new facilities affected

education faculty teaching methods, the faculty interviews did. The professors continued to model how to use the equipment, what to use the equipment for, and how to use technology to teach the content. In addition, the researcher found an increased amount of classroom time was used to demonstrate educational technology was integrated as a communication tool, resource, or productivity tool.

Differences in technology integration occurred after moving to the new facility. Education faculty members' personal computer use increased as evidenced in the LoTi survey and education faculty interviews. Faculty interviews showed that education faculty members' current instructional practices benefited from increased access to educational technology in the classrooms and the availability of the education computer lab. Interview results also showed that faculty members benefited from the synergy of similar software having been installed in offices, classrooms, and the computer lab.

The preservice educators recognized that educational technology was used more often and for more purposes in the new building. They learned how to use educational technology because their education professors had modeled it. The education computer lab with the SMARTBoard provided greater access to hardware and software than was previously available.

In contrast to other studies that investigated how change occurs when educational technology is introduced, this study noted three important contributing factors to increased educational technology use in the classroom: time, access, and collaboration. Greater access led to increased time and collaboration among preservice educators and education faculty members.

CHAPTER 1

INTRODUCTION

The integration of educational technology is considered to be a critical factor behind the United States' competitive position in education, and consequently, in business. Over the past 16 years, the United States has invested more than $40 billion to bring computer hardware, educational software, and Internet connections into the classroom (Dickard, 2003). Policymakers, parents, and the public have looked to educational technology to revolutionize education. While American schools have invested in the information age by spending heavily on infrastructure, schools have neglected to develop "detailed plans for how technology would support larger curricular goals, how teachers would be trained to integrate technology, or how technology tools would be maintained and upgraded" (Keane, Gersick, Kim, & Honey, 2003, p. 15). Are infrastructure investments alone sufficient?

The Office of Technology Assessment (1995) completed a study to check if educational technology usage in classroom instruction had kept pace with the increased access to technology. This report concluded, "Technology offers richer, more varied, and more engaging learning opportunities for students, but these practices tend to be the exception rather than the norm" (Sandholtz, 2001, p. 349). Much of the training for teachers focused on fundamental computer operations rather than on how to integrate educational technology across the curriculum (Sandholtz, 2001).

National Initiatives

"The 'new basics' such as computer skills," tougher standards, higher teacher salaries, and higher graduation requirements were demanded more than 25 years ago in the report *A Nation at Risk* (Ornstein & Levine, 2006, p. 406). Recent public educational reform began with this report, which claimed the United States was losing its competitive edge over other industrialized nations (National Commission on Excellence in Education, 1983). *A Nation at Risk* indicated several aspects of educational decline, including lower achievement scores, lower teacher expectations, and lower testing requirements.

In 1994, Congress passed the *Goals 2000: Educate America Act*, which provided the framework for educational reform for the 21st century. Subsequent legislation emphasized quality curriculum and performance standards for all students, promoted the use of educational technology to help all students achieve national goals, and encouraged the need for teacher education and professional development (The National Education Goals, 1998). To focus on preparing preservice teachers to use educational technology in the classroom, in 1997, the National Council for Accreditation of Teacher Education (NCATE) adopted the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS; see Appendix A). ISTE defined the curriculum and content area standards for educational technology and listed the fundamental concepts, knowledge, skills, and attitudes for using educational technology in the classroom (ISTE, 2004b). According to these standards, preservice educators seeking any certification or endorsement should meet criteria in six areas: (a) technology operations and concepts; (b) planning and designing learning environments and

experiences; (c) teaching, learning, and the curriculum; (d) assessment and evaluation; (e) productivity and professional practice; and (f) social, ethical, legal, and human issues.

Most recently, in 2002, Congress approved then President George W. Bush's educational reform initiative, the No Child Left Behind Act (NCLB). This act legislated content and performance standards to measure student achievement in adequate yearly progress. As a result of NCLB, educational expectations began to focus on student performance in math and reading, placing highly qualified teachers in classrooms, and improving low-achieving schools (Ornstein & Levine, 2006). In addition, states were given deadlines to ensure "technology will be fully integrated into the curricula and instruction of the schools" (Fletcher, 2003, p. 56). Accountability is now the emphasis within schools. Such national reports and legislative acts have had an impact on integrating educational technology to improve students' learning.

Teacher Education Programs

Colleges with teacher education programs have struggled to integrate educational technology into the curriculum. While access to technology has increased and the desire for technology usage is present, educational technology integration has not dramatically changed within the majority of classrooms (Becker, 2000; Cuban, 1986, 2000; Hammond, 2007; Oppenheimer, 1997; Stetson & Bagwell, 1999). "The ability of teachers to use technology in classroom instruction lags behind access to technology in schools" (Sandholtz & Reilly, 2004, p. 487). Cuban (1986) identified numerous technologies that failed to change teaching in the classroom. Although computers are now in most classrooms and a significant portion of classrooms in this country have an

Internet connection, the fundamental methods and techniques of teaching have not changed. A growing gap exists between the educational experience of a child who has a technology literate teacher and a child who has a technology challenged teacher. A National Center for Educational Statistics (NCES) survey found that while "99 percent of full-time regular public school teachers reported that they had access to computers or the Internet somewhere in their schools," but only "thirty-nine percent...indicated they used computers or the Internet 'a lot' to create instructional materials" (U.S. Department of Education, 2000a, p. 1). Teacher training programs have been challenged to provide instruction that will effectively demonstrate appropriate technology use in college classrooms as well as provide experiences in K-12 classrooms that have been equipped with similar technologies (Carroll & Morrell, 2006).

Barriers to Educational Technology Integration

Several barriers complicate the process of teaching preservice educators how to integrate educational technology into their future classrooms. Five specific barriers to educational technology integration in colleges of education are: (a) lack of time, (b) lack of comprehensive support system, (c) education faculty members not modeling technology use, (d) lack of access to technology, and (e) culture/tradition of a single technology course (Brzycki & Dudt, 2005).

The first major barrier to educational technology integration is the lack of time. In fact, Beggs (2000) found that faculty ranked lack of time first among the barriers of educational technology adoption. They needed time to learn the technology and time "to develop instructional materials that utilize technology" (Beggs, 2000, p. 3). Education

faculty members need time to attend professional development or to take time to practice using different technologies (Feist, 2003). Education faculty members are "faced with more time constraints than other faculty, for student teacher supervision reduced time to revamp courses and access to support" (Brzycki & Dudt, 2005, p. 620).

Another barrier to educational technology integration is the lack of a comprehensive support system. One time professional development is not enough to impact technology integration. "They needed to be part of a comprehensive support system of help desks, one-on-one support, peer support, incentives, and direct assistance in developing modules, assignments, and activities, delivered by staff familiar with instructional design" (Brzycki & Dudt, 2005, p. 621).

Education faculty members must model effective integration of technology within their classrooms in order for their preservice educators to see examples of how to incorporate technology into teaching and learning. Teachers tend to teach the way that they were taught (Judson & Swanda, 2001; Lortie, 1975). In addition, education faculty members need to learn how to integrate technology into the K-12 classroom as well as their classroom (Keeler, 2008; Stetson & Bagwell, 1999).

Another factor that affects the integration of technology into the curriculum is the lack of access to technology. "Both faculty and students need access to computers, printers, and other peripheral equipment when they need them" (Mehlinger & Powers, 2002, p. 28). The barriers limiting computer access were lack of computers and software, lack of appropriate instructional software, lack of technical support, lack of training, and lack of time to learn and use the new technology for instructional purposes (Sahin, 2006).

Surendra (2001) found access as the most crucial diffusion factor. Other researchers agreed the most important barrier for faculty members was the lack of easily accessible resources (Odabasi, 2000; Stetson & Bagwell, 1999).

The culture/tradition of a single technology course also creates a barrier to integrating educational technology into an entire program. While over 90 percent of colleges of education programs have at least one technology component (Ornstein & Levine, 2006), the majority have a stand-alone technology course. These courses range from one to six credit hours and are offered early in the teacher education program (ISTE, 1999 as cited in Mehlinger & Powers, 2002). The stand-alone course does not fully integrate technology into the entire teacher education program.

Preservice Technology Integration

Preservice educators lacked the ability to transfer the technology skills into the classroom. In the past, teacher education stressed knowing about the computer rather than using the computer to support the teaching and learning process (Sandholtz, 2001; Stetson & Bagwell, 1999). While recent college students entered with increased computer literacy, Scheffield (1998) found these students did not possess the skills necessary for an introductory educational technology course. According to Cuban, Kirkpatrick and Peck (2001), the teachers who used technology in instruction tended to use it to reinforce existing teaching practices. To increase teaching and learning, colleges of education must permeate all of these barriers to educational technology integration.

New educational technologies can help transform schools, but only if they are used to create new models of teaching and learning. Preservice educators are expected to

learn their content area and pedagogy, which is, "in educators' language the study of teaching methods and practices" (Sparks-Langer, Pasch, Starko, Moody, & Gardner, 2000, p. 7). Shulman (1987) stated that pedagogy and content area knowledge overlapped in a Venn diagram. He called the overlapped area pedagogical content knowledge. Added to this, preservice educators are expected to integrate educational technology where appropriate. To demonstrate this integration, Niess (2005) added technology pedagogical content knowledge (TPCK) to Shulman's Venn diagram in the area that integrated the development of content area knowledge with the development of technology and the knowledge of teaching and learning.

Research

During the past four decades, substantial research has been done on educational technology integration within the K-12 classroom. However, minimal research has been conducted on the topic in higher education (Mehlinger & Powers, 2002). Within higher education, the difference between the types of institutions greatly impacts how much time and money is devoted to integrating technology and measuring the results. In a report by Market Data Retrieval, "the smallest colleges have an average technology budget of $600,000, while the largest—those with more than 25,000 students—have an average technology budget of $11.5 million" (Kiernan, 2006, p. 27).

Research I institutions have the funding and resources to evaluate their technology integration programs. One such study examined the educational technology preparation of preservice teachers enrolled in Holmes Group member institutions, which consisted of 88 research universities. Most preservice educators in the study completed a

single three-credit course about instructional technology. The results of the study supported "the conclusion that a shift in the content and emphasis of instructional technology preparation for preservice teachers is occurring" (Hargrave & Hsu, 2000, p. 7). The data presented suggests a growing emphasis on curriculum integration of technology, rather than technology for personal use or teacher productivity (Hargrave & Hsu, 2000).

Public, regional institutions are also large enough that they are able to measure how they are integrating technology. Through funding such as the Preparing Tomorrow's Teachers to Use Technology Program (PT3) grant, many completed program evaluations. Since 1999, over 400 consortia have received PT3 grants of varied scope and approach (Effecting Change State-Wide—PT3, n.d.). While not all public institutions received the PT3 grant, these institutions typically have computer support and training to assist faculty with integrating technology into their classrooms.

Small private colleges and universities struggle to measure their progress in technology integration because they lack the time, resources, and expertise needed to complete such an evaluation. In addition, small private colleges usually rely on funding for information technology from their campus operating budget instead of special state funding (EDUCAUSE, 2003). Small, private colleges may have computer support, but they lack the faculty training component to integrate technology into their classrooms.

Statement of the Problem

Preservice educators study both content area knowledge and pedagogy. Shulman (1987) referred to this instructional process as pedagogical content knowledge. Preservice

educators take a course or have methods courses that attempt to integrate technology into content areas. "Studies of K-12 teachers' instructional applications of educational technologies to date show many to be pedagogically unsophisticated; they are limited in breadth, variety, and depth, and are not well integrated into curriculum-based teaching and learning" (Groff & Mouza, 2008; Levin & Wadmany, 2008; Russell, O'Dwyer, Bebell & Tao, 2007; Zhao, Pugh, Sheldon & Byers, 2002 as cited in Harris, Mishra, & Koehler, 2009). Most college coursework does not develop preservice educators with the ability to incorporate technology into their future classrooms (Keeler, 2008).

Therefore, the problem investigated in this study was how effectively one small, private university integrated educational technology into the classroom setting after increasing access to technology by building a new technology-rich education facility on the residential campus. To assess the degree to which teaching methods changed, faculty syllabi documented how their instruction using educational technology has changed since moving to the new facility. The researcher conducted repeated classroom observations of one education faculty member instructing core course students in a professional core class to note changed technology use. The Pre-Classroom Observation Interview Tool and the Technology Use Lesson: Observation Tool were used with the classroom observation (Brooks-Young & Barnett, 2002; see Appendices B and C). Six education faculty, who qualified for the study, were interviewed about how their instruction has changed as a result of this new technology. In addition, seven education faculty members, including the researcher, were surveyed using the Levels of Technology Implementation (LoTi) questionnaire for higher education faculty (see Appendix D). This questionnaire

was purchased by the researcher. Finally, preservice educators were interviewed for their perceptions about how education faculty instructions have adjusted since moving to the new facility. The preservice educators corroborated information gathered from the faculty.

Significance of the Study

The purpose of this study was to examine the impact of increased access to technology on the pedagogy of Education Department faculty as a result of the construction of a new technology-rich facility. The researcher examined the change in how professional education core courses were taught from the professors' points of view. The new facility with access to technology enhanced technology integration throughout the method courses. This study was important to see if increased access to educational technology with technology-rich facilities resulted in increased use of technology and the enhancement of instruction to better prepare preservice educators.

Research Questions

1. How did increased access to technology through new facilities affect education faculty members' teaching methods?
2. What differences in technology integration occurred after moving to the new facility?
3. What were the perceived changes and differences noted by preservice educators, who were instructed in both the former building and then the technology-infused building?

Definition of Terms

The following definitions are given for clarification of the terms used in this study:

1. Core Course Students: Participants in the Content Area Literacy course from the professional education core courses (Lee, personal communication).
2. Digital Immigrant: Individuals who were not born into the digital world, but may have at some later point in life, adopted some aspects of new technology (Prensky, 2001).
3. Digital Native: Individuals who were born after 1980 "are all 'native speakers' of the digital language of computers, video games, and the Internet" (Prensky, 2001, p. 1).
4. Educational Technology: "Refers to the application of technology skills for learning" (ISTE, 2008, p. 2).
5. ISTE: The International Society for Technology in Education is a widely recognized organization with a history of promoting technology integration into education.
6. NETS-T: National Educational Technology Standards for Teachers developed by ISTE.
7. Pedagogy: "In educators' language the study of teaching methods and practices" (Sparks-Langer et al., 2000, p. 3).

8. Preservice teacher education: "The formal preparation a prospective teacher receives before obtaining a teacher license and beginning service as a full-time teacher" (Mehlinger & Powers, 2002, p. 9).
9. Readability chart: A chart that used a readability formula to determine the difficulty of text.
10. Readability formula: "Mathematically derived indices of text difficulty based on an analysis of linguistic variables, the two most common being word length and sentence length" (Readence, Bean, & Baldwin, 2008, p. 283).
11. Reculturing: "How teachers come to question and change their beliefs and habits" (Fullan, 2001, p. 34).
12. 6 + 1 trait writing: "Characteristics of all good writing, regardless of the age of the writer" (Cooper & Kiger, 2009, p. 338).
13. Teachable moments: "—the unplanned lessons—and then go on" (May, 2006, p. 106).
14. Technology-rich facility: "Learning environment that provides ubiquitous access to technology-tools, Internet-based resources, and online communication systems" (Tothero, 2005, p. 44).

Limitations of the Study

Limitations of this study were as follows:

1. The intent of this study was to understand technology integration at one small, private college in the Midwest.
2. This study examined preservice educators student teaching at the

residential campus in one Midwestern state (not including satellite campuses).

3. Preservice educators attended classes for one full year in both the former and new technology-rich buildings and student taught in the Midwestern state to be considered for this study.

Delimitations

This study focused on only one small, private college in a Midwestern area of the country. The participants were selected based upon their attendance in both facilities, regardless if they were representative of the teaching force. The descriptive findings of the study could not be generalized to other instructional settings. The observation of the one Education Department faculty member was a convenience sample. Samples selected in this manner cannot be assumed to represent a larger presentation.

CHAPTER 2

REVIEW OF LITERATURE

Overview of Literature

Schools face the challenge of preparing students for a constantly changing, complex world. Because of advances in technology and adjustments in our world economy, the ability to find, sort, manage, and apply new information has increased in importance. This is particularly true in the 21st century, when access to a wide array of educational resources has allowed new possibilities for teaching and learning. Educational technology has become one means to stay current. The review of literature includes an overview of technology in education, the standards movement, technology barriers, change theory, technology in educational settings, technology as a resource, and teacher use of technology.

Technology in Education

Generally people agree on the need for technology in education because it can increase student learning. "Technology, in its many forms, has become a powerful tool to enhance curriculum and instruction" (Clark, 2006, p. 482). In certain circumstances, technology has been shown to help students learn more, at a faster rate, with more motivation, and with greater connections to the community and the outside world (Lemke & Coughlin, 1998; Niederhauser, Lindstrom, & Strobel, 2007; Schacter & Fagnano, 1999). Technology is seen as a resource for achieving critical competencies such as higher level thinking skills (Moersch, 1998). As a result, elementary and secondary

schools in the United States have placed educational technology in their classrooms throughout the past century.

A key component of teacher education is to use educational technology (Ornstein & Levine, 2006; Overbaugh & Lu, 2008-2009). Rather than just having technology specialists, all teacher candidates should understand and use technology for communication, resources, and instruction. "It is the responsibility of teacher education faculty to not only explore, create, and evaluate effective teaching strategies with technology for K-12 classrooms, but to also integrate it into university curricula as a way to increase preservice teacher effectiveness" (Stetson & Bagwell, 1999). The expectation that teachers will use technology is seen throughout the standards movement. "All subject area standards directly address technology integration in some capacity" (Keeler, 2008, p. 23).

Standards Movement

The need to prepare teachers to effectively and efficiently use technology to support teaching and learning has been noted in various standards. "Standards have been established to guide the efforts of teacher training institutions in the preparation of teachers who are conversant with an array of technologies and how they can be used effectively and efficiently for pedagogy and learning" (Duhaney, 2001, p. 5). Colleges of education along with participating schools need to provide opportunities for preservice educators to meet these standards (ISTE, 2006). Regardless of the challenges to integrate technology, teacher preparation programs are expected to accomplish the standards and criteria. "This can, perhaps, best occur in methods classes where problems can be

contextualized in a content area and technology can be integrated in meaningful and appropriate ways to scaffold student learning" (Niederhauser et al., 2007, p. 507).

Over 25 years ago, *A Nation at Risk* (National Commission on Excellence in Education, 1983) recommended "computer science" as one of the five "new basics" to be added to high school graduation requirements.

> Regarding computer science, the Commission on Educational Excellence, which authored the report, specified that all high school graduates should "understand the computer as an information, computation and communication device; [be able to] use the computer in the study of the other Basics and for personal and work-related purposes; and understand the world of computers, electronics, and related technologies." (National Commission on Excellence in Education, 1983, as cited in Culp, Honey & Mandinach, 2003, p. 1)

Since that time, American schools have worked to improve their teachers' and students' technology abilities.

Goals 2000 was the next wave of education reform with reference to technology integration (Office of Educational Research and Improvement, 2004). This document provided a structure for having the federal government as a supportive partner in state and local systematic reform efforts. Technology played a major role in the development of these goals. In the executive summary, Goals 2000 supported state efforts to develop clear and rigorous standards for what every child should know and be able to accomplish (Goals 2000, 1998). In addition, Goals 2000 supported comprehensive state and district-wide planning and implementation of school improvement efforts focused on improving student achievement to those standards. Technology plans were developed to increase student learning (Office of Educational Research and Improvement, 2004).

During the same time frame, 1987, the Interstate New Teacher Assessment and Support Consortium (INTASC) was created to build consensus among states to "reform the preparation, licensing, and on-going professional development of teachers" (Council of Chief State School Officers [CCSSO], 2006, p. 1). This consortium worked to align what all teachers would know and do to help K-12 students meet standards. INTASC did not create state standards, but served as a resource and model to develop state standards (CCSSO).

The INTASC standards were created as an integral component for a new performance-based process. "INTASC has the biggest potential impact for initial preparation programs. Many state departments of education use the INTASC principles for assessing teacher preparation programs. Teacher educators must ensure that their program graduates meet the INTASC criteria" (Quisenberry, 1996, p. 32). However, the INTASC standards contained no mention of technology (CCSSO, 2006).

ISTE Standards

The U.S. Department of Education in conjunction with the International Society for Technology in Education (ISTE; 2004a) and the Milken Exchange on Educational Technology produced the *National Education Technology Standards for Students*. In 1997, the National Association for Accreditation of Teacher Education (NCATE) adopted the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) for preparing preservice teachers to use technology in the classroom because the standards focused on the K-12 classroom setting. The ISTE Standards (2006) stated that preservice educators seeking any

certification or endorsement should meet these six areas of the standards: technology operations and concepts; planning and designing learning environments and experiences; teaching, learning, and the curriculum; assessment and evaluation; productivity and professional practice; and social, ethical, legal, and human issues. ISTE (2006) stated "It is the responsibility of faculty across the university and at cooperating schools to provide opportunities for teacher candidates to meet these standards" (p. 1).

Development of ISTE Standards

The first edition of the ISTE Technology Standards for All Teachers was adopted in 1993 with 13 indicators. In 1997, the second edition was organized into three categories: "1. Basic Computer/Technology Operations and Concepts, 2. Personal and Professional Use of Technology, and 3. Application of Technology in Instruction" (ISTE, 2006, p. 1). The three categories were expanded to six by dividing the instruction category into the areas of planning, implementing, and assessing instruction. An additional category addressed the issues related to the use of technology. Because of the expansion of the instruction category with the accompanying indicators, the ISTE Standards were correlated with nine of the 10 INTASC Standards. See Table 1 (see Appendix E).

Standards Movement Continued

In 2002, standards were revised in response to Congressional approval of then President George W. Bush's educational reform initiative, the No Child Left Behind Act (NCLB). The NCLB Act stated that educational technology increases accountability, transforms education, and improves access. In addition, NCLB promoted initiatives that

allowed professional educators to integrate technology into the curriculum and instruction and to align it with academic standards (Ornstein & Levine, 2006).

The eight Iowa Teaching Standards were developed by Iowa Department of Education for the purpose of comprehensive evaluation for beginning and career teachers (Iowa Code, 2003). Technology is specifically mentioned in Standard 3 and Standard 4 (see Appendix F). The criteria in these standards refer to technology as a resource in the "development and sequencing of instruction" and in the "delivery of instruction." Technology is not explicitly referred to in communicating with stakeholders in the school district or in gathering and reporting assessment data.

Challenges to Meeting Technology Standards

A National Center for Educational Statistics study (U.S. Department of Education, 2000b) reported that only 10% of the teachers with access to computers felt "very well prepared" to use computers and the Internet, and only 23% felt "well prepared." While the current population of preservice educators is better equipped with technology skills than ever before, they are not able to integrate technology into their teaching practices (Hammond, 2007; Owen & Demb, 2004; Sandholtz & Reilly, 2004). This is a point of frustration for stakeholders who want to see technology truly integrated into the classrooms across the nation. The statistics on how well teacher education programs prepare teachers to integrate educational technology are lacking (Kleiner, Thomas, & Lewis, 2007).

At the same time, computer access has increased at home and in schools. In 2000, 65% of children had access to a home computer compared to 32% in 1993 (Rathbun &

West, 2003). "Over the past 10 years, 99 percent of our schools have been connected to the Internet with a 5:1 student to computer ratio" (U.S. Department of Education, 2003, as cited in U.S. Department of Education, 2004, p. 10). However, providing the software and hardware without adequate training results in failure to realize the potential of technology in education.

This lack of educational technology training affects hiring practices. Superintendents are reluctant to hire new teacher candidates that are not trained to integrate technology into the classroom. "Their contention is that precious staff development funds are being eaten away by initial training that should, and could, be provided by preservice teacher education programs" (Stetson & Bagwell, 1999, p.145). As early as the 1990s, three fourths of school administrators sought teachers who possessed technology skills and competencies (Stuhlmann, 1998). Research continues to support training for preservice educators because it costs so much time and money to offer professional development in technology integration after teachers are employed (Keeler, 2008).

Colleges with teacher education programs have struggled to prepare preservice educators to integrate educational technology into the curriculum. While access to technology has increased and support for technology usage is present, technology integration has not dramatically changed within the majority of classrooms (Cuban, 2006; Hammond, 2007; Oppenheimer, 1997; Stetson & Bagwell, 1999). Computers have not transformed the teaching strategies for a majority of teachers (Becker, 2000; Cuban, 2006). Researchers have reported that schools and colleges of education are behind

schedule on integrating technology into today's K-12 classrooms (Brooks & Kopp, 1990; Dublin, 1994; Lei, 2009). Several barriers complicate the process of teaching preservice educators how to integrate technology into their future classrooms.

Technology Barriers

Several common barriers typically limit technology integration into college of education programs. These barriers include: (a) education faculty members do not model technology use, (b) dependence on a single technology course, (c) lack of access to technology, and (d) lack of preservice educators' ability to transfer the technology skills into the classroom.

Model Technology

Education faculty members must model effective integration of technology within their classrooms for their preservice educators to see examples of how to incorporate technology into teaching and learning. Unfortunately, faculty members may not possess enough knowledge about computer technology and are, therefore, unable to adopt it in their classrooms. According to Cavanaugh (2002), teacher education faculty members do not have enough knowledge and skills to integrate and model the adoption of technology into their own instruction. Computer expertise is a significant factor affecting computer use for instructional purposes (Asan, 2002; Lei, 2009). Teacher education programs are presented a double challenge: how to integrate technology into the K-12 classroom as well as into their own college classrooms (Stetson & Bagwell, 1999). Yet, preservice educators noted observing university faculty teaching with technology encouraged and convinced them to integrate technology (Wright & Wilson, 2005-2006).

Single Technology Course

Over 90% of college of education programs depended on a single technology course (Ornstein & Levine, 2006). Most teacher education programs with these stand-alone courses offered them early in the teacher education program, and the courses ranged from one to six credit hours (ISTE, 1999). Originally, the single-course format was designed to prepare preservice educators to use technology in their instruction (Hargrave & Hsu, 2000). "Stand-alone technology courses can provide teacher education students an overview of the technologies they need to know" (Mehlinger & Powers, 2002, p. 86). However, the stand-alone course did not fully integrate technology into the entire teacher education program. While students may have gained skills within the area of technology, they may not have integrated that technology knowledge into their classroom (Willis & Sujo de Montes, 2002). "Seldom is technology integration substantially addressed within the context of the important core courses. Thus, students oftentimes don't see technology integration as a standard tool in their future classrooms" (Foulger & Williams, 2007, p. 107). Preservice educators need to transfer their knowledge of technology into their content areas.

Access

Studies have shown that teachers are not comfortable using technology in their instruction (NCES, 1999) possibly because of limited access to resources and planning time and inadequate training (Albion, 2001; Brzycki & Dudt, 2005). Teachers must have access to technology before they can integrate technology into their teaching. This

growing concern over teachers' ability to address the demands of today's educational system has led to increased interest in how teacher preparation programs are including technology in their instruction (NCES, 1999). As a result, teacher education programs have been pushed to better prepare their preservice educators to use educational technology.

Transfer of Technology

Teacher education programs have shifted from single course models of instruction to technology integration that spans the entire preservice program. The belief is that this model of technology integration will most effectively prepare preservice educators to incorporate technology into their own classrooms. The choice to use technology depends on the teacher and the effectiveness of his or her teaching methods and instructional strategies. While government, private industry, and parents promoted technology in education, it is ultimately the teachers who determined if and how technology was integrated in the classroom. Research has demonstrated that preservice educators who have experienced technology integration across their entire teacher preparation program had increased positive attitudes and confidence levels about teaching with technology (Beyerbach, Walsh, & Vanatta, 2001; Pope, Hare, & Howard, 2002).

Technology in Educational Settings

Researchers and educators have struggled to define the best roles and functions for technology in educational settings since computers first arrived in schools in the mid-1960s (Cuban, 1986). Much of the early work with computers focused on computer-assisted instruction (CAI), such as PLATO and TICCIT. During the 1970s and early

1980s, technology innovation became even more diverse and microcomputers became available to the general public (Reiser & Dempsey, 2007). During the late 1980s and 1990s, technologies were enhanced with graphics-rich and networked environments. Throughout the 1990s, the rate of technology innovations accelerated. Both accessibility and lower costs allowed the introduction of new technologies into the classroom setting. The introduction of telecommunications and networking technologies, enhanced graphics and multimedia capabilities, higher speeds, and user-friendly applications changed the potential for technology in education (Hawkins, 1996).

A few teacher education programs responded to the technology preparation wake-up calls of researchers, policymakers, and educators. Innovative institutions revamped their programs to better prepare their preservice educators to use technology in the K-12 setting. Over 400 institutions were awarded federal grants through the Preparing Tomorrow's Teacher to Use Technology (PT3) program, which reached 52 of the 100 largest teacher preparation programs across the United States (Preparing Tomorrow's Teacher to Use Technology, 2003). Begun in 1990, The Campus Computing Project was the largest continuing study to track the role of information technology in American higher education (PT3, 2003). This annual survey showed an increase in the number of college courses that used technology, based on self-reported data.

> In 2001, about one-third of the roughly 600 participating institutions reported having a plan to integrate technology into the curriculum, and three-fourths reported providing formal support, such as additional funding, release time, or technical assistance, to faculty to restructure courses ...Notably the academic computing officers ranked education faculty as being slightly less prepared than their colleagues in the science, business, engineering, mathematics and occupational programs, but they were judged to be better prepared than their colleagues in the fine arts, humanities, and social sciences. (PT3, 2003)

The annual survey revealed "that instructional technology use on college campuses is growing steadily, and that campus leaders acknowledge the importance of helping faculty integrate technology into the instruction and see this as a key institutional priority" (PT3, 2003).

Process of Change

"Technology has now changed or altered how people access, gather, analyze, present, transmit, and simulate information. Today's technologies provide tools, applications, and processes that empower individuals of our information society" (See, 1994, p. 30). While supporters of technology believed that technology could enhance student learning, critics felt technology usage had not greatly impacted education.

> There are many uncertainties regarding the benefits of technology and the changes that the adoption of technology necessitates, such as the demand for technical support, pedagogical and instructional management issues, teacher professional development, network infrastructure, and costs of all components. (Hunter, 1993; Office of Technology Assessment, 1989, as cited in Dooley, 1999, p. 2)

"Putting ideas into practice was a far more complex process than people realized" (Fullan, 2001, p. 5). The amount of time for a change process to occur varies, moderately complex changes may take three to five years and larger changes may take five to 10 years. Change is a process, not an event (Fullan, 2001; Hall & Hord, 2006). Fullan (2001) further stated

> We are talking about reculturing the teaching profession—the process of creating and fostering purposeful learning communities. Teachers and principals must reculture their schools, but so must administrators work on reculturing their districts; universities, their teacher preparation programs; and states, their policies of accountability and development. (p. 136)

However, teachers are reluctant to adopt a technology that appears incompatible with the norms of a subject content, subject pedagogy, and subject assessment (Hennessy, Ruthven, & Brindley, 2005; Hew & Brush, 2007).

New technologies offered a number of useful tools to help create new learning environments and reshape the traditional structure of schools. Even though faculty used technology for communication purposes, they needed training to integrate technology into curriculum (Sahin & Thompson, 2006). The Internet allowed fast access to information and provided teachers with additional information and more resources than ever before. Communication increased through tools that enabled teachers to send emails among teachers, parents, students, and communities.

Administrators and educational leaders assumed that once an innovation had been introduced, it would be used and practiced. Evidently, this did not happen because initiatives continue to be introduced to enhance technology integration. In reality, teachers did not take advantage of the opportunities offered by educational technology (Brinkerhoff, 2006). Researchers stressed that increased access to technology does not equate with increased use of technology in classrooms (Brzycki & Dudt, 2005; Cuban, 1999; Lei, Conway, & Zhao, 2008; Zhao & Frank 2003 as cited in Lei, 2009). Change theory provides a model for examining how learning and integration occur before, during, and after a situation has been altered and can inform the choice of solution.

Theoretical Models of Educational Technology Implementation

Theoretical models were developed to describe classroom teachers' implementation of educational technology (Borthwick & Pierson, 2008). All of the

models recognized change is a process that requires time and support to be effective. The three models considered for this study are Concerns-Based Adoption Model (CBAM), Technology Use Lesson: Observation Tool, and Level of Technology Implementation (LoTi).

The Concerns-Based Adoption Model (CBAM) is a widely used framework that assesses and tracks individuals during the change process of an innovation (Hall & Hord, 2001). This model has served as a theory base addressed in other studies about instructional technology (Sahin & Thompson, 2006; Overbaugh & Lu, 2008-2009).

Slough and Chamblee (2007) reviewed studies over a decade that investigated the use of the CBAM model to study technology integration in the content areas of science and mathematics teaching. Most of the studies reviewed used the Stages of Concern Questionnaire as a diagnostic tool "to help individuals adopt an innovation" (p. 222). Further review was conducted to investigate those studies that went beyond short-term implementation.

Level of Technology Implementation (LoTi)

Moersch (2001) conceptualized a framework known as the Level of Technology Implementation (LoTi) to create a consistent set of measures that accurately reflect the progressive nature of teaching with technology. Moersch designed a model incorporating the work of the CBAM with the findings from Apple's Classrooms of Tomorrow (ACOT) research that identified five stages of change. LoTi's conceptual model focuses on classroom level technology integration, instruction, and assessment (Moersch, 2002).

The eight stages of the Levels of Use dimension of the CBAM align with Moersch's Levels of Technology Implementation (LoTi) Framework (2001). The LoTi stages are:

1. Level 0: Nonuse-lack of access to technology or lack of time
2. Level 1: Awareness-computer lab or pull out program
3. Level 2: Exploration-technology supplements existing program
4. Level 3: Infusion-technology infused into higher level thinking
5. Level 4A: Integration (Mechanical)-tool to solve authentic problems
6. Level 4B: Integration (Routine)-student action with technology on major concept
7. Level 5: Expansion-technology access expanded beyond the classroom
8. Level 6: Refinement-Seamless medium for solving real-world problems

The Levels of Use of Technology table (see Appendix G), which relates the two research-based frameworks, was developed at RMC Research Corporation (2000, p. 1-3). This table (see Appendix G) shows how the innovation of educational technology relates to the change process. In addition, it provides the complete description of the Levels of Technology Implementation (LoTi) Framework. Various research studies have used these frameworks to explain the usage of instructional technologies in teacher preparation programs (Moersch, 2002; Slough & Chamblee, 2007).

Technology Use Lesson: Observation Tool

The Technology Use Lesson: Observation Tool (Brooks-Young & Barnett, 2002) was based upon the Apple Classrooms of Tomorrow research (see Appendix C).

Therefore, it evolved from the same research as the LoTi survey. "By using this tool, observers can help the teacher identify not only the current stage of use, but to review exemplars for extending the teacher's level of skill to the next stage" (Brooks-Young & Barnett, 2002, p. 1). This tool includes five levels:

1. Entry: basic use of technology
2. Adoption: personal use with traditional instruction
3. Adaptation: increased student use in traditional classroom
4. Appropriation: project-based with technology
5. Invention: discovering new uses for technology

This model provided a framework to investigate educational technology implementation in this study in the classroom setting.

Technology as a Resource

The use of computers and technology resources has increased on college campuses. "However, it is difficult to gauge exactly how extensively computers are being infused into the curriculum as opposed to being used for administrative functions" (Preparing Tomorrow's Teachers to Use Technology, 2003). Educators and researchers began to realize that to accomplish the goals of technology integration, fundamental changes were needed in the way teachers teach and students learn. Creating new learning environments needed to incorporate innovative pedagogy, and new technology represented a complex change for teachers and administrators (Fullan, 1999).

Despite the fact that computers are in most classrooms, there have had minimal impact on teaching and learning. Computers have not transformed the instructional

practices of a majority of teachers (Becker, 2000; Cuban, 1993, 2001; Keeler, 2008). "The ability of teachers to use technology in classroom instruction lags behind access to technology in schools" (Sandholtz & Reilly, 2004, p. 487). Just because the computers are present does not mean that they are being used. "To provide state-of-the-art training to preservice teachers requires that in addition to knowing how to use and integrate technologies, methods instructors keep abreast of emerging technologies and their potential instructional uses" (Abowd, 1999 as cited in Keeler, 2008).

School reformers have stressed how important schools and skilled learning are to the viability of our nation as part of a global economy. This view of the importance of technology in America's workforce was firmly established in the 1990s with the release of The Secretary's Commission on Achieving Necessary Skills (SCANS) report (U.S. Department of Labor, 1991). Possibly because of such reports, parents have supported technology in schools so their children might be prepared to compete in the work world of the 21st century. Without appropriate technology in the schools, students may not be prepared to compete in the job market (Cuban, 1993; Looney, 2005).

On the positive side, today's children grow up in a high-tech environment. These digital natives are early adopters of technology and use available technology in more ways, for more purposes, and use technology more regularly. Whereas adults have tended to think of technology as a tool they needed to learn, children see technology as an environment. They expect to have technology surrounding them because it has always been available in their lives (Lei, 2009).

> Although this generation of preservice teachers has grown up in a digital age and they have been using more technology for their learning as students than previous

> generations, they have not been exposed to different ideas about teaching with technology due to the slow adoption of technology in classrooms in the last two decades. They might be considered digital-native students, but they are not yet digital-native preservice teachers (p. 92).

Healy (1998) stated that if the technology is available within the classroom, it is more likely to be used to increase student learning. Teachers must have access to technology in the classroom, so they can effectively and efficiently use it. The challenge remains for teachers to make a paradigm shift in order to do this. Most teachers are Digital Immigrants, who have adopted some aspects of new technology, but struggle to teach a population of Digital Natives (Prensky, 2001). Educators have noted that digital natives learn differently and use technology differently than digital immigrants (Lei, 2009).

Teachers Use of Technology

While increased access to technology occurs in classrooms, few teachers report feeling well prepared to integrate technology into the curriculum. According to Cuban et al., (2001), the teachers who use technology in instruction tend to use it to reinforce existing teaching practices, not to offer more engaging learning opportunities.

> Whether or not students' learning opportunities are enhanced through classroom use of technology is the measure of success that matters...To help teachers become more productive in their use of technology, we need to help them focus more on instruction and learning. (Sandholtz & Reilly, 2004, p. 510)

The preparation of teachers to use technology in the classroom is a key factor in determining whether or not teachers actually incorporate it into their curriculum. In the past, training for teachers stressed knowing about the computer rather than using the computer to support the teaching and learning process. In reality, training that focused on

integrating technology for instructional purposes was most successful. "The resource most often requested was time—time to learn, to prepare, and to experiment" (Sandholtz & Reilly, 2004, p. 496). The integration of technology into a curriculum requires specific, structured amounts of time (Hew & Brush, 2007). In addition, teachers need time to collaborate with other colleagues (Kay, 2006).

Initially, computers were used for skill and drill, or computer-assisted instruction (CAI). This did not match the constructivist view of education demonstrated at the highest level in the LoTi survey (Moersch, 2001). Education faculty members must ensure that preservice educators realize the importance of linking technology, content, and pedagogy (Lei, 2009). Constructivists believe that knowledge is not just transmitted by the teacher to the student. Instead, the teacher provides the environment that allows learners to construct their own meaning from their experiences (Jonassen, Peck, & Wilson, 1999). Meaningful technology integration should be more about pedagogy than technology (Dutt-Doner, Allen, & Corcoran, 2005 as cited in Lei, 2009). "Teachers with this orientation will not allow technology to drive what they do, rather exposures of this nature should allow sound principles of teaching and learning to determine what technologies are used and how they are employed in teaching and learning activities" (Duhaney, 2001, p. 5). The constructivist theory of learning provides a foundation for this method of teaching.

Summary

Access to a wide array of educational resources has allowed new possibilities for teaching and learning. However, schools face challenges to prepare teachers to integrate

the educational technology. Initially, schools upgraded facilities with technology. Federal and state governments along with educational organizations, NCATE and ISTE, established standards that included technology. Barriers limited technology integration but there have been gains in its use. Studying the integration process assists in understanding what is needed for effective use. The use of change theory-based instruments can help to explain the process of technology integration in educational settings. Teachers need to learn to connect technology with content and pedagogy and researchers can help all to understand the process.

CHAPTER 3

METHODOLOGY

Introduction

The study used qualitative research design "to explore the traits of individuals and setting" (Charles, 1995, p. 21). This descriptive research explained the situation as it existed at the time and place of this study after collecting data from multiple sources. This study addressed the question of how increased access to technology at a small, private university would affect the education faculty and the preservice educators. In contrast to previous research that evaluated data about the number of computers in the classroom or the availability of high-speed Internet connections, the focus of this study was not the access to technology, but the implementation of technology use. Previous research focused on levels of concern; this research focused on how and to what extent technology was integrated after the Education Department was relocated to a new technology-infused building.

A case study was conducted at a small, private Midwestern university. This chapter outlines how triangulation was achieved through content analysis of teachers' course syllabi (electronic format), repeated observation of one education faculty member teaching throughout a methods course with technology integration, semi-structured face-to-face interviews with education faculty, an Education Department faculty questionnaire, and preservice educator interviews.

The first section of this chapter describes the setting. Next, a description of the participants—education faculty members, core course students, and preservice

educators—is included. Then the instruments and timeline of the study are presented. The role of the researcher and permission for the study are stated next. Finally, the methods of data collection and data analysis are reviewed.

Review of Research Questions

The research questions addressed in this study included:

1. How did increased access to technology through new facilities affect education faculty teaching methods?
2. What differences in technology integration occurred after moving to the new facility?
3. What were the perceived changes and differences noted by preservice educators, who were instructed in both the former building and then the technology-infused building?

Setting

This study began in 2004-2005 and concluded at the end of the 2007-2008 academic school year at a private, Midwestern, four-year liberal arts college. At the beginning of the 2005-2006 school year, the Business and Education Departments moved into a new technology-infused facility. Education faculty and preservice educator participants had each participated in courses for a year in each building. The focus of this study addressed the differences in faculty and student use of technology in instruction due to differences in access to technology between the two buildings on the residential campus.

The former facility was originally constructed as the campus gym. When a new gym was constructed in 1963, the former building was renovated as a site for education, music, and art classes. Education faculty members faced many challenges attempting to integrate technology into their instruction in the facility. The most significant challenge was the lack of necessary electrical outlets and high-speed Internet cables because of the building's age.

Educational faculty members cautiously plugged in equipment with the fear of knowing they could easily blow a fuse, which could leave entire sections of the building without electricity. If window air conditioners were used, simply turning on a television, VCR, or an overhead projector was enough to blow a fuse. In addition to dealing with the building's outmoded electrical infrastructure, education faculty members grew frustrated with having to move technology components on carts so that they could be used. For example, to show a website or PowerPoint presentation, carts with computers and cables were positioned in front of the screen. When not in use, they were moved to the side of the room.

Education faculty members stated that they did not use technology at times because it was awkward and time consuming. No computer labs were in the building. When several education professors started working at the university, as recently as 1995, they did not have computers in their offices. When others began, they had to share computers. At the time of the study, all education faculty members had a Dell computer in their office, and they shared printers.

The new facility had two floors: the education division occupied the first floor and the business division occupied the second floor. The first floor consisted of six classrooms, one computer lab dedicated to the Education Department, 11 offices, a workroom, a conference room, and restrooms. Each classroom was equipped with an Elmo Document Camera (Elmo) and a computer station with a Digital Light Processing (DLP) projector. The Elmos allowed books, materials, and manipulatives to be projected through the DLP projectors onto a large screen for the entire class to view. VCRs were installed so movies could be projected on the large screen. One classroom included a Sympodium, which allowed for viewing multimedia presentations and websites, writing with an interactive pen, and saving class notes. Importantly, the wiring in the building allowed for other devices to be added as needed. In addition, the education computer lab provided increased access to technology for both faculty and preservice educators due to its proximity to the education classrooms and offices and the modern equipment it contained including 20 Dell computers, four iMacs and a SMARTBoard. Education faculty and education students reserved use of the education computer lab for class activities, projects, and presentations. All education faculty members had a computer and a color printer in their offices with the option to print using the laser printer in the workroom. The classrooms, computer lab, and offices were all set up with the same equipment so that they were all compatible.

University administrators had not stated what educational technology should be placed in the classrooms, but rather left that decision to the Education Department with the expectation that the facility contained a technology-rich environment. To facilitate

this, the university received a $150,000 grant from a charitable trust to support instructional technology in the teacher education program. Thus, Education Department members provided a significant amount of input in the design of the first floor and the equipment purchased. The Director of the Teacher Education Department worked with faculty to develop a plan for what they believed would be most important in the education portion of the new facility. Architects incorporated the Education Department's requests for number and size of offices, classrooms, and work and meeting spaces were incorporated into the preliminary drawings and floor plans.

In particular to the setting for this study, classroom 105 and the education computer lab were used for the class observation of the technology-rich course, Content Area Literacy. This course was selected because the words "integrate technology" were included in the course description read during the syllabi reviews. The entire course was delivered from 8 a.m. until 5 p.m. daily for one week during the second summer session. This technology-rich course was intentionally selected so educational technology would be showcased.

Participants

The three basic groups of participants were: education faculty, core course students, and preservice educators. Eight education faculty members, two male and six female, taught the professional education core classes. However, one of the education faculty members had not taught in the former building, so he did not qualify for this study. Thus there were seven faculty participants, including the researcher. Faculty members' college level teaching experience varied between two and 11 years, although

all had been in the education field for 15 to 38 years (see Table 1). One faculty member taught mostly elementary methods courses, three members taught secondary methods courses, and three members taught mixed teaching levels.

Table 1

Background Information of Education Faculty Members

Professor	Years	TD Date	Technology Input
A	15	IP	Explicit
B	27	2003	Explicit
C	27	2004	Implicit
D	31	2003	Implicit
E	38	1981	No
F	28	2005	Implicit

Note: TD = Terminal Degree; IP = In Progress.

Table 1 shows the six education faculty members included in the study excluding the researcher, the number of years they have been in education, the year in which they received their terminal degree, and if technology had been explicit, implicit, or was not taught while they were working on their terminal degree. Technology input was classified as explicit if technology was used as a method of delivery for instruction for part of their program, and directly used during their graduate coursework. Technology input was

classified as implicit if technology was used for research outside the classroom and without any direct usage of technology during the classroom setting. This information was gathered after much of the study was completed to clarify information gathered from preservice educators' interviews, education faculty interviews, and the LoTi survey.

The second category, "core course students," was originally not a participant category. However, after observing the professional education core class offered during the summer of 2007, the researcher realized that few preservice educators were in this particular class. Rather, of the 18 students in the class, most were taking the course for graduate credit and were employed in area school districts. When interviewing the course professor, the researcher discovered that this course contained the lowest number of preservice educators enrolled in the 10 years that she has taught summer school. Therefore, the "core course students" category was added. Thus the total number of core course students involved was 18 in the Content Area Literacy course: two undergraduates and 16 graduate students.

Preservice educators involved in personal interviews comprised the third group of participants for the study. These participants met the participation criteria as they had attended courses in the former building and in the new building for a minimum of one year in each location at the college selected for this case study. Each participant completed at least 14 weeks of student teaching in the Midwestern state during the 2006-2007 academic school year. As of August 1, 2007, after student teaching and graduation, 18 preservice educators qualified to participate in this study and were contacted: 12 responded and completed the interviews. Seven of the participants were females and five

were males. Six of the participants were elementary education majors, four were secondary education majors, and two were K-12 majors. The six elementary education majors all had a reading endorsement and at least one other endorsement in some combination: special education, English/language arts, early childhood, and/or physical education. The secondary education majors had majors in social studies, English, and two in mathematics. The K-12 majors had endorsements in physical education and art. This combination of participants represented a broad range of coursework being offered in the teacher education program.

Instruments and Materials

Several instruments were used to gather information for this study. Education faculty syllabi from the professional education core courses were reviewed. One faculty member was observed teaching one of the education methods courses. Two observation tools were used in the classroom observations of the summer core course: the WestEd RTEC Pre-Classroom Observation Interview tool (Brooks-Young & Barnett, 2002; see Appendix B) and The Technology Use Lesson: Observation Tool (Brooks-Young & Barnett, 2002; see Appendix C). After the classroom observations, six education faculty members were interviewed (see Appendix E). The education faculty members then completed the online LoTi questionnaire (see Appendix F). During this time, the 12 preservice educators were interviewed (see Appendix G).

Timeline of Study

During the 2004-2005 academic school year, education faculty taught preservice educators in the former building. However, preservice educators enrolled in EDU 252

Computers and Instructional Technology (CIT) course attended class in a different building on campus because there were no computer labs in the former building. Syllabi were collected for the 2004-2005 year from the professional education core courses (see Table 2).

Table 2

Research Study Timeline

Date	Research Activity
2004-2005	Education core courses in former syllabi (course syllabi)
2005-2006	Education core courses in new building (course syllabi)
2006-2007	Education core courses in new building (course syllabi)
Summer 2007	Classroom observations of technology-rich course
Aug./Sept. 2007	Preservice educator post-student teaching interviews
Fall 2007	Education faculty interviews
Dec. 2007	LoTi questionnaire
2007-2008	Transcription of audio recorded data
2008	Data analysis
2008-2009	Dissertation writing

The Education Department moved during the summer of 2005. Beginning with the 2005-2006 academic school year, education faculty taught preservice educators in the

new building that was infused with educational technology, including a designated education computer lab. Syllabi for the 2005-2006 year were collected from the professional education core. During the 2006-2007 academic school year, the 12 preservice educators student taught in the Midwestern state. Thus, these preservice educators were enrolled in the professional core in both buildings for at least a year.

Semi-structured interviews were prepared for the education faculty members and the preservice educators. The preservice educators completed interviews after their student teaching and graduation. The final set of faculty syllabi was collected during the summer of 2007. In addition, the WestEd RTEC Pre-Classroom Observation Interview tool was used to interview the education professor of the technology-rich course during the summer of 2007. Classroom observations of this course occurred with field notes recorded. The Technology Use Lesson: Observation Tool was used to code the information gathered from the course.

The education faculty members were interviewed at the end of fall 2007. After these interviews, faculty completed the LoTi survey. All of the interviews were transcribed during the spring and summer of 2008. Member checks were conducted to corroborate recorded data. The data was analyzed to answer the research questions. The findings from the LoTi survey prompted the researcher to reclassify information obtained from the education faculty interviews. Member checks were again conducted to corroborate recorded data.

Role of the Researcher

In qualitative research, "researchers become 'immersed' in the situation and the phenomena studied. Researchers assume interactive social roles in which they record observations and interactions with participants" (McMillan & Schumacher, 2001, p. 396). Typically, researchers use multiple strategies to corroborate qualitative data. "Participant observation is really a combination of particular data collection strategies: limited participation, field observation, interviewing, and artifact collection" (McMillan & Schumacher, 2001, p. 437). For this study, education faculty syllabi were reviewed as the artifact collection. Field observation occurred when the researcher directly observed and recorded information in the classroom setting without interaction. After observing one education faculty member teaching, the researcher interviewed education faculty members in semi-formal one-on-one interviews. Education faculty members, including the researcher, took the LoTi questionnaire developed by Christopher Moersch. The final step was post-student teaching interviews with preservice educators.

For the purpose of this dissertation, the researcher was an insider and, therefore, had the distinct advantage of understanding the institution, administration, faculty, and preservice educators. In this case, the researcher was a college professor and university supervisor. Additionally, the work as the participant observer was shaped by the researcher's background knowledge (Florio-Ruane & McVee, 2002). As a result, this researcher was able to rely on these past and present experiences to construct reality and bring background knowledge to the research site. In addition, the researcher's network was helpful. As a university employee, the researcher had uncomplicated access to

participants and the full support from the director of teacher education from the onset of the project. Education faculty members were receptive to observations of their classrooms and interviews with the researcher. The researcher continued to be an assistant professor of education at the same institution as the preservice educators, which likely aided the receptiveness of preservice educators in being interviewed.

Being an insider at the institution also carried some potential disadvantages during the study. To avoid issues of confidentiality and provide anonymity with colleagues in the education department, the researcher stressed adherence to confidentiality and anonymity. In addition, the researcher did not supervised any preservice educators student teaching during the 2006-2007 school year in order that they would not feel coerced to participate in the study. Interviews were conducted after final grades for student teaching had been submitted in to the Registrar's Office and the preservice educators had graduated.

Permission for the Study

Permission was obtained from the Human Subjects Review Board from the University of Northern Iowa (see Appendix H). In addition, permission to conduct this research was obtained from the university attended by the preservice educators and the education faculty members.

Data Collection

Multiple data sources were collected using faculty syllabi, course observations, faculty interviews, the LoTi Questionnaire, and preservice educator interviews. This methodology was implemented to move from the general characteristics to the specific

characteristics of this case study. The preservice educators were interviewed post-student teaching to add further insight and verify the information obtained from the faculty.

Faculty Syllabi

Education faculty syllabi were reviewed searching for technology integration. First, electronic versions of education faculty members' syllabi for the 2004-2005, 2005-2006, and 2006-2007 academic years were obtained from the departmental administrative assistant. "Documents and records are singularly useful sources of information, although they have often been ignored, particularly in basic research and in evaluation" (Lincoln & Guba, 1985, p. 276). According to Brzycki and Dudt (2005), syllabi revisions were outcomes that can easily be measured and analyzed. Also, most universities regarded syllabi as a contract between the instructor and student.

Many syllabi examined from the education faculty members listed learning objectives and/or outcomes, delivery method, and assignments, which gave evidence about the use of educational technology. In particular, the researcher compared and contrasted the syllabi from the same faculty member's courses when the faculty member taught in the former building and when the faculty member taught in the new building. Twelve professional education core courses were taught during this three year period, and the education faculty members taught the same courses during this period of time.

Class Observation of Technology-rich Course

The second step in data collection was repeated observations of one education faculty member and her course in the new, technology-accessible building. According to Vierra, Pollock, and Golez (1998), "qualitative observers choose a focus for observation

and a setting in which to observe" (p. 196). This course, Content Area Literacy, was selected because it was in the professional education core courses and "technology integration" was included in the course description on the syllabi. Content Area Literacy was one of 12 courses in the professional education core for all elementary and secondary education majors. The course objectives were to develop individualized content reading skills, evaluate the readability of textbooks, integrate technology in content area reading, and develop strategies to assist students in reading their content area textbooks. The education professor teaching the course was an assistant professor of education, had taught at the college level for 11 years, and taught this course 9 times. A technology-rich course was intentionally selected so that the participants showcased the use of technology. The classroom observations were considered as "freeze-frame snapshots," which did not take into account the progression of time (Cohen, Manion, & Morrison, 2000). The researcher observed the week long class periods for their entirety during the second summer session. All classroom observations were scheduled in advance with the education faculty member.

Using the WestEd RTEC Pre-Classroom Observation Interview tool, the researcher conducted a seven question interview with the Content Area Literacy instructor prior to each observation (Brooks-Young & Barnett, 2002; see Appendix B). The Technology Use Lesson: Observation Tool (Brooks-Young & Barnett, 2002; see Appendix C) provided the framework for the classroom observations in three areas: learning environment, student technology use, and lesson implementation. It focused entirely on technology use (Dirr, 2006). This tool was used because it corresponded with

one lesson. As field notes were recorded, the researcher based the class activities on the three Observation Tool categories. The observations were audio recorded and transcribed. Member checking occurred to assist in the accuracy and interpretation of the observations. The education faculty member responded to observation notes and additional questions through interviews.

Faculty Interviews

The third data source was interviews with six education faculty members, a common way that qualitative researchers collect data (Vierra et al., 1998). "Even when observation is the primary strategy in a project, interviews can provide data that are not accessible by observation—for example, historical background. Interviews can also be used to verify, clarify, or amplify field observations" (Vierra et al., 1998, p. 215). Education faculty member interviews were scheduled at the convenience of each faculty member in the conference room. The private interviews ranged from 30 to 90 minutes. Follow-up questions were transmitted electronically or asked face-to-face. The semi-structured interviews were held before the questionnaire was completed to protect against threats to internal validity (Gall, Gall, & Borg, 1999). "In the structured interview, the problem is defined by the researcher before the interview" (Lincoln & Guba, 1981, p. 155). Questions were developed based on the ISTE Standards (see Appendix B). Interviews were audio recorded to aid analysis. The audio was transcribed, which allowed the researcher an accurate record of the conversation. The researcher was able to cross check interview notes with the audio material.

LoTi Questionnaire

The fourth step was administrating the online LoTi Questionnaire: Higher Education Faculty (see Appendix D) to seven faculty members, including the researcher. The researcher took the questionnaire to provide personal insight into the survey and a comparison with the rest of the education faculty. The online questionnaire was completed after the education faculty interviews to reduce bias that may occur if conducted in the reverse order. Permission to use the results from this survey was granted by Christopher Moersch. The researcher purchased the survey to provide an outside source. The Moersch questionnaire was designed "to determine the level of a classroom teacher's technology implementation by generating a profile for the teacher across three specific domains: LoTi, personal computer use (PCU), and current instructional practices (CIP)" (Moersch, 1995 as cited in Moersch, 1999, p. 41).

Preservice Educator Interviews

The fifth step was to interview preservice educators who had completed their 14 weeks of student teaching during the 2006-2007 academic year. Of these 18 preservice educators, 12 responded and completed the interviews. The interviews occurred in August and September, 2007, the year after the preservice educators student taught. Because of the time of year, interviews were held on campus in the education conference room and in area school classrooms where some participants were starting their teaching careers. The researcher went where it was most convenient for the preservice educators. Questions were developed based on the ISTE Standards (see Appendix C). The interviews were audio recorded and transcribed.

Interviewing the preservice educators allowed the researcher to obtain a perspective other than self-reported data. "Unfortunately, much of the research to date has relied on self-reported data from teachers and this type of data too often presents a less than accurate picture" (Judson, 2006, p. 581). Research has suggested that people answering a self-assessment tended to overestimate their own skill and ability levels (LaClave Project Assessment, 2002).

Data Analysis

Multiple data sources were analyzed. This included faculty syllabi, core course observation, education faculty interviews, education faculty LoTi questionnaire, and preservice educator interviews.

Faculty Syllabi

First, electronic versions of syllabi were analyzed from education faculty members while they were teaching in the former building and when they taught in the new building. Originally, the syllabi for the 2004-2005 and 2005-2006 academic school years were analyzed. Later, the 2006-2007 syllabi were analyzed. Conducting a content analysis, the key search word was educational technology. Originally, the intent was to code "educational technology" based upon if it was located under major goals, delivery method, assignments, or on the schedule. The researcher highlighted the technology terms in the syllabi using three different highlighter colors to help identify the academic year. The syllabi were reviewed for how the technology was used, checking for technology integration and the International Society for Technology in Education (ISTE) standards. After it became apparent that educational technology was not appearing in the

syllabi under these categories, the researcher analyzed the syllabi by classifying what and how the educational technology was being used. The technology terms, such as PowerPoint or videotape, were highlighted. The exception was word processing. Word processing was coded if the syllabus indicated *typed, write a paper, paper format, provide typed notes, or word process.*

Class Observation of Technology-rich Course

Next, one education faculty member was observed in her course, Content Area Literacy, a technology-rich course taught in full-day, five-day format during the second summer session, 2007. The researcher interviewed the education faculty member prior to each class session using the WestEd RTEC Pre-Classroom Observation Interview tool (see Appendix B). The researcher took notes while interviewing. In addition, the researcher audio taped and transcribed the interviews. After these narratives were written, the education faculty member reviewed them for the purpose of member checking.

The next step under faculty observation was to observe the course. The researcher recorded notes based upon the following three categories: education faculty member's instruction, student engagement, and the characteristics of the technology integration from The Technology Use Lesson: Observation Tool (Brooks-Young & Barnett, 2002; see Appendix C). The researcher took field notes and audio taped the course. The audio tapes were transcribed. Information from this course was presented as a daily narrative to provide a picture of what was occurring in the classroom. Direct quotes from this classroom observation were included as evidence.

Faculty Interviews

Face-to-face semi-structured interviews were conducted with six education faculty members, excluding the researcher. The researcher asked a series of questions based upon the ISTE Standards (see Appendix E). The interviews were audio recorded and the tapes transcribed. A paper manipulation system was used for coding and categorizing. Transcript comments from each faculty member were printed on colored paper and numbered allowing the researcher to trace and backtrack the acquired information. Papers with comments were then cut apart and categorized by the question number. Additional papers were used to categorize the themes that emerged. As the data collection and analysis continued, categories were refined. After the reclassification, additional questions were asked about each faculty members' educational background to provide an explanation for other findings. This technique is called the constant comparison method because of the continuous process for identifying the distinctive attributes (McMillan & Schumacher, 2001).

LoTi Questionnaire

The faculty participants completed an online questionnaire, the Level of Technology Implementation Questionnaire (LoTi), to clarify each participant's level of technology implementation, personal computer use, and current instructional practices. The researcher purchased the use of this instrument (Moersch, personal communication, 2007) and also completed the questionnaire. The participants had been in the new building for two years, so the intent of this survey was to support or deny earlier findings. Instead data from the personal computer use section and the level of technology

implementation section prompted the researcher to reclassify the information from the faculty interviews.

Preservice Educator Interviews

Preservice educators were interviewed in August and September of 2007 after the 2006-2007 academic year of student teaching. The researcher used a set of semi-structured questions (Appendix I) for the interviews, but refined them as the interviews took place. Interviews notes were taken and the interviews were audio taped and transcribed. These transcriptions were printed out on colored paper and numbered. Because this information was based on the ISTE standards, narratives were written around these topics and provided insight into what happened. Information also provided a baseline and led to the question revisions that occurred for the education faculty interviews. Overall, this painted a picture from the perspective of the preservice educators.

Summary

This chapter explained the methodology for analyzing how increased access to technology affected educational technology usage. The primary focus of this study was to examine faculty members' perceptions of technology usage. The researcher examined the change in how professional core courses were taught from the professors' points of view. It was believed that a new facility with accessible and high quality technology had the potential to enhance technology being incorporated throughout the professional core. This study examined if the actual teaching methods were affected after access to

technology increased. Then preservice educators were asked if the increased access to technology altered how education faculty members' manner of instruction.

CHAPTER 4

RESULTS AND ANALYSIS

Introduction

This chapter consists of the review of research questions, results of the investigation of the education faculty syllabi, information from the classroom observations, education faculty interviews and preservice educators interviews, and results of education faculty responses to the LoTi questionnaire. The analysis of this information was based on the following research questions:

1. How did increased access to technology through new facilities affect education faculty teaching methods?
2. What differences in technology integration occurred after moving to the new facility?
3. What were the perceived changes and differences noted by preservice educators, who were instructed in both the former building and then the technology-infused building?

The first section of this chapter includes the results from the education faculty syllabi in three subsequent years. These results did not show much change. The second section of this chapter contains information from the technology-rich classroom observation. The observation shows what technology was used and how it was integrated into the classroom. The third section of this chapter consists of the education faculty interviews. These interviews explain what actually took place in the classroom in comparison to the syllabi. The fourth section of this chapter contains the data on the

levels of the Level of Technology Implementation (LoTi) questionnaire. The results of this survey showed the education faculty were at different levels of technology implementation and current instructional practices. All of the faculty members demonstrated a high level of personal computer use and confirmed information acquired from the faculty interviews. The fifth section provided insight on technology integration through preservice educator interviews.

Faculty Syllabi

When faculty syllabi were analyzed, word processing was the most frequent use of educational technology according to the 2004-2005 syllabi. The Internet and videos were used in half of the courses. Faculty or student PowerPoint presentations were listed in almost half the courses. Software, graph, digital picture, E-mail, Web pages, and WebQuests were used only in EDU 252. However, it is important to note that EDU 252 was not held in the former building, but in a library computer lab.

Table 3 includes the survey analysis of syllabi prior to the construction of the new building. The list below was formed based upon what appeared in the syllabi.

Table 3

Information from Syllabi during Spring Semester, 04-05 (Final Year in Former Building)

Technology	Education Course Numbers											
	110	142	152	162	188-194	210	233	252	300	304	425	462
Word processing	X	X	X	X	X	X	X	X	X	X	X	X
E-mail								X				
Digital picture		X										
Internet	X	X		X		X		X		X	X	
Videos	X			X	X	X				X		X
Videotaped									X			
Software								X				
Web pages								X				
WebQuest								X				
Graph											X	
PP (Prof)						X						
PP (Stud)		X	X					X		X		X
MovieMaker												

The same method was used to analyze faculty syllabi from the 2005-06 academic year (see Table 4). Similar results occurred in the syllabi for 05-06 as occurred in 04-05. The most frequent use was word processing. The Internet and videos were used in half of the courses as were faculty or student PowerPoint presentations. Software, graph, digital picture, E-mail, Web pages, and WebQuests were stated once. MovieMaker was added this year, the first year in the new building.

Table 4

Information from Syllabi during Spring Semester, 05-06 (First Year in New Building)

Technology	Education Course Numbers											
	110	142	152	162	188-194	210	233	252	300	304	425	462
Word processing	X	X	X	X	X	X	X	X	X	X	X	X
E-mail								X				
Digital picture		X										
Internet	X	X		X		X		X		X	X	
Videos	X			X	X	X				X		X
Videotaped								X	X			
Software								X				
Web pages								X				
WebQuest								X				
Graph											X	
PP (Prof)						X						
PP (Stud)		X	X					X		X		X
MovieMaker								X				

The researcher repeated this analysis the following academic year, 2006-07, to see if more change would occur after a second year in the new building (see Table 5). The most frequent use of educational technology remained word processing. Videos, Internet, and PowerPoint presentations were stated in about half of the syllabi. The lowest frequency for education technology was software, graph, digital picture, E-mail, Web pages, WebQuests, and MovieMaker.

Table 5

Information from Syllabi during Spring Semester, 06-07 (Second Year in New Building)

Technology	Education Course Numbers											
	110	142	152	162	188-194	210	233	252	300	304	425	462
Word processing	X	X	X	X	X	X	X	X	X	X	X	X
E-mail								X				
Digital picture		X										
Internet		X		X		X		X		X	X	
Videos	X			X	X	X				X		X
Videotaped								X	X			
Software								X				
Web pages								X				
WebQuest								X				
Graph											X	
PP (Prof)						X						
PP (Stud)		X	X			X		X		X		X
MovieMaker								X				

In summary, the results of the syllabi analysis did not show many changes from the initial syllabi. In addition, the syllabi were reviewed for how the technology was used, checking for technology integration and use of the International Society for Technology in Education (ISTE) standards. However, education faculty members did not include in their syllabi the technology integration that occurred in their coursework; therefore, the categorization hoped for did not occur. The education faculty members did not explicitly list the ISTE standards in their syllabi, but rather referred to national and state standards. The original intent of this study was to categorize technology if it was located under the syllabi Major Goals, delivery method, assignments, or on the schedule. Instead, the professors listed when educational technology was incorporated into student activities and assignments. This procedure did not demonstrate the depth of usage.

Class Observation of Technology-rich Course

The observation of the technology-rich course showed how increased access influenced technology integration. The classroom for this course had a teacher station, which included a computer, VCR, and Elmo with the Digital Light Processing (DLP) projector. The Elmo allowed books, materials, and manipulatives to be projected through the DLP projector onto a large screen for the entire class to view. The education professor modeled educational technology through the use of the Elmo and computer with Internet access in the classroom. In addition, core course students used the computer station, Elmo, and education computer lab. The professor and core course students used the education computer lab down the hall, which consisted of 20 Dell computers, Elmo with

DLP projector, and the SMARTBoard. The researcher observed the core course students and education faculty member collaborating in the classroom and in the education computer lab.

This faculty observation of the technology-rich course occurred in three steps. First, the researcher interviewed the education faculty member prior to class observation each day. These interviews indicated educational technology was used daily. The second step was the Technology Use Lesson: Observation Tool. It indicated a positive learning environment for technology integration, a high level of student technology use, and daily use of the Elmo and DLP projector. The third step was classroom observation for five consecutive days during the second summer session. The education faculty member modeled technology use and encouraged the core course students to incorporate technology. This demonstrated a high level of collaboration.

Pre-Classroom Observation Interviews

Day 1. During the first pre-classroom observation interview, the education professor stated that she anticipated integrating the following technologies into the Content Area Literacy course: having the core course students find WebQuests, using the Internet to complete readability online and school profiles, extending how to use technology, addressing assessment terms, and discussing what content literacy is. The next step following this lesson was the "how to" taught using direct instruction. The class would also cover before reading, during reading, and after reading strategies. The professor pointed out that the researcher should realize that lots of the core course

students brought in extensive, varied background knowledge because most of the core course students were teaching in different area school districts.

The first lesson took place in classroom 105. The professor used the computer and Elmo, the DLP projector, Internet, and Microsoft Word. Using the Elmo, the professor shared readability results to arrive at a class summary of information. The professor developed the idea for this lesson based on the textbook and past experience. She presented examples of what the core course students likely did not already know. The professor also used examples in the textbook and tailored them to the state where the university was located. This helped explain why content area literacy was important. (Note: For complete details of class observation of a technology-rich course, see Appendix K).

The education professor's comments about educational technology demonstrated a high level of technology integration in the week-long class. The first set of comments illustrated how the education professor modeled educational technology integration.

The education professor stated, "One of the things technology is to be used for is a resource for you." This modeling showed how to locate and use math lessons with a technology application. "And of course I am going to use the Elmo for that," the professor explained.

"If I expect you to use technology, I model it. If I expect you to use websites, we go to them."

"Then you click here....It can be a type of assistive technology piece. It is a technology adaptation."

Day 2. In the next interview with the same education professor before the second day of class, discussion included how the class had used technology to search the Internet, create a booklist, create a WebQuest and work with readability information. Her plan for day 2 included watching a video with "before reading" strategies. The video would address vocabulary and the 6+1 traits of writing. She wanted her core course students to understand the whole idea of planning, using a graphic organizer, and using websites. The next information was on "during" and "after" reading strategies. The class would continue to work with vocabulary strategies.

The second day of class would be held in room 105. She planned to use the same hardware and software: computer with Elmo, DLP projector, Internet, Microsoft Word, and the video. The idea for the lesson came from the textbook and other resources the professor checked. The next section of the lesson was really an extension of the textbook. The students reviewed guided reading and direct instruction as well. The professor mentioned that the group of students was more dependent than she thought they would be.

Day 3. During the third pre-class interview, the education professor explained that she would show part of a video and extend the information from the textbook. For example, using the Elmo to show the entire class, she would demonstrate the use of double-entry journals with an example she gave a student. The class would continue to work through the video. Core course students would demonstrate their lessons using instructional strategies. The professor would also demonstrate how to graph the assessments. The next step is to repeat this process for the next two days of class.

According to the education professor, she felt the group of core course students as a whole was beginning to understand the big picture of content area literacy.

For day 3, the lesson took place in room 105 and in the computer lab. The hardware and software in room 105 consisted of the computer with Elmo, the DLP projector, Internet, plus computers in the building's computer lab. The lesson idea came from a wide array of reading. The education professor planned to link the instructional strategies taught in this lesson to the before, during, and after reading strategies.

The next set of comments focus on project-based learning or incorporating educational technology as a tool to enhance learning. "CORI- I think I could take this and use technology and apply it....It can be adapted to every age level to see the content." This type of activity encourages collaboration between the education faculty member and core course students as they implement the during reading strategy.

Day 4. At the onset of the fourth interview, the professor said the students were integrating educational technology into their demonstration lessons. They were incorporating instructional strategies more than she ever thought possible! In the classroom, core course students would present their lessons and work on developing their use of post reading strategies. Following this lesson, the professor planned to review goal sheets for the whole unit and have core course students align strategies with content areas. She emphasized again the level of technology and subject matter knowledge varied in this group of core course students.

The fourth day's lesson took place in room 105. The computer with Elmo, DLP projector, Internet, and video were all used for instruction. The idea for this lesson came from the textbook that coordinated well with a video series that was also used.

The next set of comments demonstrate how the education faculty member modeled appropriate technology usage and required the core course student to model appropriate technology usage as well. The student placed the paper on the Elmo. The size font in the document was small. When the core course student did not enlarge it....the Professor said "(Student), when you go back up there, show how you can enlarge it."

Again, the education professor showed the Quiz Results and Item Analysis on the Elmo. "Where do I find how to make the graph? It is a button you click on Excel and you do it. It is real easy to pick up. I did it over lunch."

Day 5. In the fifth and final pre-class interview, the education professor explained that the class had been developing core course student lessons and would complete them, summarizing the major instructional points of the class. Finally, the core course students were assigned to present their lessons in their own classrooms, and be videotaped. Core course students would also complete and turn in other class projects.

The fifth class took place in room 105. The education professor and core course students used the computer with Elmo, DLP projector, Internet, and video. The education professor developed this lesson based on her experience teaching this course nine times. She emphasized that she adapted the lesson for this group of core course students.

The following two comments from the education professor focus on the theme of access. "On the website, you can watch a slide show of that too."

"They could take virtual tours."

Finally, this comment explained a new way to implement educational technology to motivate students. "With the use of technology, we can make our reading more interesting. We can entice our students."

In summary, these pre-classroom interviews illustrated both what and how educational technology was integrated to teach content area literacy. The pre-classroom interviews confirmed information from the syllabus. This background information helped the researcher clarify the observation.

Technology Use Lesson: Observation Tool

The Technology Use Lesson: Observation Tool (Brooks-Young & Barnett, 2002) identified the following points from this course: (a) the education professor modeled the use of technology every day, (b) most of the students used the available technology to demonstrate content area reading strategies, (c) some of the students integrated the technology into their lesson plans to increase motivation for student learning, (d) some of the students experienced some hardware and software that was new to them, i.e. SMARTBoard, Elmo, and using the building's new educational computer lab, (e) students were required to incorporate technology into the application of content area reading strategies into their own classrooms.

Tables 6 and 7 highlight technology usage based on the observation tool. The enhanced learning environment included a classroom equipped with computer station including an Elmo, VCR, and DLP projector. In addition, the nearby education computer lab added 20 computers, Elmo with DLP projector, and a SMARTBoard. The student

technology use revealed technology was used as a tool to learn with rather than from. This was significant because it was not drill and practice usage, but rather a higher level of technology usage.

Table 6

Technology Use Lesson: Observation Tool

	Day
Learning Environments	1 2 3 4 5
Students have no interaction with other students	
Students collaborate with peers	X X X X X
Students are provided opportunities to use higher order thinking skills	X X X X X
Technology access is adequate to meet lesson objectives	X X X X X
Students with special needs have access to appropriate hardware and software	
Student Technology Use	1 2 3 4 5
Technology skills expected of students meet or exceed district standards	N/A
Technology used is appropriate for student's skill level	X X X X X
Technology is used as a tool to learn from (i.e., drill/practice, tutorials)	
Technology is used as a tool to learn with (comm., publication, or research)	X X X X X

Note. Using the Technology Use Lesson: Observation Tool, the researcher coded the days according to the chart.

Even though the content emphasis of this course was Content Area Literacy, educational technology was integrated throughout the course. Table 7 included the

educational technology and activities demonstrated or engaged in during the week-long course.

Table 7

Use of Technology in One Course: Summer 2007

	Day 1	Day 2	Day 3	Day 4	Day 5
Quiz from Internet					X
Elmo	X	X	X	X	X
DLP projector	X	X	X	X	X
Excel				X	
Graphic Organizer		X	X	X	
Internet	X		X	X	
Video		X		X	X
WebQuest	X			X	
Computer lab		X	X		
SMARTBoard			X		
Online readability formulas	X				
Digital picture				X	

The education professor and students in this course integrated educational technology into the content areas by using the Elmo frequently. In addition, the professor and students used the computer and Internet in the classroom and used the education computer lab. Educational technology was used as a tool to learn as evidenced in the *Technology Use Lesson: Observation Tool.* This was significant because this was the highest level of skill or stage of use in incorporating technology into the lesson.

Faculty Interviews

In contrast to the faculty syllabi, the faculty interviews showed the classroom from the viewpoint of what the education faculty members actually do. Answers to the interview questions, correlated with the ISTE standards, demonstrated three common components where there was a high level of technology integration: time, access, and collaboration. Because of the increased access to technology, the education faculty members stated they could model the use of educational technology. More time was spent demonstrating their understanding of technology operations and concepts.

The education faculty stated they did not have formal professional development using educational technology. Instead they learned how to use the technology informally through others, some through their coursework while working on advanced degrees. Technology-enhanced instructional strategies were utilized to enhance the methods courses because of the increased access to educational technology. In addition, the new technology enabled the methods professors to attain more resources for their curriculum area. Most of the education professors have shifted their way of managing student

learning. Consistent access in offices, classrooms and the education computer lab has made this possible.

Because the preservice educators are more tech-savvy than most of their professors, the new technology provided an opportunity for their use of higher order thinking skills and creativity. This enabled them to access more content information and present it in various ways. This collaboration contributed to higher levels of technology integration. In addition, all of the education faculty members stated more of their communication is done using technology. It was easier for faculty to collaborate with faculty as well as for faculty to collaborate with students. Table 8 illustrated the different kinds of educational technology used as stated in the faculty interviews.

Table 8

Results of the Faculty Interviews

Technology	Professor					
	A	B	C	D	E	F
Word processing						X
E-mail		X				X
Digital picture						X
Internet	X	X	X	X		X
Videos	X	X	X	X	X	X
Videotaped						
Software						X
Web pages						
WebQuest						
Graph		X				X
PP (Prof)	X		X			X
PP (Stud)						X
MovieMaker						
Elmo	X	X		X	X	X
Computer lab		X				
Grade program		X				X
DVD		X		X	X	

The next section includes interview information with education faculty members regarding how they related their use of educational technology to the ISTE standards. The ISTE standards were used because they provided a framework and are the professional guidelines for technology implementation.

Standard 1: Technology Operations and Concepts

Demonstrating technology concepts. Education faculty stated they feel that their use of the teaching station demonstrates their understanding of technology operations and concepts. "They (perservice educators) see me using it every day. I mean a day does not go by that when I walk into that classroom, I don't turn on the equipment. Some days I use it exclusively. Some days I may just refer to it for one or two items" (Professor F, 2007, p. 2). Through modeling and sharing, faculty said they are able to give the preservice educators the necessary information so they can use a technology operation/process themselves. "My whole thing is I want to teach them how to do it so I'm really good about step-by-step this is what you need to do if you have this problem" (Professor C, 2007, p. 1). Several education faculty members stressed that they did not want to manipulate the educational technology for the preservice educators, but rather guide the preservice educators through the process so the preservice educators could use the pieces of equipment.

For example, professors B, C, and A acknowledged how much easier it is to use educational technology in the classroom. "In the former building, I used my computer as if it was part of my classroom, as part of my office. I would only use the technology as an add-on to what I was teaching. Now it is integrated so it is part of what I am doing. I have

even used technology so if we have read something to show students how to paraphrase with technology, how to teach vocabulary with technology. It is just all part of it. Technology used as a part of almost every lesson. It is a tool. Before I could not always keep the power on!" (Professor B, 2007, p. 1).

"It is just so much easier, I guess. It is at our disposal now. Whereas in the other building, I often tended not to use it because it was a hassle. First of all, was it available? Then if it was available, did it work? And I think that was always something that, even if we had it checked out, and we knew that we were going to have it at our disposal during the particular class period, it may not work for one reason or another. And we had nothing to fall back on; we didn't have other classrooms where it was available. It was on a movable cart, and that was it. Now we walk into the classroom and we have it at our fingertips. We have workstations in every room where technology is right there on top of workstation. We have Elmo available, we have computer, we have the projector systems for the computer, we have screens in every classroom, we have a VCR available, and we have DVD capacity.....I don't directly teach it. But I am modeling it constantly in my classroom" (Professor C, 2007, p. 1).

".....This building has given me more opportunities. I take it for granted. I can sit down at the computer anytime and find the information I am looking for. It makes it easy to stay in contact with students, student teachers, cooperating teachers, and professors" (Professor A, 2007, p. 1).

Staying current with technology. Three of the six education faculty members said they stay current with technology in their curriculum area through reading professional

literature. "One of the main things I have (to do is) to read the textbooks. Any new edition that comes out, I have to read to see what technology is available as supplements for the texts" (Professor C, 2007, p. 1). Another education professor said exploring and reading helped her stay current. "In the reading journals, there are always articles published in there about some of the latest uses of technology" (Professor B, 2007, p. 2). Another education faculty member stated that he benefits from watching how preservice educators use educational technology during his student teaching observations. In addition, he watches what other faculty members use as well as the faculty at the institute where he is earning an advanced degree (Professor A, 2007).

The interviews also revealed instances where increased access to educational technology had not changed teaching and learning for these professors. This demonstrated a lower level of technology integration.

"I have students go to websites as part of assignments, and they have gone to the lab to do that, but I have not even brought up a website and shown in the classroom, although that is a capability" (Professor D, 2007, p. 1).

"I find that it is impossible to keep up. And there are certainly times that I wonder about the necessity of trying to keep up" (Professor E, 2007, p. 6).

Standard 2: Planning and Designing Learning Environments and Experiences

Background in teaching with technology. Only one of the six education professors interviewed claimed to have an advanced ability to teach using educational technology. One professor explained how she was very fortunate because when computers were first coming into the schools, her department received a grant to purchase four Apple 2e

computers. At that time, she took many classes that were readily available. She has always tried to keep up with technology and was not afraid to approach educational technology (Professor F, 2007).

Two professors stated they had limited formal background in educational technology, but started learning about technology as they completed coursework on their advanced degrees and through university workshops. "We (the education department) had our own little training session. And that made a difference for me. So we had additional training sessions, I guess, with the latest equipment all the time so that way I know how to use it" (Professor B, 2007, p. 2). "I would say almost every year there was some technology training of some sort" (Professor C, 2007, p. 2).

Three professors said they had limited formal background. "When I was first hired in 2003, I could barely type. I have since progressed to adequate" (Professor A, 2007, p. 1). Another professor stated "I haven't had any systematic instruction in it (educational technology). I tried to implement just what I had; I've tried to bring forward what I have learned in some other areas. And probably not very effectively" (Professor E, 2007, p. 2). "My training has largely come from sessions (workshops held by teachers)" (Professor D, 2007, p. 1).

Technology-enhanced instructional strategies. Four of the six education professors knew basic methods of integrating technology-enhanced instructional strategies. One education professor stated that he primarily used the Elmo to show either words or graphic organizers (Professor E, 2007). Another education professor said she moves from video to using the Elmo. Her students are also expected to use educational

technology. Many of her students teach in the schools. "I make the assumption that they got it (educational technology strategies) in their schools, but some of them may have gotten it in other classes before they come to me here. That I can't be sure" (Professor D, 2007, p. 2). Professor A said he did not do any educational technology strategies training in a formal lesson, but rather he has had his preservice educators use it. If the preservice educators came to him, or he sensed it in class discussion, he helped them develop the technology-related skills (Professor A, 2007). Another professor used low-tech and high-tech versions to demonstrate assistive technology which gave students a broader view of what and how to integrate educational technology (Professor C, 2007).

On the other hand, two of the six education professors integrated technology throughout their instructional strategies. In the reading courses, "We do the digital language experience approach, and that is where the students take digital pictures and then build on that to tell their story" (Professor B, 2007, p. 3). To write summaries, this education professor "taught them how to do a five part summary. That used to be a paper/pencil task, now it is a keyboarding task" (Professor B, 2007, p. 3). In her Teaching Elementary Math course, "I had one of my graduate students that wanted to do something with geometry. And then I said do it with virtual geometry" (Professor B, 2007, p. 3). The student used the National Council for Teachers of Mathematics and integrated Virtual Geoboards. The other professor who integrates technology frequently begins classes with various discussion starters, such as a little cartoon, quote, question, or something related to the topic for the day. Then as preservice educators talk about the topic during the class, she tries to have some pictures, some examples, or a video clip

about the topic. "It just supports what the textbook and what I say and do in class. It just gives examples...It helps with questioning and critical thinking" (Professor F, 2007, p. 5).

Locating technology resources in curriculum area. The six education faculty members offered numerous ways to locate educational technology resources for their curriculum area. Four of the professors said that they used the textbooks and the publishing companies. Sometimes textbooks include a companion disc "so I pulled teaching ideas, quizzes, tests, suggested articles, discussion questions, or things like that" (Professor F, 2007, p. 5). Fifty percent of the education faculty listed professional conferences as a source for locating technology in their area. Several faculty mentioned professional organizations, but stressed different aspects such as the standards, professional journals, or the organization itself. Other resources mentioned were: Area Educational Agency (AEAs), colleagues, IT staff, surfing the web, and trial and error.

Managing student learning environments and experiences. Five of the six education professors said the new technology-enhanced environment changed the way they manage student learning. Four of them believed that integrating educational technology had gotten easier. However, one professor stated that the coursework had gotten more cumbersome because it took more time. For example, in one assignment last term students had to make a CD-Rom or DVD of themselves doing a Concept-Oriented Reading Instruction (CORI) or a Question/Answer Relationships (QAR) lesson. This meant fewer paper/pencil tests and more projects (Professor B, 2007). Another professor said "When I first started teaching, I felt I should provide everything for student learning.

I put responsibility back on them. I want them to utilize technology. I changed my approach to how I teach. It is more beneficial for my students" (Professor A, 2007, p. 2). Professor F stated "I teach the same concepts basically in my coursework. I think I have expanded a lot more because of the teaching station and the availability" (2007, p. 6).

Four of the six education faculty members stressed the accessibility to computers as positive. "It's also nice to have a computer lab down the hallway" (Professor E, 2007, p. 3). On occasion, classes left the classroom and went to the education computer lab down the hall to, for example, whether it was to prepare some material for a presentation or search the Internet for projects and resources. Another professor commented that "A thing I like about it is too, I can be in my office, and I can manage all this stuff on my computer and put it together, and then I know that when I go to my classroom, it is going to be the same thing. I can always access it. It has made it better" (Professor F, 2007, p. 6).

In contrast, one education faculty member pointed out how the Learning Management System (Jenzebar) was not being used prior to August 2007, because the university had just given access to faculty (Professor D, 2007). At the time of this study, the department was not using one standardized system for recording grades, taking attendance, and distributing coursework.

Syllabi reflect technology usage. Four of the six education faculty stated that their syllabi do not accurately reflect how they used educational technology. Several said they stress what the students have to focus on, but not what the professor will be doing in class. "I don't put everything in the syllabus that I actually use in my classroom. Maybe I

should do more of that. But, I guess what I am using I don't feel like I need to put in the syllabus. Maybe I should do that more. What I tend to do is put in what students are either going to see or have to use" (Professor C, 2007, p. 3). Three of the six education professor said that the syllabi should show there was more technology being used now than in the old building. One professor pointed out "But, sometimes, technology, just like everything else, there comes that teachable moment where you can just go show the students something on the Internet or go over to the computer lab and they can go to work and locate something themselves" (Professor B, 2007, p. 4).

Two of the six members believed that their syllabi accurately reflected how they used technology. One professor stated that when the preservice educators did presentations, technology was always involved. "That expectation is there." (Professor D, 2007, p. 3).

Standard 3: Teaching, Learning, and the Curriculum

Managing student learning. Four of the six education faculty members managed student grades through a computer gradebook program or Excel document. In addition, one education professor kept a spreadsheet of student attendance. Again, several education faculty members said they had just received access from the university to the Learning Management System in August 2007. "We had a training session by one of our IT people. It takes time" (Professor B, 2007, p. 4). "And I tried to switch over to the portal system this term, and I lost grades. So, I'm doing something wrong. So I have to go back and be retrained in order to do that correctly" (Professor C, 2007, p. 4). Another professor stated, "I was going to, but I currently do not. I had intentions of using it, but I

have not followed through. Because of the system that we have, I started it, I tried to get some information in, and I was able to do that. But it seems less efficient to do it that way, than the way I had done it before, so I stopped trying" (Professor E, 2007, p. 4).

Two of the six education faculty managed grades manually on paper. "It is easier for me to do it in terms of a manual system, rather than set up an electronic system. And frankly, I don't have very much knowledge about how to set it up" (Professor E, 2007, p. 4). The other professor stated that when she was grading at night, it was easier for her to have a piece of paper to write the grades on when all the papers and projects were spread out (Professor D, 2007).

Content standards integrated into technology enhanced instruction. Two of the six education professor who taught specific content courses stated that content standards are integrated into their technology enhanced instruction. They listed the International Reading Association Standards for reading and the National Council for Teachers of Mathematic Standards for mathematics.

The other education faculty members said the content standards challenged them. The two education professors, who focused on special education, stated that they really don't have standards. "In special education, there aren't any. Or you could say, just the opposite, there are all of them!" (Professor C, 2007, p. 4). The other professor added, "We have the Council for Exceptional Child (CEC). They have standards.... (but) they don't really match up with content" (Professor D, 2007, p. 4). The education professor who taught early childhood courses explained that technology use for young children has been a sensitive area. Some people believe that young children should be exposed to

computers, while others believe that computers are not developmentally appropriate. In addition, the education faculty member, who taught general methods and field experience, stated, "I don't know that I am self-consciously integrating any content standards into secondary methods class. In the field experience class, the only content has to do with the Iowa Teaching Standards. And that's... I am not sure that that counts" (Professor E, 2007, p. 4).

Technology assisted in higher order thinking skills and creativity. Five of the six education faculty said technology assisted in higher order thinking skills and creativity. One education professor stated that it gave the preservice educators the freedom to utilize their strengths because the students were much more tech-savvy than most of their professors (Professor A, 2007). Another professor added that most of today's research is accomplished online. The other technology aspect this professor loved was how preservice educators could apply their knowledge. Depending upon their major, the preservice educators can create brochures, newsletters, or other products. For example, in the nutrition course, "Instead of saying, tell me about nutrients, now they are talking about those nutrients in a way that they can communicate to their clientele and how it can be utilized" (Professor F, 2007, p. 8). "Plus, they (the preservice educators) also are closer to authentic sources because instead of just reading about some of the artifacts of Native Americans, they can see the pictures of the artifacts and museums" (Professor B, 2007, p. 5). Three of the education professors commented that the preservice educators were excellent at finding course specific information on the Internet. Professor D added "Those (preservice educators) who are really tech savvy really put on dynamic

presentations. They may include video streaming, photographs shooting in from various angles. They provide the visual" (2007, p. 4).

One of the six education faculty members was not sure if his method of using technology assisted with higher order thinking skills and creativity. "I don't know if the kinds of applications I am making, whether it assists very much at all....I am putting information out there" (Professor E, 2007, p. 4).

Standard 4: Assessment and Evaluation

Technology resources to collect, analyze, and interpret data. Three education professors stated they use data either when they are creating an examination or after the examination has been checked. "A lot of times I will do that when I am putting together a new test that I have not done before, or I am reworking it pretty severely, I'll just set up a little spreadsheet" (Professor F, 2007, p. 8). She continued explaining that in the first column, she listed the topic areas. Then she completed an item analysis to see how many questions she listed related to each area. "I can kind of look at it and get a visual graph on how many questions I have related to each topic. And then I can relate that to how much time I spent on it in class" (Professor F, 2007, p. 8). Another professor added, "I look at tendencies. I look at exams, things like poor test questions, and rubrics" (Professor A, 2007, p. 2). Professor B said, "I've also done the same thing (item analysis) for my own classes to check on different instructional strategies" (2007, p. 5).

One education faculty member stated, "The biggest thing here is I teach my students to do this. I have our students teach a lesson, and then write up the results, give a

quiz, and then chart the results of that quiz, and do an item analysis" (Professor B, 2007, p. 5).

Two professors went on to say that they used technology while they were working on their dissertations. "Ninety-nine percent of my research was done online" (Professor F, 2007, p. 8).

Standard 5: Productivity and Professional Practice

Technology to communicate. All six of the education faculty members stated that they use email and use it more frequently than in the former building. "I use lots and lots of emails. I share lots through email with attachments and just information. It has increased 500 fold" (Professor D, 2007, p. 4). She explained that it is not just students sending emails, but colleagues, peers, the Centers, the State department, prospective students, and teachers with licensure questions using email (Professor D, 2007). Another professor added, "I let them (the preservice educators) know that from day 1. My computer is always on. My email account is always open. It is continuously checked, it sits on my desk and it's just continuously checked, no matter what's going on" (Professor F, 2007, p. 8). Several faculty members acknowledged that students use more email now because it is more accessible. "The lab is available to them here in education. Those who don't have it at home; they come and use our facility. I am so glad that we have that for students because I don't think that I have ever walked by that place and it doesn't have at least one student in there" (Professor C, 2007, p. 5). In addition, a couple of education faculty mentioned that they check their email at night from home. "The system and

everything is better here, so it is easier to get on and off and check from home" (Professor B, 2007, p. 5).

Two professors commented that communication through email has helped preservice educators when they began student teaching. "That's what has really helped in communicating with student teachers. You can give them more support because they know they can get a hold of you at home" (Professor B, 2007, p. 5).

Technology for professional development. Two education faculty members stated that they use technology for professional development when they take online classes. Another professor said, "For the professional development, any technology that's offered, I like to attend...I just think we can't keep updated enough. I just think it is a lifelong learning process" (Professor C, 2007, p. 5). A fourth professor commented, "I just registered online today for a conference" (Professor D, 2007, p. 5). However, she noted that she had not taken online courses or Webinars.

Two education professors shared their use of search engines to surf for information. When they made curriculum changes, they looked online. "I found syllabi. I found ideas from many other places that I drew from. If there was something I wanted more information on, I contacted them directly" (Professor F, 2007, p. 9). The professors mentioned how wonderful people were about sharing content and ideas.

One professor stated that the education department worked more collaboratively on recent projects. "To write our master's program or program evaluation, all these things are done collaboratively...Our Conceptual Framework draft has multiple authors because there are different people that can add in something" (Professor B, 2007, p. 6).

"The most professional development I have done, I would say, I have done has to do with learning more about Differentiated Instruction...and the primary way of doing that is using the ASCD Differentiated Instruction and The Power of Two (DVDs)" (Professor E, 2007, p. 5). He added that his professional development is very limited.

Standard 6: Social, Ethical, Legal, and Human Issues

Modeling and teaching legal and ethical practices. Three of the six education faculty members stated that they warn their preservice educators about their (the preservice educators') use of the Internet. "I state the fact: anything you put in writing across the Internet, it will be read numerous times. You have to be careful about what you write and say to people" (Professor A, 2007, p. 3). He added that he spends time modeling, discussing, and explaining legal and ethical practices.

Right before student teachers go out to the schools, one faculty members said, "We read and discuss chapter 25 and 26 of the Iowa Code. We talk about expectations for them. I talk to them about Facebook and MySpace because employers are Google searching people they want to hire" (Professor D, 2007).

"I try to follow what I understand to be the legal and ethical guidelines regarding photocopying, and citations, and that sort of thing, regarding the resources I have" (Professor E, 2007, p. 6).

Additional Information

One professor explained how he struggled to keep up with technology. He said "there has been a sort of a dialectic within me between print media versus electronic media" (Professor E, 2007, p. 6). He explained that "the electronic oriented culture

undermined the ability of people to think in linear ways, which is the print oriented way" (Professor E, 2007, p. 6). His beliefs were influenced by the work of Neil Postman, an expert in media.

In summary, the education faculty members' interviews showed the classroom from the viewpoint of how education faculty members integrated technology into the methods courses. The interview results revealed a great deal of variance in their levels of use. Those professors who had recently completed an advanced degree were more likely to include both breadth and depth in their technology integration.

LoTi Survey

The Level of Technology Implementation (LoTi) survey provided a glimpse at technology integration after the participants had been in the building for two school years. This survey was designed to determine the level of higher education faculty's technology implementation across three specific domains: (a) Level of Technology Implementation (LoTi), (b) personal computer use (PCU), and (c) current instructional practices (CIP; Moersch, 1995, as cited in Moersch, 1999). The results from this 2008 survey of the education department faculty members were listed in the Level of Technology Implementation profile prepared for this study, which is cited as LoTi Technology Use Profile, 2008 in this study. Following are the results from each domain.

Level of Technology Implementation

Even though the composite data indicated a high level of technology integration further investigation noted that a wide range existed between the low and high scores on technology implementation (see Figure 1). "The Level of Technology Implementation

(LoTi) profile approximated the degree to which each participant either supports or implements the instructional uses of technology in a classroom setting" (LoTi Technology Use Profile, 2008). This indicated that one education faculty member was still developing confidence in the use of technology while another faculty member already integrated technology and was revising this integration (Borthwick & Pierson, 2008). Their scores reflected this variance.

> The Level of Technology Implementation (LoTi) ranking displayed the results for the seven participants and assisted in explaining how instructional technology affected education faculty teaching methods. The range for the education department was 1-5 for the Level of Technology Implementation (LoTi). Based on the responses, the median LoTi level for the education department corresponded with a Level 4a (Integration: Mechanical) (LoTi Technology Use Profile, 2008).

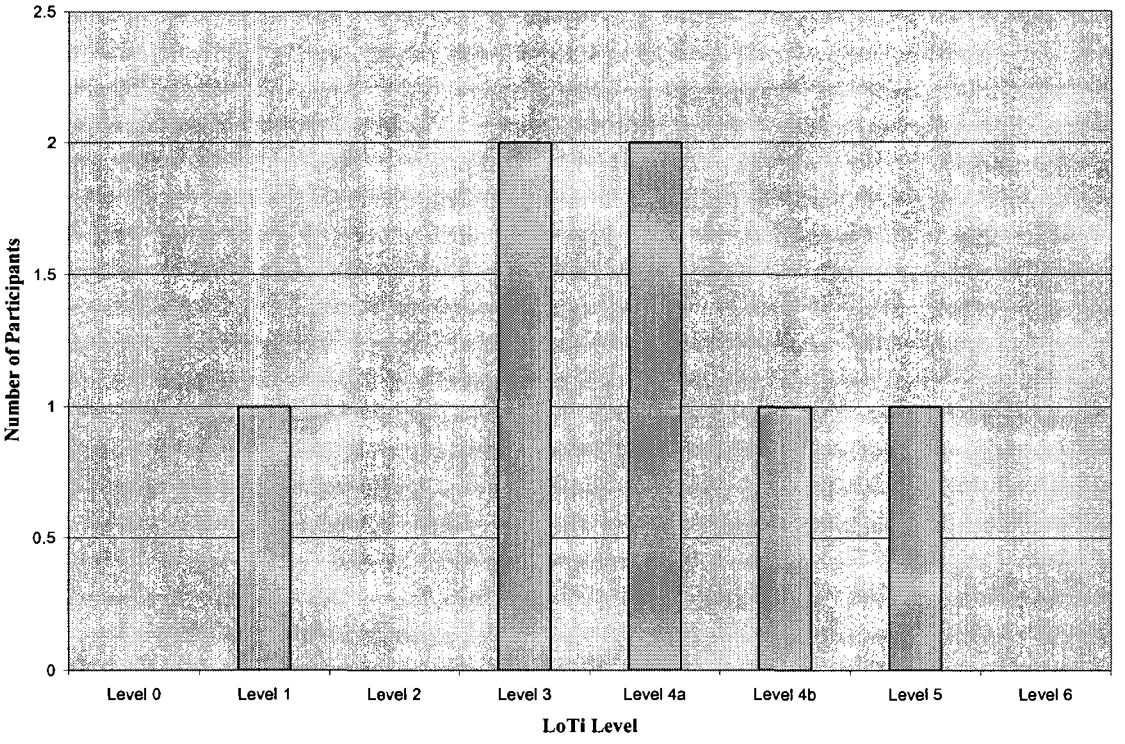

Figure 1. Level of Technology Implementation

The Level 4a (Integration: Mechanical) implied that educational technology was used as a tool that provided a rich context for students' understanding of the pertinent concepts, themes, and/or processes. Heavy reliance was placed on prepackaged materials, outside resources, and/or interventions that assisted the education faculty in the daily management of their operational curriculum. Educational technology was perceived as a tool to identify and solve authentic problems. Emphasis was placed on student action and on issues resolution that required higher order thinking skills (LoTi Technology Use Profile, 2008).

Access to educational technology had made this level of technology implementation possible. Now the education faculty members not only had access to more resources, they also had access to the same resources in their offices, the classrooms, and the education computer lab.

Personal Computer Use

"The Personal Computer Use (PCU) profile addressed each participant's comfort and proficiency level with using computers (e.g., troubleshooting simple hardware problems, using multimedia applications) at home or in the workplace" (LoTi Technology Use Profile, 2008). This provided information on a portion of "what" differences educational technology had made. The range for the education department was 4-6. Based on the responses, the median PCU Level for the education faculty corresponded with a PCU Intensity of Level 5 (Somewhat True of Me Now) as shown in Figure 2. The mean was also at Level 5. This indicated that all faculty members were in close proximity in their personal computer usage.

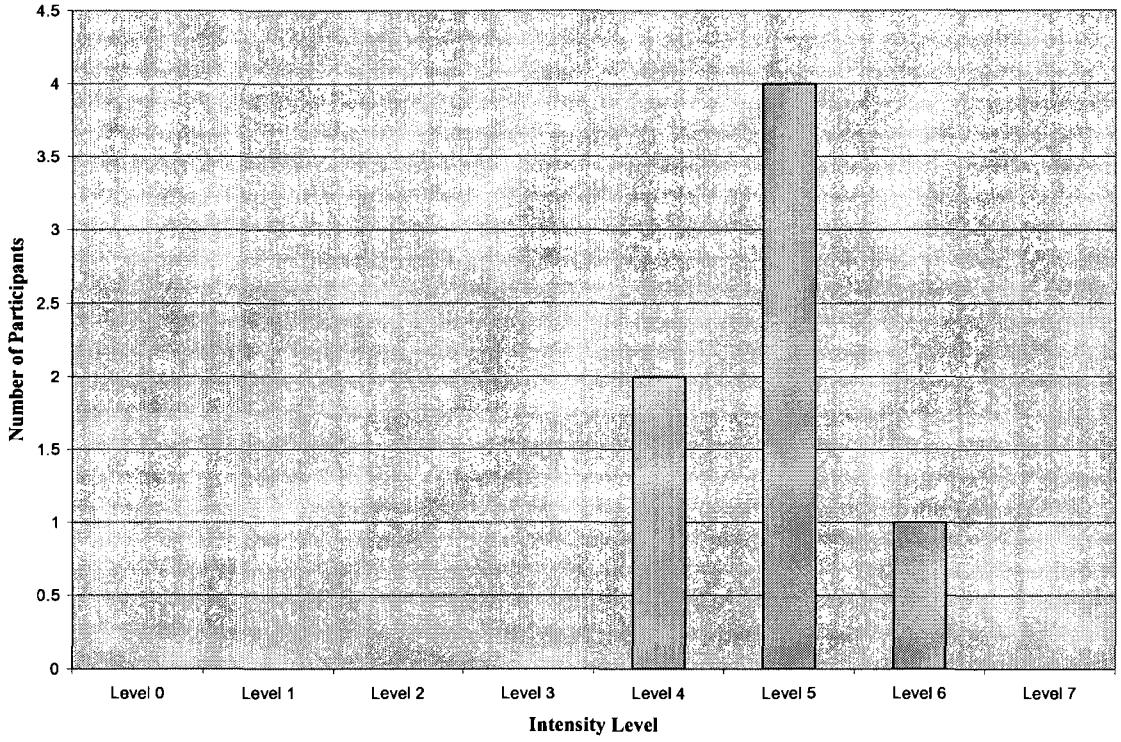

Figure 2. Personal Computer Use (PCU).

The PCU Intensity Level 5 indicated that the education faculty demonstrated high skill level with using computers for their personal use. Participants were commonly able to use the computer to create their own web pages, produce sophisticated multimedia products, plus use productivity applications and web-based tools. They were also able to troubleshoot most hardware, software, and/or peripheral problems without assistance from the information technology team (LoTi Technology Use Profile, 2008).

The Personal Computer Use section showed the education faculty were using educational technology for more purposes and for more of the time. Even those faculty who did not demonstrate a high level of technology implementation, did use technology

more for their personal use. All education faculty were using technology more at home and in their offices, but some were not transferring this usage into their classroom.

Current Instructional Practices

"The Current Instructional Practices (CIP) profile revealed each participant's support for or implementation of instructional practices consistent with a learner-based curriculum design" (LoTi Technology Use Profile, 2008). The range of the CIP was levels 3-6. The mode was level 5. Based on their responses, the median CIP Level for the education faculty corresponded with a CIP Intensity Level 5 (see Figure 3).

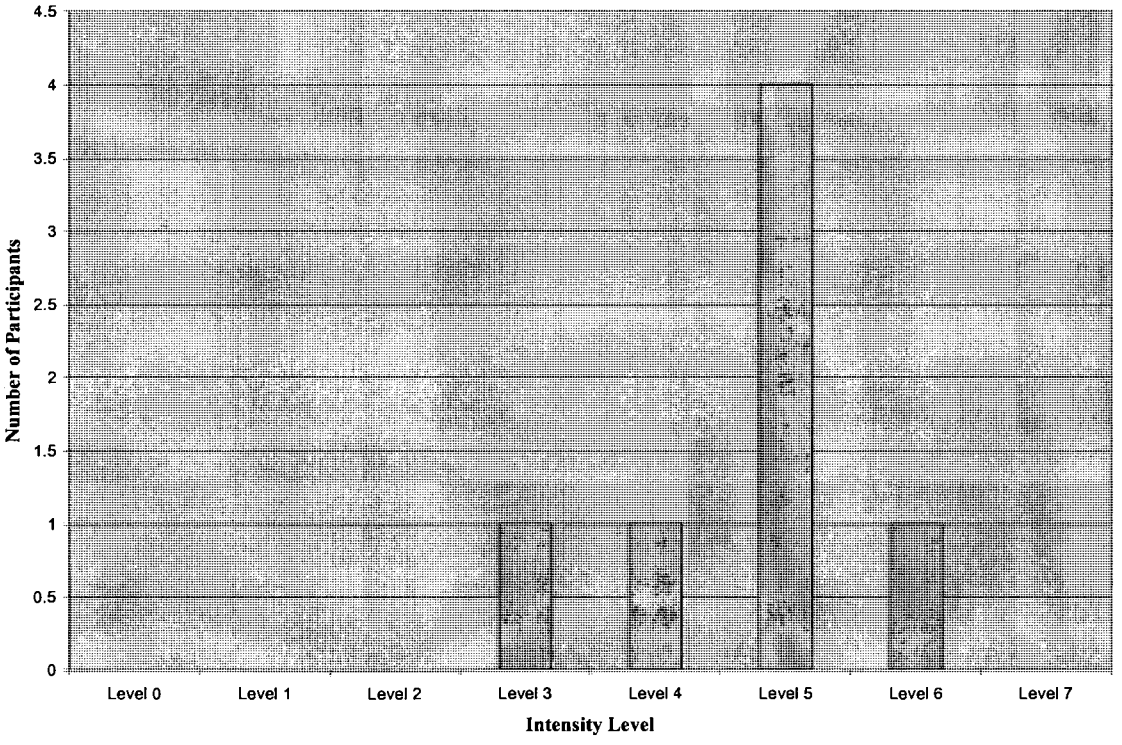

Figure 3. Current Instructional Practices (CIP).

> At a CIP Intensity Level 5, the participant's instructional practices tend to lean more toward a learner-based approach. The essential content embedded in the standards emerges based on students' 'need to know' as they attempt to research

> and solve issues of importance to them using critical thinking and problem-solving skills. The types of learning activities and teaching strategies used in the learning environment are diversified and driven by student questions. Both students and teachers are involved in devising appropriate assessment instruments (e.g., performance-based, journals, peer reviews, self-reflections) by which student performance will be assessed. However, the use of teacher-directed activities (e.g., lectures, presentations, teacher-directed projects) may surface based on the nature of the content being addressed and at the desired level of student cognition. (LoTi Technology Use Profile, 2008)

The responses from the Current Instructional Practices section of the survey illustrated the collaboration that occurred between the education faculty and the preservice educators. The shift moved from teacher driven instruction to a student learner focus.

Information learned from the LoTi survey included the wide range of technology implementation within the classroom setting. This contrasted with a high level of personal computer use of all the education faculty members. Therefore, the current instructional practices of these faculty members are in close proximity.

Preservice Educator Interviews

Twelve preservice educators participated in the interviews. The most frequent technology skills the preservice educators had prior to coming to college (see Table 9) was word processing, followed by PowerPoint and Excel. Other preservice educators stated they learned more technology skills in college, such as PowerPoint, Microsoft Office, and HyperStudio (see Table 10). In addition, the interviews allowed for preservice educators to share how their professors used educational technology in both buildings. The second part of the interviews addressed the ISTE Standards for technology (see Appendix C).

Table 9

Technology Skills Before College

Technology	Student											
Student	1	2	3	4	5	6	7	8	9	10	11	12
Word processing	X		X	X	X	X	X	X	X	X		
Email	X						X					
Internet							X					
Overheads		X							X			
PowerPoint		X	X			X			X			
Excel			X	X				X	X			
HyperStudio								X				
DOS programming					X							
Adobe Photoshop					X							

Questions 1 and 2 were added to the survey after two participants had completed the survey. The first question asked what technology skills preservice educators had when they came to college. The second question asked "what did you learn when you got to college and who taught you?"

The students summarized the use of technology in the former building as the use of videos, overheads, and PowerPoints (see Table 9). The one computer with an LCD projector was on a big cart with power cords that tangled. The use of educational technology was very limited. Preservice educators' class preparation was completed in the library.

Table 10

Technology Skills During College

Technology skill	Student											
	1	2	3	4	5	6	7	8	9	10	11	12
Word processing							X		X			
Internet			X									
PowerPoint	X	X		X			X	X	X	X		
Excel							X			X		
HyperStudio						X	X		X	X		
Projector		X			X	X						
Elmo			X		X	X						
Web Page					X	X	X					
WebQuest					X					X		
SMARTBoard			X		X							
Microsoft Office	X					X	X	X		X		
Programming				X								
Java	X											
Graphing calculators				X								

From the preservice educators' responses, it was evident that a change occurred in the way information was communicated to the preservice educators. In addition, they stated that Internet resources, such as WebQuests, were investigated. The preservice educators also learned to use educational technology to provide information in their classrooms. Student Five indicated that she learned mostly from the professors because they built technology into the lessons. Educational technology was known as part of the curriculum.

The preservice educators recognized that educational technology was used more often and for more purposes in the new building. Because there was more access to technology, more time was spent learning with and learning from technology. They learned how to use educational technology because their education professors had modeled it. The education computer lab with the SMARTBoard provided greater access to hardware and software than was previously available. Collaboration occurred between the preservice educators and between the faculty and preservice educators.

Technology Usage in the Former Building

According to the preservice educators, the education professors did not use much technology in the former building. Preservice educators had three to seven different education professors in the former building. The mode was five, out of the possible eight education professors. Educational technology was not accessible and very limited. Many preservice educators explained how the technology lost power or ran slowly. Sometimes the computer had started, but the Internet connection had not worked. The preservice

educators said that educational technology was not used nearly as much as it would be in the new building.

Classes were held on two floors. The professors and students switched floors all of the time between classes. On each floor, the computer and LCD projector were placed on top of carts. In some rooms, the LCD projector was put on top of books or records to raise the image high enough to be seen on the screen. Cords were tangled everywhere. The cart was moved from room to room. The LCD projectors were not mounted in the ceiling; therefore, one was stolen right off the cart. A true teaching computer station was not in any of the classrooms. One student stated that "electronics were in the way of the view (for the students) and in the way" (Preservice educator 5, 2007, p. 1).

Overhead projectors with transparencies were the main source of educational technology in the former building. Preservice educators were given many handouts. PowerPoints were not shown very often. One student stated, "I think they did have PowerPoints, but it was all on carts so not everyone used them" (Preservice educator 3, 2007, p. 2). Videos were used, but the system only allowed for VHS tapes and not DVDs. A computer lab was not in the building. If the preservice educators wanted to prepare for class, they had to visit the library and work in one of the three computer labs located in that building.

Technology Usage in the New Building

When asked how education professors used technology in the new building, the preservice educators stated that more types of technology were used and technology was used more often. "First of all, the classrooms were a lot more technology-friendly" (Student 8, 2007, p. 1). Another preservice educator stated that it was a lot easier for the professors to deliver the content and information to them. A third preservice educator stated that the education faculty made a couple of good investments. The technology allowed for "teachable moments." Preservice educators noted that all of the same technology pieces were in place in each classroom. They all had computer stations that included a Dell computer with Internet access, an Elmo, a VCR player, a screen, and a DLP projector. The preservice educators were able to make more organized, professional presentations. "We were presented on how to use it (the educational technology)" (Preservice educator 5, 2007, p. 1). All the classrooms were in an air-conditioned building. In addition, the wiring was brand new. Several preservice educators commented on the fine access to technology. Preservice educator number 3 stated, "We really took advantage of it." Access to the Internet helped both education faculty and preservice educators for research and presentations.

A couple of preservice educators said that they did not learn how to use the SMARTBoard, but they saw other preservice educators experimenting with it. The education computer lab on the same floor, opposite the classrooms, was used for daily instruction, individual assignments, and allowed classes to work together. The technology in the new building was great for in-class activities, but also allowed for great out-of-

class activities. The preservice educators stated that they would go to the education computer lab before, between, and after classes to work. The preservice educators networked in the education computer lab as well. The education computer lab contained the SMARTBoard, DLP projector, screen, Elmo, 20 Dell computers, 4 iMacs, and a printer. "When I (the preservice educator) had a question, I went and asked my teachers, who were right there." When the preservice educators went to classrooms for field experience and student teaching, several felt they were better prepared than their cooperating teachers in educational technology use. They were able to utilize what they had learned in the new building. They had also learned how to take advantage of Area Education Agencies (AEAs) resources.

While the preservice educators recognized that the technology equipment was new, the issue had two sides. While some preservice educators said that the technology equipment was new with no problems, another preservice educator stated that the new building and its equipment sometimes had some glitches.

Technology Linked to Content

Technology was linked to content in several different manners. For example, in Developmental Reading, the education professor and preservice educators used the Elmo to show the modes of reading and writing. Another education professor used technology in the Health and Nutrition course to look up information about the food pyramid. CyberGuides were introduced in the Literature: Birth-Adolescence course, which linked pieces of literature with websites. The preservice educators created their own CyberGuides using Microsoft FrontPage. WebQuests were created in one course and

used in other courses. According to one student, PowerPoints were used in almost any course to link technology with content. In addition, website reviews were completed in the education lab which allowed all the preservice educators to do the same thing at the same time. Preservice educators learned to use the Merriam-Webster dictionary.com pronunciation guide. Another preservice educator commented that their geography class utilized the computer lab to study states and capitols. The preservice educator added that research presentations in different areas within education linked technology to content.

Professors Current in Technology Integration

Eleven out of the 12 preservice educators stated that some education professors were more current than others in technology integration in their content areas. The preservice educators said those professors current in technology could teach the students how to do everything, could demonstrate, and could problem solve. In addition, those professors did "direct instruction" and were positive role models with the integration of technology. One preservice educator explained, "It's kind of how they carry themselves" (Student 3, 2007, p. 2). Most of the professors used educational technology in class daily, although the type of technology used varied. One preservice educator said that two professors did not use educational technology in their courses, but that the courses could have been the reason. Two preservice educators stated that "younger teachers know more about computers" (Students 1 and Student 8, 2007). Preservice educators explained that if the older teachers had a question about how to use the technology, they had a harder time solving it. They might need someone else (computer service, another professor, or a preservice educator) to fix it for them. They might also get frustrated if something went

wrong. Overall, the preservice educators said that most education professors were functional. They were not scared to use the technology. They were updated in their educational technology and worked to integrate educational technology.

The education faculty members used technology more frequently than other faculty in other university divisions. "Education faculty used it (educational technology) a lot more than the English professors" (Student 6, 2007, p. 2). Another preservice educator said that the history professors' use of educational technology was non-existent.

> I wanted to use PowerPoint. I had to request the cart. There was not a screen. It was a white brick wall or green chalkboard. There was not a hook-up for the Internet. The history professors did not ask for technology that I could tell. (Student 11, 2007, p. 1)

Yet another preservice educator stated that the art professors were divided. One art professor did not use educational technology, but the other professor "always was bringing in information" through the use of technology (Student 5, 2007, p. 1). Two preservice educators said that the math professors used technology to teach their content through graphing calculators, computer programs, and the Internet.

Managing Student Learning

Only three of the 12 preservice educators knew how education professors managed student learning in either of the buildings. One education professor used the computerized gradebook from her former school district. The preservice educators explained how she posted the printouts. From the printouts, the preservice educators knew it was computer-based because of the spreadsheet (Student 11, 2007). Other preservice educators noted that education faculty brought in the paper gradebook to class

in the former building. In the new building, most preservice educators stated that they did not know what education professors did to manage student learning. The preservice educators saw education faculty log onto the computers, but "never really noticed what else they did" (Student 1, 2007, p. 1). Two preservice educators wondered if they did not know how education faculty managed student learning because that work was done "behind the scenes" or "maybe in their offices" (Student 2 and Student 4, 2007, p. 1).

Assessment and Evaluation

According to the preservice educators, education faculty did not demonstrate assessment and evaluation in the former building. The education professors talked about assessment and evaluation with "just examples of rubrics in paper format" (Student 7, 2007, p. 1). In the former building, education faculty presented the final products to the class, but did not actually create them in front of the class (Student 4, 2007). In contrast, "in the new building, we (preservice educators) were in the computer lab, in our building, in class! Special education did this. We created rubrics, graphs, and diagrams" (Student 10, 2007, p. 1). Education faculty and preservice educators created assessment tools in the classrooms and computer lab. Several preservice educators stated that they were told to look online for materials. "A lot of teachers taught us how to create rubrics" (Student 2, 2007, p. 1). A couple of preservice educators explained that the class expectation was to present information in front of class that often involved technology use to teach content. For example, "our reading class ...had us generating our own rubrics on the computers" (Student 3, 2007, p. 1).

Communication

In the former building, preservice educators used email and phones; however, all 12 preservice educators stated that they used email more in the new building. They cited the reason for increased usage was the increased access. In the former building, "we could access our email accounts, but not in the building" (Student 10, 2007, p. 2). "We used to go over to the library or to our dorm room" (Student 11, 2007, p. 2).

In the new building, the education computer lab is centrally located, which made it very convenient. "There were 20 computer in the education lab and another lab upstairs, so something was always open" (Student 9, 2007, p. 2). In between classes, preservice educators ran in and quickly checked email, or they did homework between classes if they had a longer break (Student 3, 2007). Several preservice educators noted that the floor plan in the new building allowed for better communication. The education classrooms were on one side of the building and the computer lab was across the hall from them (the classrooms). The education faculty offices were down the hall and around the corner (Student 8, 2007). Because of the proximity, "we (preservice educators and education faculty) would also see each other more" (Student 12, 2007, p. 2). Student 2 and Student 5 explained that the education computer lab was good for commuters as it became their "lounge" (2007). In addition, preservice educators said that the education faculty increased their use of emails. Several preservice educators noted that some professors sent emails from home. For example, one education professor "even stated in class that she would check her emails at home. I knew I could email her in the evening and still get a response" (Student 1, 2007, p. 2).

Ethical Responsibilities

Seven of the 12 preservice educators had not noticed a difference between how the education professors emphasized and demonstrated ethical responsibilities during instruction between the two buildings. The preservice educators acknowledged that the education faculty talked about copyright laws in both facilities. The emphasis used to be on plagiarizing (Student 11, 2007). If the preservice educators used videos or online information, they were instructed to credit the source.

Several preservice educators mentioned that guest speakers helped explain information about such topics as online predators, Facebook and MySpace, Internet sites, and chat rooms. One preservice educator noted that two education professors pushed ethical responsibilities (Student 4, 2007). In addition, other education faculty stressed "appropriate classroom behavior in regard to technology" (Student 5, 2007, p. 2).

Student Teaching

Seven of the 12 preservice educators stated that their cooperating teachers supported use of educational technology. Two of these seven noted that the increased level of technology with the new building gave them more access to technology than the limited amount of educational technology found in their school districts where they were student teaching. One preservice educator explained:

> I taught Iowa history, and we took a virtual tour of the capitol. There were so many kid-friendly Iowa websites. I wanted my students to research, so I used the Hotlist. My cooperating teacher was very encouraging about the use of technology. She was impressed with my knowledge and the virtual tour. She was unaware about some of the educational technology I was using. (Student 10, 2007 p. 2)

Another preservice educator noted that he used computer technology to get lesson plan ideas from the Internet. "Two education faculty gave links during class, which I used during student teaching. Grades and attendance were also completed online" (Student 7, 2007, p. 2).

> Honestly, I think the increase in the level of technology influenced me while student teaching. I used computers with my guided reading groups. In addition, I used the AEA number and website to obtain additional resources. If I didn't know how to use the website, they would not have that extra knowledge. I enhanced both units (about organs and sharks) through the use of video and the computer. (Student 1, 2007, p. 2)

Four of the 12 preservice educators said that they had one cooperating teacher who supported technology and one who did not. In one case, the preservice educator felt that because the first placement was in Kindergarten, technology use may not have been developmentally appropriate (Student 2, 2007). The other three preservice educators noted that their cooperating teachers did not care to use educational technology or know how to use technology (Students 3, 5, and 11, 2007). They expressed frustration about their cooperating teachers not being helpful.

One preservice educator said that his school district was "not on the cutting edge" of educational technology (Student 4, 2007, p. 2). He stated that the computer lab was getting resources, but he really only used overheads and graphing calculators to teach in his classroom. He drove back to the university to work on lesson plans in the education computer lab. He applied for all of his jobs online (Student 4, 2007).

Additional Information

The last interview question for the preservice educators asked them to share anything they had not been asked about technology. The overwhelming response was that educational technology mattered a great deal. "Access to the education computer lab was huge" (Student 10, 2007, p. 2). While preservice educators and/or education faculty members could reserve the education computer lab, they could also look out the classroom doors and through the window in the lab to see if it was available. The education computer lab was planned so faculty members could monitor its use. However, the window allowed for "teachable-moments" when either education faculty members or preservice educators wanted to use the lab to integrate technology.

Several preservice educators mentioned that the use of educational technology improved instruction. "Instructional methods have been enhanced. It's more interactive and engaging" (Student 11, 2007). Two of the 12 preservice educators said they wished they had had access to the technology sooner. "Professors had some knowledge. Most (education) teachers trained us, learning as you go along. I was a Fall Student Teacher. Who knows what else I would have learned if I had been there longer" (Student 8, 2007, p. 2).

Several preservice educators commented about how impressed their cooperating teachers were with how they used educational technology. "My cooperating teacher and job interviews were impressed with the amount of technology use" (Student 6, 2007, p. 2). "As I started teaching, it was expected that I knew how to use technology because I had just graduated. Veteran teachers would sometimes come to me and ask how to do

something on the computer" (Student 1, 2007, p. 2). "Through my coursework, I was encouraged to implement technology to improve instruction" (Student 10, 2007, p.2). "It has changed the education program without a doubt" (Student 7, 2007, p. 2).

The preservice educators noted that the new technology-infused building increased access to educational technology. This enabled the students to learn both with their professors and from their professors. In addition, the preservice educators used the designated computer lab to learn from each other.

Summary

The preservice educators stated that technology was linked to content in different ways. Eleven of the twelve preservice educators stated some education professors are more current than other education professors in technology integration in their content areas. For the preservice educators, the most profound attribute in the new building was access to technology.

Summary

Chapter four reported the data acquired from the education faculty syllabi, the technology-rich classroom observation, education faculty interviews, and the Level of Technology Implementation (LoTi) Questionnaire. This information was compared to preservice educator interviews. Member checking occurred to clarify questions that arose during the study and to add depth to the information acquired while conducting the study. The analysis centered on how increased access to technology affected education faculty members' teaching methods and what differences occurred after education faculty members gained increased access to technology.

Education faculty members modeled how to use educational technology to enhance student learning more often after relocating to a new technology-rich building. That finding was strongly supported by preservice educators' statements that more types of technology were used and technology was used more often. The faculty members modeled how to use technology to learn content, how to use the equipment, and what to use the equipment for. For example, preservice educators and education faculty stated that the use of PowerPoint for presentations became the expectation in the new building, whereas in the former building, the use of PowerPoint was the end goal that only a few students achieved.

According to the 2008 LoTi survey, all of the education faculty members used technology more for personal use after moving to the new building. Most of the faculty members also transferred this increased usage into the classroom environment. While preservice educators perceived the education faculty members who became frustrated while using new technology were not proficient in its use, the results of the LoTi survey and the faculty interviews showed these same faculty members ranked highest on the LoTi survey. Because these education faculty members were the early adaptors, they met more of the exemplars of the LoTi survey.

The classroom observation of the technology-rich course revealed the outcome of an education faculty member teaching while using educational technology. The education faculty, core course students, and the researcher's observations substantiated that the use of the Elmo was a beneficial difference for the visual learners. Internet access in the classrooms, a computer lab designated for teacher education, and coordinated software

for faculty offices provided a technology-infused environment for education. Yet, with all of these resources, some education faculty members did not change their instruction much. The results of the Current Instructional Practices profile showed education faculty applied educational technology in their classroom settings to various degrees.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Overview

The integration of educational technology has been an ongoing process since the introduction of computers into the classroom. Challenges exist in both the physical process of implementation and the philosophical beliefs about why and if educational technology should be used. In addition, since the standards movement, requirements have changed for educational technology integration.

Discussion

In this study, the researcher examined how increased access to educational technology through new facilities affected the teacher education faculty members and how they taught. The research questions sought information on "how" education faculty members altered their teaching methods. In addition, the researcher addressed "what" differences in technology integration occurred after moving to the new facility. Information and perceptions were gathered from the faculty and preservice educators, who were students for a year both in the former and new buildings.

After the Education Division at a private, Midwestern, four-year liberal arts college moved to the new building, education faculty members had access to six classrooms with computer stations, Internet access, Elmos, DLP projectors, screens, and VCRs. An education computer lab was located across the hall from the six classrooms. It contained 20 Dell computers, four iMacs, a printer, a SMARTBoard, an Elmo and a DLP projector. Some faculty members noted that they had access to the same hardware and

software in their office as in the education classrooms. Other education professors noted the Information Technology (IT) staff had to install software programs in either the classroom computers or office computers so all of the software was indeed aligned. Hall and Hord (2006) note how important organizational support is to successful innovations. For example, having IT support staff available to facilitate this software alignment.

Syllabi

After reviewing syllabi covering a three-year span, the researcher discovered that little of the educational technology usage was documented. This phenomenon was explained during the education faculty members' interviews. Education professors tended to document technology integration that involved student activities and assignments, but not technology used in their own teaching methods.

Of the limited references to educational technology in faculty syllabi, word processing was the most frequently mentioned. Word processing, a low level of technology usage, is commonly used for assignments such as research papers. This could be classified as Level I (Awareness) according to the LoTi survey because it matches activities where "applications have little or no relevance to the individual teacher's operational curriculum" (Moersch, Ondracek, & Saunders, 2005, p. 57). Current research supported the fact that most student teachers (preservice educators) also use low level technology if and/or when they integrate educational technology (Henning, Robinson, Herring, & McDonald, 2006-2007).

Education Faculty Interviews

Faculty members were at varied levels of educational technology integration. Two separate and distinct views emerged from the interviews with education faculty members who were "lower-level" users of educational technology. These faculty would be at Category 0 (Nonuse) or Category 1 (Awareness) according to the LoTi framework. One set of faculty members stated they were aware of the increased need for educational technology integration into methods courses. They said they were trying to integrate technology, but they needed more time for professional development, time to experiment, and time to implement technology into the classroom.

The other set of faculty members who were "lower-level" users had philosophical issues with integrating technology into the classroom. They were not sure if technology integration would increase student learning. These faculty members questioned whether educational technology was age-level appropriate, for example, at the early childhood level. Or, they asked if the technology is just bells and whistles, would it enhance student learning? Although these faculty members were hesitant to integrate educational technology into the instruction, they used technology for communication purposes.

Education faculty interviews clarified that informal professional development occurred mostly from reading literature and university-sponsored "workshops." These were not sequential, planned workshops, but instead were departmental training sessions to help education faculty use the latest equipment. In addition, two education faculty members learned about educational technology as they completed coursework on their advanced degrees. The researcher noted that some faculty members brought back

integration methods from professional development classes attended off campus. The faculty that integrated more educational technology would be at Category 4a (Integration: Mechanical) or 4b (Integration: Routine) or Category 5 (Expansion) according to the LoTi framework. This was evidenced by their focus on student learning and collaboration with others.

Education faculty members also mentioned other resources for learning about enhanced educational technology in their curriculum area including the Area Education Agency (AEAs), colleagues, IT staff, surfing the web, and trial and error. This informal professional development increased education faculty members' ability to integrate educational technology because they were able to collaborate with each other. As a department, the collaboration has transferred to other recent projects, such as writing the master's program and the program evaluation. Whereas former projects were written by individuals and then presented to the group, recent projects are written as ideas and concepts by several authors and shared through email. Education faculty at Category 4b (Integration: Routine) created documents using word processing, databases, and spreadsheets as original documents for the assessment system. This collaboration was also aided by the physical location of the computer lab in the education building. In the former building situation, the lab was in another building due to physical constraints on the electrical wiring. The new building allowed access to technology beyond the classroom walls and into the education computer lab. Now collaboration has escalated, including professor to professor, professor to student, and student to student communication.

The education faculty members related that in the technology-rich building, preservice educators were better prepared to integrate educational technology. Five of the six education faculty members reported that technology assisted in higher order thinking skills and creativity. The preservice educators tended to be more technologically savvy. They could apply their knowledge using technology to showcase their content and pedagogy. Half of the education faculty commented on the increased ability of preservice educators to locate resources on the Internet. The preservice educators created dynamic presentations using pictures, artifacts, and video streaming. The instructional use of technology had moved beyond LoTi Category 4 to Category 5 (Expansion). Student experiences were "directed at problem-solving, issues resolution, and student involvement surrounding a major theme/concept" (Moersch et al., 2005, p. 64).

Education faculty members referred to time issues throughout their interviews. After training sessions, they needed time to implement the new information. At times, such as with grading, it was quicker to continue with their manual grading systems. At the time of this study, the new Learning Management System (LMS) was not available. The LMS allows for online attendance, grading, handouts, and activities. Education faculty members also said the time they had available for teaching increased in the new building because the access to educational technology had increased. Unplugging and moving one piece of equipment in order to use another piece of equipment was no longer an issue. Classroom set-up in the new facility allowed faculty members to walk into a classroom, turn on the equipment, and teach their lessons. While access logistics

"increased" teaching time, some faculty still considered the process of using and integrating technology to be cumbersome.

Some education faculty members expanded their teaching techniques and methods because of the teaching stations and the technology availability. They now require more from the preservice educators. Some of the coursework has become more complex, such as the project where preservice educators record themselves teaching a Concept-Oriented Reading Instruction (CORI) or a Question/Answer Relationships (QAR) lesson. This provided additional evidence of Category 5 (Expansion) of the LoTi survey.

Communication changed dramatically in the new facility because the means to communicate were more accessible, according to all education faculty members. They use email more frequently to communicate with preservice educators, colleagues, peers, Center coordinators, the state Department of Education consultants, prospective students, and teachers with licensure questions. The education computer lab is available within the new facility many hours during the day. Preservice educators frequently work in the computer lab. Even while student teaching, some preservice educators come back to campus to work in the computer lab because it gives them access they may not have at home.

LoTi Survey

This survey provided an unbiased source of information on technology implementation, personal use of technology, and instructional practices. It is important to note that the education faculty members demonstrated a high level of computer usage

upon relocating to the new building. This could not have occurred in the former building without major remodeling because of the facility's electrical limitations.

The LoTi survey identified a distinct difference between personal computer use and educational technology integration into instruction in the new building. All education faculty members increased the amount of time spent with technology and the types of technology used. One of the most obvious increases in educational technology usage with personal computers was for communication. In contrast, the greatest difference in technology integration occurred in instruction, where education faculty members at level 5 (Integrated) or above tended to use instructional strategies that were more learner-centered.

Two of the seven education faculty members who completed the LoTi survey "self-assessed themselves at the Target Technology Level as defined by the National Education Technology Standards (NETS) and Technology Standards for School Administrators (TSSA)" (LoTi Technology Use Profile, 2008). At this level, education faculty members integrate educational technology "in challenging and engaging learning experiences that promote problem-solving, critical thinking, and self-directed learning" (LoTi Technology Use Profile, 2008). This information paralleled information gathered from the education faculty members' interviews and the technology-rich course observations, but did not align with the preservice educators' interviews.

Therefore, after viewing results of the LoTi survey in comparison to preservice educator data, the researcher reexamined the education faculty interviews and classified them by personal use and technology integration. This new analysis showed education

faculty members had a high personal computer use in their offices, but that computer usage did not always transfer into their instruction. This information matched the LoTi survey result where one of the seven education faculty was well below the Target Technology Level. At this level, the education faculty member used educational technology primarily as a productivity tool.

Class Observation of Technology-rich Course

The technology-rich course provided a "snapshot" view of one education course in order to witness how and what educational technology was used in the classroom setting. The researcher interviewed the education professor to ascertain before class what was going to happen during class regarding instructional strategies and the reasoning behind the choices. These interviews occurred daily in preparation for the next day.

The researcher used the Technology Use Lesson: Observation Tool as a framework to record the professor's level of skill or stage of use in incorporating educational technology into the lesson. This tool examined how educational technology was utilized on a daily basis. Overall, core course students within this course demonstrated a high level of technology use and educational technology integration. The Technology Use Lesson: Observation Tool evidenced that core course students collaborated with peers daily, that they were provided opportunities to use higher order thinking skills daily, and that educational technology access was adequate to meet daily lesson objectives. The learning environment was conducive to the use of the available educational technology. The category of student technology use indicated the technology

used was appropriate for the students' skill levels and that technology was used as a learning tool through communication, publication, and/or research.

The actual classroom observations revealed the education professor modeled the use of educational technology on a daily basis. In addition, most of the core course students enrolled in the course used the educational technology available to them to "teach" their content area reading strategies. However, while most students used educational technology in the classroom, not all of them did. This is consistent with other research in the area of educational technology integration (Fullan, 2001). Some of the students referred to the Elmo and the computer station, but did not utilize them. For example, two students said they could have showed something on the Elmo, but they never walked over to the Elmo and actually placed their items on the Elmo. On several occasions, core course students needed to be told how to turn on the Elmo or how to zoom in on the object. It was important to note that core course students enrolled in this course were mainly graduate students currently employed in area schools as PreK-12 teachers. The university had better access to technology than the area school districts. The few undergraduate students in the course were better prepared to use the university's classroom equipment because they were familiar with it.

Preservice Educator Interviews

The preservice educators indicated that education faculty members did not use educational technology very often in the former building because of the set-up time required, the slow technology speed, and easily lost electrical connections. To prepare for class, preservice educators left the former building and traveled to the library to research

and create materials. Educational technology in the former building was very cumbersome for faculty and preservice educators alike.

In contrast, the preservice educators shared that education professors used more types of educational technology and more often in the new facility. They saw the classrooms as much more technology-friendly. Preservice educators noted that consistent technology was available in each classroom. From their viewpoint, the education faculty members delivered content and information with greater ease in the new facility. Even though education faculty interviews showed time was considered as a barrier to technology integration, preservice educators did not confirm this. Rather, they remarked at how the increased access was key to educational technology implementation.

The main source of educational technology in the former building was using transparencies on overhead projectors. More handouts were given to the preservice educators. PowerPoints were seldom shown. Video cassettes were used, not DVDs because they were not compatible with the available equipment. According to the LoTi description, this would be Category 0 (Non-use) because the "existing technology is predominately text-based (e.g., worksheets, chalkboard, and overhead projector)" (Moersch et al., 2005, p. 56).

The new facility allowed preservice educators better access to technology, and several remarked they took advantage of it. They had access to the Internet in the classrooms and in the education computer lab. The lab's location on the same floor and directly across from the classrooms provided space and facilities for group class projects, daily instruction by the professor and/or preservice educators, and individual

assignments. Preservice educators said they went to the education computer lab before, between, and after classes and used the lab to network with each other. When they had questions, they asked their professors whose offices were nearby. Two of the 12 preservice educators explicitly stated that they wished they would have had such access to educational technology sooner.

Several preservice educators felt educational technology improved instruction because it became interactive and engaging. Most of the preservice educators gave examples of how educational technology was integrated into the curriculum in their different courses. Preservice educators used education technology to research information, create products, or give presentations. For example, preservice educators researched information about the modes of reading and writing and/or about the food pyramid. For other courses, preservice educators created CyberGuides or WebQuests. The preservice educators also gave presentations, using the correct pronunciation from the Merriam-Webster dictionary.com site or showing virtual tours from the Internet. These presentations were more organized and professional than student presentations in the former building.

The majority of preservice educators stated that education faculty members were more current in their use of educational technology than professors in other divisions, including liberal arts and business. Some faculty in other divisions appeared very challenged to integrate technology such as one liberal arts professor who said he only needed a piece of chalk to teach his lesson. Some liberal arts professors said they did not use technology because it was cumbersome. However, the math and science faculty

integrated technology into their content areas using graphing calculators and various computer programs.

Eleven of the 12 preservice educators observed that within the education division, some education professors were more current than others in integrating educational technology. They believed these education professors could teach, demonstrate, and problem solve using educational technology. They openly said, "Younger teachers know more about computers." The preservice educators explained that older teachers had a more difficult time problem solving or fixing things when technology did not work. They would get frustrated if something went wrong. In reality, some of the "older" education professors were the "early adopters" and were considered the "higher levels" based upon the LoTi survey and education faculty interviews (Hall & Hord, 2006). They willingly tried new educational technology in the classroom. However, they were vocal if something did not go according to plans. The reality was that preservice educators did not always recognize which faculty members were at the higher levels of technology integration according to the LoTi questionnaire (LoTi Technology Use Profile, 2008).

Many times the preservice educators did not realize how education professors used educational technology. For example, the preservice educators did not know how or what education faculty members did to manage student learning (such as electronic gradebooks or attendance), assessment, and evaluation. Two of the preservice educators wondered if this was because the education faculty members used the technology in their offices, not in plain sight in the classrooms.

The preservice educators noted that in many cases they were better prepared to use educational technology in the K-12 classroom than their cooperating teachers during field experience and student teaching. These preservice educators also noted that the new education building had greater access to educational technology than the local school districts. Some preservice educators commented they drove back to the university so they could work in the education computer lab. The preservice educators in field experience and student teaching used educational technology to research ideas and information, instruct during class, and communicate with university supervisors and their cooperating teachers.

Seven of the 12 preservice educators had cooperating teachers who supported integrating educational technology. If their cooperating teachers did not care to use educational technology or know how to use it, the preservice educators shared their frustration with this situation. The preservice educators noted that their cooperating teachers were impressed with their ability to integrate educational technology. As preservice educators transitioned into their teaching careers, veteran teachers asked them how to do things on the computer. The preservice educators stated education faculty members encouraged them to implement educational technology to improve instruction throughout their coursework and during student teaching. As new teacher graduates, they were expected to know how to integrate educational technology into their classrooms while they were student teaching and when they began their teaching career in their own classrooms.

Research Question 1

How did increased access to technology through new facilities affect education faculty teaching methods?

The results from the syllabi of the education faculty members did not demonstrate a shift in how the faculty taught. Instead, results showed several syllabi incorporated more assignments requiring preservice educators to use technology. The intent of this research was to understand how education faculty members would categorize technology, however, this information was not listed in the syllabi and is not the function of a college course syllabus. Education faculty noted in their interviews that they tended to put student activities and assignments in the syllabi rather than explicitly listing how they were going to integrate technology into their teaching style. Therefore, the Level of Technology Implementation (LoTi) Questionnaire was used instead to rank how the new facilities affected faculty teaching methods.

The results of the LoTi questionnaire could be categorized at three distinct areas for the Level of Technology Integration. Each level demonstrated the degree to which education faculty members integrated educational technology into their teaching methods. One faculty member at the low level did not integrate technology on a regular basis within the classroom setting. Four of the seven education faculty members who completed the questionnaire scored at the middle level, meaning they integrated educational technology in a mechanical manner to enhance instruction. Even though none of the education faculty members scored at the highest level, two faculty members responded with some of the characteristics of this level where technology is learner-

centered to solve real-life problems. As discussed at the beginning of Chapter 4, education faculty interviews confirmed the results of the LoTi questionnaire.

The observation of the technology-rich classroom and the interview of the education professor who taught this course confirmed the information acquired from the LoTi survey and the education faculty interviews. This professor could be classified at the "Appropriation" or "Invention" level on the Technology Use Lesson: Observation Tool. Based on the LoTi framework, the same professor was categorized as Level of Technology Implementation 4b (Integration: Routine) and Current Instructional Practices Level 6 (Refinement). Two themes emerged from the observation, the role of technology access and time have affected technology integration.

The first three comments all address the theme of access to technology. With increased access, this professor used educational technology to model, to motivate, and as a resource.

"One of the things technology is to be used for is a resource for you." This was stated in the classroom and was used to model how to locate and use math lessons with a technology application.

"If I expect you to use technology, I model it. If I expect you to use websites, we go to them."

"With the use of technology, we can make our reading more interesting. We can entice our students." This example illustrated how educational technology can be motivating for students.

The other theme that emerged was time. The education professor showed the Quiz Results and Item Analysis on the Elmo. "Where do I find how to make the graph? It is a button you click on Excel and you do it. It is real easy to pick up. I did it over lunch." By using educational technology, the professor saved time by quickly producing the graph in Excel.

Summary

The education faculty members modeled how to use education technology. While their syllabi did not demonstrate how the new facilities affected education faculty teaching methods, the faculty interviews did. The professors continued to model how to use the equipment, what to use the equipment for, and how to use technology to teach the content. In addition, the other consistent theme that emerged was the amount of classroom time where educational technology was integrated as a communication tool, resource, or productivity tool.

Research Question 2

What differences in technology integration occurred after moving to the new facility?

The syllabi represented the student activities and assignments for the professional core courses. Education faculty members' syllabi did not indicate many changes were made to their integration of technology into their instruction. Word processing was the dominant use according to the syllabi. MovieMaker was added during the first year in the new building. The syllabi did not demonstrate the depth of usage.

Two sections of the LoTi survey provided information on the differences in educational technology integration that occurred after faculty moved to the new facility.

The Personal Computer Use (PCU) section addressed the education faculty members' proficiency at using personal computers at home and/or at work. The Current Instructional Practices (CIP) investigated the education faculty members' support for learner-based curriculum design.

The results from the Personal Computer Use (PCU) section showed both a median and mode score of 5 out of a possible 7. Level five indicated that the education faculty members could use both hardware and software effectively. In addition, the range of scores was level 4-6. This range demonstrated a close proximity between education faculty members for this one component.

The results from the Current Instructional Practices (CIP) section of the LoTi survey also represented a median and mode score of 5 out of a possible 7. For this section, level 5 indicated that education faculty members' instructional practices were based upon the needs of the learners. "The types of learning activities and teaching strategies used in the learning environment are diversified and driven by student questions" (Moersch et al., 2005, p. 68). The range was greater than for Personal Computer Use (PCU), ranging from level 3 to level 6. This indicated a greater variety in the actual application of technology in the classroom setting for instructional purposes.

The education faculty interviews substantiated the results of the PCU section of the LoTi survey with these comments about the use of personal computers:

"I can sit down at the computer anytime and find the information I am looking for. It makes it easy to stay in contact with students, student teachers, cooperating teachers, and professors" (Professor A, 2007, p. 1).

Four of the professors said they used materials from the textbooks and publishing companies. "Sometimes there was a companion disc that went along with the textbook, so I pulled teaching ideas, quizzes, tests, suggested articles, discussion questions, or things like that" (Professor F, 2007).

The majority of the education faculty managed grades through a computer gradebook program or Excel document. Several education faculty members stated that they had received access to the Learning Management System. "We had a training session by one of our IT people. It takes time" (Professor B, 2007).

The above comments demonstrated that the education faculty members used educational technology for communication, locating resources, and management. Education faculty members took advantage of training sessions or professional development from the IT department on campus, colleagues, and/or conferences. This demonstrated a high level of interest and personal use.

The results from the Current Instructional Practices (CIP) section of the LoTi survey were also confirmed with the education faculty member's interviews. One professor demonstrated low-tech and high-tech versions of assistive technology by providing the students a broader view of what and how to integrate educational technology (Professor C, 2007). Another professor explained that when the preservice educators did presentations, technology was always involved. "That expectation is there" (Professor D, 2007).

Faculty members' comments included:

"It just supports what the textbook and what I say and do in class. It just gives examples . . . It helps with questioning and critical thinking" (Professor F, 2007).

"I had one of my graduate students that wanted to do something with geometry. And then I said do it with virtual geometry" (Professor B, 2007).

"When I first started teaching, I felt I should provide everything for student learning. I put responsibility back on them. I want them to utilize technology. I changed my approach to how I teach. It is more beneficial for my students" (Professor A, 2007).

The education professor of the technology-rich course contributed this statement when describing the difference in technology integration that occurred after moving to the new building.

> In the former building, I used the computer as if it was part of my classroom, as part of my office. I would only use the technology as an add-on to what I was teaching. Now it is integrated so it is part of what I am doing....It is just all part of it. Technology used as a part of almost every lesson. It is a tool. Before I could not always keep the power on!

This demonstrated progress in educational technology implementation. The new building allowed for the continuous opportunity to "coach" preservice educators to use technology.

Another important item education faculty noted was that the preservice educators could reserve the education computer lab and, during class, they could walk down the hallway to use the lab. Sometimes students looked through the lab window and went there with their class because they could see the lab was available. The Elmo, Internet access in the classroom, the computer lab, and coordinated software helped meet the preservice educators' needs in a student-centered classroom.

Summary

Education faculty members' personal computer use increased as evidenced in the LoTi survey and education faculty interviews. Faculty interviews showed that education faculty members' current instructional practices benefited from increased access to educational technology in the classrooms and the availability of the education computer lab. Interview results also showed that faculty members benefited from the synergy of similar software having been installed in offices, classrooms, and the computer lab.

Research Question 3

What were the perceived changes and differences noted by preservice educators, who were instructed in both the former building and then the technology-infused building?

According to the preservice educators, the types and frequency of educational technology increased. They learned from education faculty members how to use the equipment, what to use it for, and how to use technology to teach content.

Preservice educators summarized the use of educational technology in the former building as the use of videos, overheads, and PowerPoints. After moving to the new building, educational technology became part of the curriculum. This was demonstrated through use of the Elmo, the Internet, SMARTBoard, computer lab, and PowerPoints.

Based upon statements from the preservice educators, the education faculty members used technology more frequently than other divisions. The preservice educators stated specifically that faculty in the Education Department used it more than the English and history professors. In their experience, one art professor had used technology and one did not. However, the preservice educators did note that the math professors used

technology to teach their content through graphing calculators, computer programs, and the Internet.

The access to educational technology increased in the new building. Better access to educational technology not only was used for in-class activities, but it also allowed for greater use of technology outside of class hours. Because preservice educators could use the education computer lab before, between, and after their classes individually and working with others, they were less reliant about having an education faculty member available in the lab to show them how to use technology, equipment, or structure its use in their class strategies.

Having utilized what they learned in the new building, several preservice educators felt they were better prepared to integrate educational technology than their cooperating teachers. While PowerPoint became an expectation, preservice educators felt in general that they were expected to know how to use a variety of educational technologies because they were the recent graduates.

The preservice educators perceived the education faculty members who were early adopters of technology as professors who did not know how to use educational technology because these faculty members were quick to express frustration if the technology did not work. Instead, these education faculty members had scored the highest on the LoTi questionnaire and had expressed high levels of technology integration in the faculty interviews. In reality, they were the ones that used educational technology the most frequently, with the greatest variety of applications.

Results

The results of the study show that increased access to education technology made a difference in how education faculty members taught and what they taught. Preservice educators learned from education faculty members and from each other. Faculty members learned from their staff development, but also from the preservice educators. Preservice educators even used the education computer lab for demonstrations in courses taught by faculty members who were not labeled as "technology-savvy." By reserving the education computer lab, the whole class moved into the lab where the preservice educators participated on the computers while another preservice educator demonstrated on the SMARTBoard. These preservice educators had learned from other faculty models or their peers how to integrate educational technology into their lessons. This collaboration provided support to learn new technology skills.

This quote parallels the results from this study.

> Teachers must become comfortable as co-learners with their students and with colleagues around the world. Today it is less about staying ahead and more about moving ahead as members of dynamic learning communities. The digital-age teaching professional must demonstrate a vision of technology infusion and develop the technology skills of others. These are the hallmarks of the new education leader. (Knezek, 2008, as cited in ISTE, 2008, ¶ 2)

Conclusions

This study examined how increased access to educational technology through new facilities affected education faculty teaching methods. Information was acquired from education faculty members and preservice educators. In conclusion, three components of

a high level of educational technology integration are: more productive time, access, and collaboration. These components all interact to support each other.

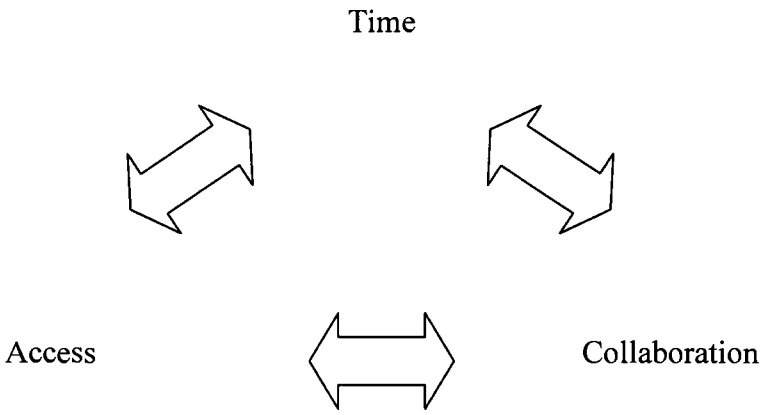

Figure 4. Common Components of High Levels of Technology Integration.

Even though *time* was listed as a barrier to educational technology, this study revealed that access could contribute to removing the barrier of time. According to the LoTi survey, all education faculty members increased the amount of time spent with technology. Because the access increased educational technology, education faculty members saved time. Some education faculty members still felt they needed more time for professional development. Others said the new technology saved time because they did not need to spend time moving equipment so it could be used.

All study participants—education faculty members, core course students, and preservice educators—commented on how *access* to educational technology increased because of the new technology-rich facility. The same hardware and software was available in the education computer lab, classrooms, and faculty offices. Education

faculty members acknowledged the importance of having seamless transition with their technology between any of these locations. The technology also enabled education classes to move beyond the classroom walls and into the education computer lab. Preservice educators and education faculty could readily see through the lab window if the education computer lab was in use or available to them. Preservice educators stated that increased access was key to educational technology implementation to showcase their content and pedagogy projects. When the preservice educators student taught, they often returned to campus to use the education computer lab because the university had better access to technology than the local school districts.

Students *collaborated* daily, according to the Technology Use Lesson: Observation Tool. One of the barriers to technology implementation was lack of faculty modeling. This was not an issue in this Content Area Literacy class because the professor of this technology-rich class did model technology integration. The proximity between the software/hardware compatible faculty offices, education computer lab, and the classrooms enabled these activities. Collaboration occurred between student to student, student to faculty member, and faculty member to faculty member. In the latter situation, technology use enhanced extended faculty collaboration and communication in several ways. The Computer and Instructional Technology class was now taught in proximity to other classes, providing greater opportunities for skill development. Some faculty shared new methods of technology integration with other faculty on campus from off-campus professional development workshops or coursework from their advanced degree work at other universities. This collaboration among faculty helped to overcome the barrier of

formal professional development found in earlier studies. Even "lower level" users used the technology for communication.

Previous research suggested five barriers to educational technology integration which include:

1. lack of time,
2. lack of comprehensive support system,
3. education faculty members not modeling technology use,
4. lack of access to technology, and
5. culture/tradition of a single technology course (Brzycki & Dudt, 2005).

This study's findings demonstrated how these barriers were overcome. First, education faculty and preservice educators had access to educational technology. Education faculty members in their interviews originally confirmed that time was an issue, but when they had the same software and hardware in both the classrooms and their offices in the new building, time was less of an issue than before. Many education faculty commented on how easy it was to access materials in their offices in preparation for their courses in the classroom setting. Again, access helped overcome the barrier of time.

Even with education faculty members modeling integrating educational technology into instruction, preservice educators and graduate students need to be explicitly taught how to use the equipment. For example, the technology-rich course included many graduate students who taught in area schools. They needed to be shown how to use the Elmo. Without such direct instruction, graduate students asked how to enlarge the image or they skipped the process altogether.

The technology-rich classroom observation indicated that modeling educational technology use was important, but it also required collaboration among the students to implement the educational technology. This demonstrated a way of crossing the barrier of the single technology course. The expectation to integrate educational technology outside of the "technology" course was reinforced with a goal of enhancing student learning.

Collaboration was evident in the classrooms where the education faculty member was not "technology-savvy." Preservice educators transferred their educational technology knowledge from course to course. Because they had access to technology and time in the designated education computer lab, they developed lessons incorporating educational technology and shared them with classmates. Sometimes preservice educators sought assistance from each other and at other times they sought out education faculty members.

In contrast to other studies that investigated how change occurs when educational technology is introduced, this study noted three important contributing factors: time, access, and collaboration. Other studies stated professional development was a needed component. However, organized sequential professional development did not contribute to the educational technology integration within the methods courses. Instead, the access led to increased time and collaboration among preservice educators and education faculty members.

Recommendations

Document Technology Integration

Before the next accreditation site visit from the State Department of Education, the education faculty will want to document technology integration in some manner. This action will indicate an accurate representation of what is happening during instruction. It will demonstrate to outside reviewers that education faculty are using educational technology in their classrooms and addressing the technology standards.

Inform Building Planners

As the university continues to grow, the planning of university buildings needs careful consideration in regard to how learning environments are created. Architects do not necessarily plan for learning communities. Administrators need to listen to faculty input. For example, the window in the education computer lab was decided based upon education faculty wanting to monitor the lab. In reality, the window provided opportunities for collaboration beyond the walls of the computer lab.

Continued Professional Development

Educational technology training should be supported and funded for all education faculty members, including new hires. In this study, formal professional development did not occur. Yet, an informal learning community was established as education faculty members collaborated after attending conferences, reading journals, and receiving advanced coursework. Education faculty members at Level 4a should move to Level 4b according to the LoTi survey. This could be achieved through continued collaboration with other faculty members, IT staff, students, and outside professional development.

Continue Technology Integration Research

Additional research needs to be done to determine which uses of technology are most effective in educational settings. This has been an ongoing challenge. Comparisons could be made to the recent ISTE Standards that were published after this study.

Maintain Follow-Up Interviews

The final recommendation would be to continue to complete follow-up interviews with recent preservice educators. Educational technology changes at a rapid pace. As the educational faculty continues to improve their integration of educational technology, the impact on preservice educators needs to be monitored.

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APPENDIX A

NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS

ISTE National Educational Technology Standards for Teachers
http://cnets.iste.org/teachers/t_stands.html

NETS for Teachers

Educational Technology Standards and Performance Indicators for All Teachers

Building on the NETS for Students, the ISTE NETS for Teachers (NETS•T), which focus on preservice teacher education, define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. All candidates seeking certification or endorsements in teacher preparation should meet these educational technology standards. It is the responsibility of faculty across the university and at cooperating schools to provide opportunities for teacher candidates to meet these standards.

The six standards areas with performance indicators listed below are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. Performance indicators for each standard provide specific outcomes to be measured when developing a set of assessment tools. The standards and the performance indicators also provide guidelines for teachers currently in the classroom.

1 TECHNOLOGY OPERATIONS AND CONCEPTS.
Teachers demonstrate a sound understanding of technology operations and concepts.
Teachers:

- demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students)
- demonstrate continuous growth in technology knowledge and skills in order to stay abreast of current and emerging technologies.

2 PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES.
Teachers plan and design effective learning environments and experiences supported by technology.
Teachers:

- design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- apply current research on teaching and learning with technology when planning learning environments and experiences.
- identify and locate technology resources and evaluate them for accuracy and suitability.

- plan for the management of technology resources within the context of learning activities.
- plan strategies to manage student learning in a technology-enhanced environment.

3 TEACHING, LEARNING, AND THE CURRICULUM.
Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.
Teachers:
- facilitate technology-enhanced experiences that address content standards and student technology standards.
- use technology to support learner-centered strategies that address the diverse needs of students.
- apply technology to develop students' higher order skills and creativity.
- manage student learning activities in a technology-enhanced environment.

4 ASSESSMENT AND EVALUATION.
Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.
Teachers:
- apply technology in assessing student learning of subject matter using a variety of assessment techniques.
- use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
- apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

5 PRODUCTIVITY AND PROFESSIONAL PRACTICE.
Teachers use technology to enhance their productivity and professional practice.
Teachers:
- use technology resources to engage in ongoing professional development and lifelong learning.
- continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- apply technology to increase productivity.
- use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

6 SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES.
Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice.
Teachers:
- model and teach legal and ethical practice related to technology use.

- apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
- identify and use technology resources that affirm diversity
- promote safe and healthy use of technology resources.
- facilitate equitable access to technology resources for all students.

From *National educational technology standards for all teachers,* by International Society for Technology in Education [ISTE], 2000, Eugene, OR: Author. Copyright 2000 by ISTE NETS. Reprinted with permission.

APPENDIX B

PRE-CLASSROOM OBSERVATION INTERVIEW TOOL

Pre-Classroom Observation Interview

1. What has this class been doing with technology recently?

2. What do you anticipate doing in your classroom on the day I will be observing? PROBE: What do you hope students will learn as a result of the lesson you are planning? What benchmarks will you be implementing? What content area will you be covering?

3. What is the next step after this lesson?

4. Is there anything in particular that I should know about the group of students that I will be observing?

5. Where will this lesson take place? – (Lab, or classroom)

6. What hardware and software will (you) be using? Why?

7. How did you come up with the idea for this lesson?

From *Pre-classroom observation interview* by S. J. Brooks-Young & H. Barnett, 2002. Retrieved from http://rtecexchange.edgateway.net/cs/rtecp/view/rtec_files/117. Reprinted with permission.

APPENDIX C

TECHNOLOGY USE LESSON: OBSERVATION TOOL

Technology Use Lesson: Observation Tool -

Susan Brooks-Young & Harvey Barnett

This tool is designed for use by site administrators, mentor teachers, peer coaches, or other educators when observing a lesson to determine a teacher's level of skill, or stage of use in incorporating technology use into the lesson.

Based upon the Apple Classrooms of Tomorrow research published in 1996, the levels include:

Entry:	Learn the basics of using the new technology.
Adoption:	Use new technology to support traditional instruction. Focus is often on personal use or teaching basic technology skills to students.
Adaptation:	Integrate new technology into traditional classroom practice. Here teachers often focus on increased student productivity and engagement by using word processors, spreadsheets, and graphics tools.
Appropriation:	Focus on cooperative, project-based, and interdisciplinary work–incorporating the technology as needed and as one of many tools.
Invention:	Discover new uses for technology tools, for example, developing spreadsheet macros for teaching algebra or designing projects that combine multiple technologies.

It's important to understand that even the most experienced users progress through these levels each time they learn to work with a new technology.

By using this tool, observers can help the teacher identify not only the current stage of use, but to review exemplars for extending the teacher's level of skill to the next stage. We recommend that prior to conducting an observation, the teacher and the observer meet to review the lesson plan and discuss the teacher's goals and objectives for the lesson. The Pre-observation form located at http://rtecexchange.edgateway.net/cs/rtecp/view/rtec_files/117 is an excellent tool for this purpose.

During the actual lesson, use the coversheet to describe the setting for the lesson. Pages two and three are designed to be easy-to-use checklists. After the lesson, review the checkmarks to see where they are clustered. This will help identify the current stage of use.

Technology Use Lesson: Observation Tool –

Learning Environment	Observed
Students have no interaction with other students	
Students collaborate with peers	
Students are provided opportunities to use higher order thinking skills	
Technology access is adequate to meet lesson objectives	
Students with special needs have access to appropriate hardware and software	

Student Technology Use	Observed
Technology skills expected of students meet or exceed district standards	
Technology used is appropriate for student's skill level	
Technology is used as a tool to learn from (i.e., drill and practice, tutorials)	
Technology is used as a tool to learn with (i.e., communication, publication or research)	

Lesson Implementation	Observed	*note below	Level
Technology use is not clearly related to lesson objectives		O	Adoption
The lesson is focused on learning a technology skill		I	Adoption
Traditional assessment methods including paper and pencil tests are used to measure student outcomes.		A	Adoption
Technology use is somewhat related to lesson objectives		O	Adaptation
Technology use is optional and not necessary to meet lesson objectives		O	Adaptation
Technology use is simplistic and all students are assigned the same activity		I	Adaptation
Technology is used for drill and practice, tutorials, or as a free time activity		I	Adaptation
Productivity tools and courseware are used to augment the lesson		I	Adaptation
Technology is used with little or no management problems		A	Adaptation
Student outcomes are often measured using teacher developed rubrics or traditional assessments		A	Adaptation

* Indicates if statement is related to Objective, Instruction or Assessment

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From *Technology use lesson: Observation tool* by S. J. Brooks-Young & H. Barnett.,2002. Retrieved from http://members.tripod.com/sjbrooks_young/techobstool.pdf. Reprinted with permission.

APPENDIX D

LEVELS OF TECHNOLOGY IMPLEMENTATION QUESTIONNAIRE

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Appendix D
pages 162-166

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APPENDIX E

INTASC STANDARDS

INTASC Standards

Principle #1: The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

Principle #2: The teacher understands how children and youth learn and develop, and can provide learning opportunities that support their intellectual, social and personal development.

Principle #3: The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to learners from diverse cultural backgrounds and with exceptionalities.

Principle #4: The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

Principle #5: The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

Principle #6: The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

Principle #7: The teacher plans and manages instruction based upon knowledge of subject matter, students, the community, and curriculum goals.

Principle #8: The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.

Principle #9: The teacher is a reflective practitioner who continually evaluates the effects of her/his choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

Principle #10: The teacher communicates and interacts with parents/guardians, families, school colleagues, and the community to support students' learning and well-being.

APPENDIX F

IOWA TEACHING STANDARDS

Iowa Teaching Standards

Standard 1: Demonstrates ability to enhance academic performance and support for implementation of the school district's student achievement goals.

The teacher:

a. Provides evidence of student learning to students, families, and staff.
b. Implements strategies supporting student, building, and district goals.
c. Uses student performance data as a guide for decision making.
d. Accepts and demonstrates responsibility for creating a classroom culture that supports the learning of every student.
e. Creates an environment of mutual respect, rapport, and fairness.
f. Participates in and contributes to a school culture that focuses on improved student learning.
g. Communicates with students, families, colleagues, and communities effectively and accurately.

Standard 2: Demonstrates competence in content knowledge appropriate to the teaching position.

The teacher:

a. Understands and uses key concepts, underlying themes, relationships, and different perspectives related to the content area.
b. Uses knowledge of student development to make learning experiences in the content area meaningful and accessible for every student.
c. Relates ideas and information within and across content areas.
d. Understands and uses instructional strategies that are appropriate to the content area.

Standard 3: Demonstrates competence in planning and preparing for instruction.

The teacher:

a. Uses student achievement data, local standards, and the district curriculum in planning for instruction.
b. Sets and communicates high expectations for social, behavioral, and academic success of all students.
c. Uses student's developmental needs, backgrounds, and interests in planning for instruction.
d. Selects strategies to engage all students in learning.
e. Uses available resources, including technologies, in the development and sequencing of instruction.

Standard 4: Uses strategies to deliver instruction that meets the multiple learning needs of students.

The teacher:

a. Aligns classroom instruction with local standards and district curriculum.
b. Uses research-based instructional strategies that address the full range of cognitive levels.
c. Demonstrates flexibility and responsiveness in adjusting instruction to meet student needs.
d. Engages students in varied experiences that meet diverse needs and promote social, emotional, and academic growth.
e. Connects students' prior knowledge, life experiences, and interests in the instructional process.
f. Uses available resources, including technologies, in the delivery of instruction.

Standard 5: Uses a variety of methods to monitor student learning.

The teacher:

a. Aligns classroom assessment with instruction.
b. Communicates assessment criteria and standards to all students and parents.
c. Understands and uses the results of multiple assessments to guide planning and instruction.
d. Guides students in goal setting and assessing their own learning.
e. Provides substantive, timely, and constructive feedback to students and parents.
f. Works with other staff and building and district leadership in analysis of student progress.

Standard 6: Demonstrates competence in classroom management.

The teacher:

a. Creates a learning community that encourages positive social interaction, active engagement, and self-regulation for every student.
b. Establishes, communicates, models, and maintains standards of responsible student behavior.
c. Develops and implements classroom procedures and routines that support high expectations for student learning.
d. Uses instructional time effectively to maximize student achievement.
e. Creates a safe and purposeful learning environment.

Standard 7: Engages in professional growth.
The teacher:
a. Demonstrates habits and skills of continuous inquiry and learning.
b. Works collaboratively to improve professional practice and student learning.
c. Applies research, knowledge, and skills from professional development opportunities to improve practice.
d. Establishes and implements professional development plans based upon the teacher's needs aligned to the Iowa teaching standards and district/building student achievement goals.

Standard 8
Fulfills professional responsibilities established by the school district.
The teacher:
a. Adheres to board policies, district procedures, and contractual obligations.
b. Demonstrates professional and ethical conduct as defined by state law and district policy.
c. Contributes to efforts to achieve district and building goals.
d. Demonstrates an understanding of and respect for all learners and staff.
e. Collaborates with students, families, colleagues, and communities to enhance student learning.

APPENDIX G

LEVELS OF USE OF TECHNOLOGY TABLE

Level	CBAM Level	CBAM Description	LoTi Category	LoTi Description
CBAM and LoTi: 0	Nonuse	State in which the user has little or no knowledge of the innovation, no involvement with the innovation, and is doing nothing toward becoming involved.	Nonuse	A perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominantely text-based (e.g., ditto sheets, chalkboard, overhead projector).
CBAM and LoTi: 1	Orientation	State in which the user has recently acquired or is acquiring information about the innovation and/or has recently explored or is exploring its value orientation and its demands upon user and user system.	Awareness	The use of computers is generally one step removed from the classroom teacher (e.g., it occurs in integrated learning system labs, special computer-based pull-out programs, computer literacy classes, and central word processing labs). Computer-based applications have little or no relevance to the individual teacher's instructional program.
CBAM: 2; LoTi: 2	Preparation	State in which the user is preparing for the first use of the innovation.	Exploration	Technology-based tools serve as a supplement (e.g., tutorials, educational games, simulations) to the existing instructional program. The electronic technology is employed either for extension activities or for enrichment exercises to the instructional program.
CBAM: no equivalent; LoTi: 3	.	.	Infusion	Technology-based tools including databases, spreadsheets, graphing packages, probes, calculators, multimedia applications, desktop publishing, and telecommunications augment selected instructional events (e.g., science kit experiments using spreadsheets or graphs to analyze results, telecommunications activities involving data sharing among schools).
CBAM: 3; LoTi: 4a	Mechanical Use	State in which the user focuses most effort on the short-term, day-today use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.	Integration (mechanical)	Technology-based tools are mechanically integrated, providing a rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on pre-packaged materials and sequential charts that aid the tacher in the daily operation of the instructional curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme or concept.

CBAM: 4a; LoTi 4b	Routine Use	Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.	Integration (routine)	Teachers can readily create integrated units with little intervention from outside resources. Technology-based tools are easily and routinely integrated, providing a rich context for students' understanding of the pertinent concepts, themes, and processes. Technology (e.g., multimedia, telecommuications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.
CBAM: 4b; LoTi 5	Refinement	State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.	Expansion	Technology is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle through the Internet), research institutions, and universities to expand student experiences directed at problem solving, issues resolution, and student activism surrounding a major theme or concept.
CBAM: 5; LoTi 6	Integration	State in which the user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within their common sphere of influence.	Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool for students to use in solving authentic problems related to an identified real-world problem or issue. In this context, technology provides a seamless medium for information queries, problem solving, and product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task.
CBAM: 6; LoTi: no equivalent	Renewal	State in which the user re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.	.	.

Levels of Use of Technology
Updated August 25, 2005
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Note. From *Levels of Use of Technology,* [Adapted from C. Moertsch (1998), Computer Efficiency, *Learning and Leading with Technology*, p. 53; and G.E. Hall & S.M. Hord (1987), *Change in Schools*, p. 84.] Copyright 2000 by RMC Research Corporation. Reprinted with permission.

APPENDIX H

FACULTY INTERVIEW QUESTIONS

Interview Questions for Education Faculty Members

Standard I. Technology Operations and Concepts

1. What do you do to demonstrate your understanding of technology concepts?

2. How do you stay current with technology integrated into your curriculum area?

Standard II. Planning and Designing Learning Environments and Experiences

3. What type of technology training have you received?

4. What technology-enhanced instructional strategies do you demonstrate in your classroom?

5. How do you locate technology resources relevant to your curriculum area and evaluate them for accuracy and suitability?

6. Has this technology-enhanced environment changed the way you manage student learning? If so, how?

7. Do you feel your syllabi accurately reflect how you use technology?

Standard III. Teaching, Learning and the Curriculum

8. Do you use technology to manage student learning? (ie grades) If so, which program?

9. What content standards are integrated into your technology enhanced instruction?

10. How does technology assist with higher order skills and creativity?

Standard IV. Assessment and Evaluation

11. How do you use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice?

Standard V. Productivity and Professional Practice

12. How do you use technology to communicate with your peers or students?

13. How do you use technology for professional development?

Standard VI. Social, Ethical, Legal, and Human Issues

14. How do you model and teach legal and ethical practice related to technology use?

15. Is there anything I haven't asked about technology that you would like to share with me?

APPENDIX I

PRESERVICE EDUCATOR INTERVIEW QUESTIONS

Interview Questions for Preservice Educators

1. How did each of these professors use technology in the former building?

2. How did each of these professors use technology in the new building?

3. How was technology integrated into the professional core to teach each of the content areas—math, reading, science, social studies, P.E., music, art?

4. Are some of the professors more current than others in technology integration in their content areas? If so, which ones and how do you know that?

5. What did your professors do in the former building to manage student learning using technology? In the new building?

6. How was technology used for assessment and evaluation in the former building? In the new building?

7. Was technology used to communicate between students and professors in the former building? In the new building? How was it the same or different?

8. What ethical responsibilities did your professors emphasize or demonstrate during instruction in the former building? The new building?

9. How did the increase in the level of technology influence you while student teaching?

10. Is there anything I haven't asked about technology that you would like to share with me?

APPENDIX J

HUMAN SUBJECTS FORM

UNIVERSITY OF NORTHERN IOWA
HUMAN PARTICIPANTS REVIEW
INFORMED CONSENT FOR EDUCATION FACULTY MEMBERS

Project Title: Technology Integration: A Study on the Impact of Increased Technology Access

Name of Investigator: Gina Kuker, Assistant Professor of Education
PO Box 1857, Fayette, IA 52142 (563) 425-5240
kukerg@uiu.edu

You are invited to participate in a research project conducted through the University of Northern Iowa. The University requires that you give your signed agreement to participate in this project. The following information is provided to help you made an informed decision about whether or not to participate.

The purpose of this study is to learn more about how increased access to technology has impacted how education faculty members have integrated technology. If you decide to participate, you will be asked to complete an interview about how you, as an education faculty member, integrate technology into your classrooms. The interviews will be audio taped.

Your participation in this study is completely voluntary and you are free to withdraw from the study at any time for any reason without penalty or prejudice from the researcher. Your name will not be used in the presentation of the results of this study.

There are no foreseeable risks to participation. Please feel free to ask any questions of the researcher or the Director of Teacher Education before signing the Informed Consent form and beginning the study, and at any time during the study.

One possible benefit from participating in this study is you may gain insights as to how you could incorporate technology into the classroom.

Information obtained during this study which could identify you will be kept strictly confidential. The audio tapes will be destroyed after the dissertation defense. The information may be published in an academic journal or presented at a scholarly conference.

Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all, and by doing so, you will not be penalized or lose benefits to which you are otherwise entitled.

If you have questions about the study you may contact or desire information in the future regarding your participation or the study generally, you can contact Gina Kuker at 563-425-5240 or (if appropriate) the project investigator's faculty advisor Dr. Victoria Robinson at the Department of Education Leadership, Counseling, and Postsecondary Education, University of Northern Iowa 319-273-3070. You can also contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148, for answers to questions about rights of research participants and the participant review process."

Agreement:

I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older.

(Signature of participant)	***(Date)***
(Printed name of participant)	
(Signature of investigator)	***(Date)***
(Signature of instructor/advisor)	***(Date)***

UNIVERSITY OF NORTHERN IOWA
HUMAN PARTICIPANTS REVIEW
INFORMED CONSENT FOR PRESERVICE EDUCATORS

Project Title: Technology Integration: A Study on the Impact of Increased Technology Access

Name of Investigator: Gina Kuker, Assistant Professor of Education
PO Box 1857, Fayette, IA 52142 (563) 425-5240
kukerg@uiu.edu

You are invited to participate in a research project conducted through the University of Northern Iowa. The University requires that you give your signed agreement to participate in this project. The following information is provided to help you made an informed decision about whether or not to participate.

The purpose of this study is to learn more about how increased access to technology has impacted how education faculty members have integrated technology. If you decide to participate, you will be asked to complete an interview about how education faculty members integrate technology into their classrooms. The interviews will be audio taped.

Your participation in this study is completely voluntary and you are free to withdraw from the study at any time for any reason without penalty or prejudice from the researcher. Your academic records will be reviewed to limit participation to those who entered before fall, 2004 and student taught in Iowa during the 2006-2007 school year. Your name will not be used in the presentation of the results of this study. Your decision to participate or not participate in this study will in no way affect your evaluation of your student teaching experience.

There are no foreseeable risks to participation. Please feel free to ask any questions of the researcher or the Director of Teacher Education before signing the Informed Consent form and beginning the study, and at any time during the study.

Individual participants will receive no direct benefits. Insight gained from their participation could help future students.

Information obtained during this study which could identify you will be kept strictly confidential. The audio tapes will be destroyed after the dissertation defense. The information may be published in an academic journal or presented at a scholarly conference.

Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all, and by doing so, you will not be penalized or lose benefits to which you are otherwise entitled.

If you have questions about the study you may contact or desire information in the future regarding your participation or the study generally, you can contact Gina Kuker at 563-425-5240 or (if appropriate) the project investigator's faculty advisor Dr. Victoria Robinson at the Department of Education Leadership, Counseling, and Postsecondary Education, University of Northern Iowa 319-273-3070. You can also contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148, for answers to questions about rights of research participants and the participant review process.

Agreement:

> *I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 18 years of age or older.*

_____ _____

(Signature of participant) ***(Date)***

_____

(Printed name of participant)

_____ _____

(Signature of investigator) ***(Date)***

_____ _____

(Signature of instructor/advisor) ***(Date)***

APPENDIX K

FIELD NOTES FROM CLASSROOM OBSERVATION

Field Notes from Classroom Observation

The observation field notes support the information acquired through the Pre-Classroom Observation Interviews and the Technology Use Lesson: Observation Tool. The following field notes highlight the daily observations. In addition, notes from each day of class were audiotaped, transcribed, and included the information learned about educational technology and content area literacy.

Day One

The first day of class began with the students giving introductions and the professor reviewing the syllabus. Then the professor asked "What is literacy?" Students read the definition out of the book. This led into a discussion about No Child Left Behind. Then the professor asked "How do you find free and reduced lunches?" The answer was to look it up on the computer where the Iowa Department of Education website lists schools that qualify for free and reduced lunches. The professor stressed how it was important to know this information could be found on the websites that are "out there." She modeled the process, showing several examples of area school districts under School Profiles. She compared five different school districts because there is a correlation between free and reduced lunches and school achievement. A class discussion followed about how important it is to teach children in the classroom to verify what the site is and if the information can be found.

The education professor mentioned the term critical literacy. She emphasized that educators need to teach students critical literacy. After students finished reading a textbook chapter on technology, they were to read an article about WebQuests. Next the

students were asked to find WebQuests that they could use in their own classroom. The education professor gave the website of San Diego State University at www.sdsu.edu to help students locate WebQuests. She encouraged students to be prepared to tell the class why the WebQuests could be used in their classrooms.

The education professor transitioned into the readability of text and then how computers can help with this skill. The education professor went to the computer and started the Internet. A student showed an example of an Apple/Season WebQuest. The students could create a book during this WebQuest. The professor stated that technology is used for three different reasons: resources, communication (email and/or grades), and learning tools. Four additional students presented their WebQuests. The professor asked that all students turn in their copy of their WebQuest for evaluation.

The education professor said that she wanted to discuss assignments the rest of the day. She began by questioning the students about what they had learned this afternoon. One student stated that she had looked at WebQuests in another course, but this time she actually understood how to use them. Another student added how the readability level on the computer could help plan instruction. A different student mentioned how the WebQuest could help teachers find something their students were interested in and gave an example of typing mystery as a search term because many of her students were interested in CSI. She had found individual and partner WebQuests using a mystery format, and used them for writing activities.

The professor ended class for the day making two points. One, technology is a communication tool. It is easy to send emails, post grades, and send home newsletters, for

example. These all help communication with parents. Second, websites are research tools. She gave several websites for the students to visit, such as National Council of Teachers of Mathematics (NCTM) and Read, Write, Think. After class, students completed their readability formulas.

Day Two

The education professor began by summarizing what the class had done the previous day. They had examined school profiles on various websites. In several schools, they found a correlation between free and reduced lunch and school achievement. Then the class talked about how to build background knowledge. This included making "experiences" through such things as videos, guest speakers, simulations, field trips, pictures and more words.

Then the education faculty member modeled a Direct Instruction lesson. On the dry erase board, she wrote; Direct Instruction: Models, Guided Practice, Individual Practice, and Application. She showed an example of Direct Instruction through the DLP projector. She used the Elmo to project the graphic organizer about Natural Resources. Next she rewound a video and played the video from the five-piece set *Reading and Writing in the Content Areas*, which correlated with the textbook. One key point in the video was that all teachers are teachers of reading. After the video, the education professor asked class members how many of them did written anticipation guides or participation guides. A class discussion continued about how this all takes time.

After a short break, the education professor re-taught the previous lesson using her teaching method, which included incorporating visual, auditory, and kinesthetic

methods. She transitioned into what her students had developed for pre-reading activities. The Elmo was used with the DLP projector to show the pre-reading activities to other students in 6 of the 7 groups, even though it was not required.

The education professor lectured and facilitated class discussion. The next video clip about active comprehension was shown. Then the professor had the students read page 192 in the textbook. They discussed how to write questions at all levels of Bloom's taxonomy. They continued by examining option guides. One student commented that she liked the real people in the video "showing" how to do it. The professor added that real people, real teachers, and real classrooms make it a good video to show.

The faculty member played the next section of the video about Question-Answer Reponses (QAR). The QAR training was based upon research and questioning strategies. The class discussed two strategies for during reading- reading logs and response journals. Next the professor reviewed the two frameworks with preview, predict and question, and summarize. She asked students to respond with their views of how much the teacher was doing in the video example and how much the student was doing. The professor handed out a journal article. She led a class discussion about the article, video and student experiences. At one point, she noted one example was the double entry journals. She demonstrated on the Elmo. The professor stressed that you only do one of the strategies a day. The professor turned off the Elmo and the DLP projector. The class ended on day two talking about who was ready to present the next day.

Day Three

The class began with a quick refresher. They discussed the four pre-reading guides. They also spent some time talking about great instructional strategies and spending more time on pre-reading. Then the class started presentations on how they had integrated before, during, and after reading strategies in their content areas in their own classrooms.

The first student presentation was held in the education computer lab down the hallway. The student based her presentation on a website that she used frequently in her classroom. It was Mrs. Newingham's Rockin' 3rd Grade available at http://hill.troy.k12.mi.us/staff/bnewingham/myweb3/. The student presenter described the methods she used to teach math concept of angles. The student presenter said she had her students make angles on the dry erase board. Then she had them write down the angles on a piece of paper. Next she had them make the angle with their arms. The she brought up google on the SMARTBoard. The website was a virtual geoboard available at http://nlvm.usu.edu/en/nav/frames_asid_172_g_2_t_3.html?open=activities. Next she had students create a right angle. After that, she had them make an acute angle.

The student presenter said that the day before she had looked up examples of math vocabulary on the Internet. She selected math vocabulary cards. In her classroom, students have added terms to the Math Word Walls. The presenter stated that because there are so many math terms, teachers can be selective. Math vocabulary cards can be used when students are struggling to understand the terms. Then she described how she assessed the lesson by having students label the three types of angles. She also had them go around the classroom and find angles. The students took digital pictures of the angles,

labeled them, and made a bulletin board. They also worked on the math journals if they got the quizzes done in time.

After the student presentation, the professor stressed how teachers can use educational technology as a resource. She asked the class to visit the National Council of Teachers of Mathematics website available at http://www.nctm.org/. She advised them of another website that tied in well to the class activities was the Read, Write, Think website available at http://www.readwritethink.org/. This site has lessons, standards, web resources, and student materials. With the use of technology, teachers can make reading classes more interesting and entice students to read.

The second student presentation was a vocabulary lesson based on Second Chance Reading. After the student used some direct instruction, another student asked if he had a sample. The student placed a sample information sheet on the Elmo with the DLP projector about how much time was allotted for reading each day of the week. "Tele" was used to zoom in so the information could be read.

The next student presentation was a lesson about 2-D and 3-D shapes, which would be a subsequent math lesson after angles and line segments. The student used a prediction guide and also discussed vocabulary terms. In her class she said she would then ask her students to create polygoms based on riddles. She placed the information for a 2-D shape on the Elmo with the DLP projector. She pressed "Tele" to zoom in on it so it could be read. After the students labeled or drew the picture, she told them that they could go back to the prediction guide and change any of the answers if they would like. She used the changes students made as the final assessment for the lesson.

During lunch on Day Three, the students had an assignment to read. The education professor stated that she would take the CORI and use technology and apply it. She wanted to simplify it so the class could see the procedures to adapt it to every age level to see the content.

After lunch, the professor conducted a Read Aloud and explained how the Read Aloud met the needs of the students. She emphasized how important a summary statement was. She also said that some of the strategies she was teaching are good, even though they are not in the textbook or video.

The fourth student presentation was about different types of business writing, such as job applications, cover letters, requests for items, or complaint letters. The student presenter did NOT enlarge the small font size when she placed a typed sample on the Elmo, and it was therefore difficult to read. Another class member asked her to zoom in on the sample material. The presenter enlarged the text slightly, but it still could not be read. The student stated "I am not technology advanced." The font size was small on the first three examples. The fourth example was in a larger size font and could be read. Yet, the student presenter had reduced the font size.

The fifth student presented a lesson about figurative language, in particular similes. She gave direct instruction for the first part of her presentation. Then she had a worksheet about similes and asked students to work in groups to write a simile. She placed the worksheet on the Elmo. The size font was small and the student presenter did not enlarge it. The professor told the student whatever is shown has to be visible for all sections of the classroom. The instructor told her to adjust the font size using the zoom

tele and then zoom wide operations on the Elmo. After the class filled out the worksheet, the student went to turn off the DLP project, but did not click it twice so it remained on.

The sixth lesson was a creative idea called "Bigger Bottom Borrow." Technology was not used. The student presenter wrote on the dry erase board and covered information on a worksheet.

The seventh lesson was a science lesson about matter. The presenting student used a prediction guide. In a real classroom setting, she would place it on the Elmo and read through it because it included some words the students might not know. She told the class they would be doing a Question/Answer Relationship (QAR). She pressed "Tele" to zoom in on the material. Then she placed the demonstration handout on the Elmo. The student and her "assistant" created an experiment to explain matter using a liter container, baking soda, and vinegar. She utilized lots of instructional strategies.

The final student presentation for the day used the QAR strategy and story problem organizer. This student presenter placed the worksheets on the Elmo. They were enlarged so that they could be read. She said "I pressed three buttons before I got it right!"

The professor concluded class the third day by having the students comment on what they had learned that day. After several students responded, she gave the class their agenda for the following day and answered questions.

Day Four

The education professor began class with direct instruction about word walls, reading logs, and spiraling curriculum. She brought in various items to show the different

instructional methods. She emphasized encompassing different learning styles. She explained how it was important to "apply" what has been learned. She shared websites, which was almost like making a hotlist. This took time, but it could have been overwhelming for students to find all of these resources on their own. Students discussed the benefits of what they learned in the class so far. They knew more about the expectations for pre-reading, during reading, and after reading. Another student said she appreciated the websites and all the instructional strategies that encouraged the students in a classroom to carry the load. The education professor stated that if she expected her students to use the educational technology, then she modeled it. If she expected them to use websites, then she would first visit these websites in the classroom.

The first student presentation for the day was based on a short reading from the book *Attack on Pearl Harbor.* On the Elmo, the presenter placed a worksheet that she used as a resource for the lesson idea. To adapt the lesson, she placed notecards on the Elmo. A vocabulary word was written on one side of the notecard and the definition on the other side. Next, the presenter had her students add either "their" definition or a picture to the card. Underneath those, she had the students write a sentence that included the vocabulary word and underline the vocabulary word. She showed the website Merriam Webster Dictionary available at Merriamwebsterdictionary.com and demonstrated where to click. Coxan spelled coxswain. This demonstrated a type of assistive technology piece. It was an educational technology adaptation.

The next student explained the methods she used to teach 4th grade trade books. She began with an anticipatory guide and then went over the QAR posters. The student

presenter placed a piece of paper on the dry erase board and read it. Four "students" went through the process of the QAR. The "students" read the page and placed it on the dry erase board. Then the student presenter handed out the QAR questions for the book *A Picture Book about Sacagawea*. She led the "students" through a book walk. (Why did she not use the Elmo so everyone could see?) She never used technology in her lesson.

The third student lesson was about symmetry using butterflies. On the dry erase board, the student presenter created a "poster." The words were enlarged through a word processor. The "students" placed computer-generated pictures on the "bulletin board" titled Math Ideas. The "students" made a 4-page math book about symmetrical and non-symmetrical shapes. Then they filled out a computer-generated Addition Graphic Organizer and completed an assessment. Wanting to add some reading into the lesson, the presenter showed a website containing Line Symmetry available at www.linkslearning.org/Kids/.

After lunch, the education professor showed an example of a teacher's reflection on her lesson. First, she read an example and then showed two graphs on the Elmo- Quiz Results and Item Analysis. She read the story *Annabel Lee* by Edgar Allen Poe. Again, she showed the Quiz Results and Item Analysis on the Elmo and then explained how to create a graph using the Excel program.

The fourth student lesson was about Monarch butterflies. The students created flip books showing the life cycle of the Monarch. Then the student presenter showed an Internet WebQuest titled *The Monarch Butterfly Journey North* available at http://www.learner.org/jnorth/monarch/. After showing the different stages of the

monarch's life cycle, the presenter showed a short online video about the Monarch butterfly as it leaves the chrysalis (http://www.monarchwatch.com/.) She asked "Can you see it okay, or is it too small?" After this activity, they completed an assessment. The student presenter mentioned that a slide show about the life cycle of the Monarch butterfly was also available on the website used earlier.

The fifth student lesson topic featured shapes. The class made predictions as they looked at the book and went on a picture walk. They read the book *Shapes* by Tana Hovden. The student presenter had the class take a walk, identify various shapes in the building, and take digital pictures of the shapes. The student presenter stated that when she taught this topic, she took digital pictures of the shapes the class saw and placed those pictures on the television. "So that's a technology thing I am going to do with this lesson" She explained. The student presenter only needed to hook the television up in iPhoto with the Macs. The class then created a Venn diagram about shapes on the dry erase board. To assess students' understanding, the presenter used a computer-generated sheet asking questions about shapes.

Money was the topic for the sixth lesson. The student presenter started out talking about quarters. "I was going to put it up there, but…" she said, referring to placing the handout on the Elmo, but she did not place the handout on the Elmo. The class could not see the handout as a visual; they just heard what the presenter said about it. After reading the handout to the class, she said "Okay, now I need this" Indicating she needed some help with the Elmo. She asked the professor to show her how to use it. She (the student)

turned on the Elmo and placed the poem *Smart* by Shel Silverstein on it. Then the class did an activity as part of the assessment.

The final student lesson for the day focused on measurement. The student presenter read the book *How Big Is a Foot?* by Rolf Myller. She placed the book on the Elmo and read it. The Elmo projector light was not on, so the student needed to be told how to turn it on. The student asked how to measure a king's foot. Then she placed a ruler on the Elmo. The male student in the class came up to the Elmo and pointed to one inch. The class also measured a stick of gum with the ruler and other items. On the dry erase board, the student presented showed how to solve problems using different measurements.

The final class topic of the day was on post-reading strategies. The education professor led a short lecture and showed a video segment. She stayed in the room during the video as usual. The professor added comments such as "Six is the max for science experiments. Five is better, four is better yet." After the video, the professor reviewed the key points. She noted how important it was for teachers to have a stage presence and be able to communicate. The post-reading information is already there in the textbook and video. She stated that teachers (students in this class) should go above and beyond the standard post-reading practices. They could find resources on the Internet for their classrooms. For example, she suggested using the flip book seen in the video used earlier in the session. At the end, the professor discussed graphing the results of their assessments.

Day Five

The education professor began class the fifth day with content areas and types of learners chart using the dry erase board. Then the class moved into three student presentations. The first student asked, "Can I turn the Elmo on?" The student turned on the DLP projector. The professor walked over and asked the student if the red "power" indicator light was on. Next, the student turned on the computer and the Elmo. The student presenter first showed the QAR. Later in her lesson, she placed the handout that she typed up on the Elmo so it could be projected. Later in the lesson, she placed the book *Al Capone Does My Shirts* by Gennifer Choldenko on the Elmo. She also used a map of Alcatraz. She explained the location of various places on Alcatraz.

During the second lesson, the student placed the vocabulary words on the Elmo. She read a book to the class about beetles and ladybugs called *Ladybugs: Red, Fiery and Bright* by Mia Posada, but she did not place the book on the Elmo so the students could see it. She placed a sample of the lifecycle of a ladybug on the Elmo. "How do I zoom? Oh, I see it-- tele" she said. She explained the lifecycle drawing and said "Now place your finger on the correct stage." She moved the screen so that the students could draw on the dry erase board. Another student asked about the graphic organizer used. The presenter replied that she had found it online in a pdf format. She copied and pasted it into a Word document for the quiz and used whiteout to cover the answers.

The third lesson for the day involved students in playing charades. They had words for the obstacle course. The student presentation did not use technology.

After student presentation, the professor pulled down the screen. She turned on the DLP projector and Elmo. To teach students to construct conceptual knowledge, she

suggested looking up websites or having students take virtual tours. The professor next discussed assessments which will guide instruction. The students were required to have two pages of graphs as part of their assessment material.

After lunch, the students focused on writing. They discussed the type of learner they were and the type of teaching style they used. The professor asked who was the author of the Alcatraz book? Then she asked who wrote the ladybug book. One student presenter used the Elmo as she read her book, and the other did not. Therefore, the class had more difficulty remembering the author's name of the book that was not shown. The professor stressed the need to constantly be doing things in different modalities to meet the various students' needs. The professor lectured about guided reading. Then she discussed the 6+1 traits of writing. She told the students to go to the Internet and type in google, and then the "6+1 traits of writing." The website was meant to be a great resource. One student commented that websites called The Reading Lady and Rubistar could be used as great resources.