

University of New Orleans

ScholarWorks@UNO

University of New Orleans Theses and
Dissertations

Dissertations and Theses

5-17-2002

Investigating How Participation In a Techonology-Based Project Has Influenced Education Faculty Members' Beliefs and Practices with Technology Integration: Factors That Influence Faculty Technology Integration and Implications for Faculty's Integration of Technology

Li Wang

University of New Orleans

Follow this and additional works at: <https://scholarworks.uno.edu/td>

Recommended Citation

Wang, Li, "Investigating How Participation In a Techonology-Based Project Has Influenced Education Faculty Members' Beliefs and Practices with Technology Integration: Factors That Influence Faculty Technology Integration and Implications for Faculty's Integration of Technology" (2002). *University of New Orleans Theses and Dissertations*. 5.

<https://scholarworks.uno.edu/td/5>

This Dissertation is protected by copyright and/or related rights. It has been brought to you by ScholarWorks@UNO with permission from the rights-holder(s). You are free to use this Dissertation in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/or on the work itself.

This Dissertation has been accepted for inclusion in University of New Orleans Theses and Dissertations by an authorized administrator of ScholarWorks@UNO. For more information, please contact scholarworks@uno.edu.

INVESTIGATING HOW PARTICIPATION IN A TECHNOLOGY-BASED PROJECT
HAS INFLUENCED EDUCATION FACULTY MEMBER'S BELIEFS AND
PRACTICES WITH TECHNOLOGY INTEGRATION: FACTORS THAT
INFLUENCE FACULTY TECHNOLOGY INTEGRATION AND IMPLICATIONS
FOR FACULTY'S INTEGRATION OF TECHNOLOGY

A Dissertation

Submitted to the Graduate Faculty of the
University of New Orleans
in partial fulfillment of the
requirement for the degree of

Doctor of Philosophy
in
The Department of Curriculum and Instruction

by

Li Wang
B.A., Hunan Normal University, P. R. China, 1999
M.Ed., University of New Orleans, 2000

May 2002

Acknowledgement

My success to this stage is reached under the support of people who love me. I am grateful that my five research participants have been so supportive to my dissertation project. Without their sincere help and cooperation, I would not have been able to accomplish my dissertation so smoothly and quickly. I am indebted to Dr. Richard Speaker, my major professor, for completing my dissertation research project. Had it not been his support and idea, I would not have been able to develop my research idea in such a short time. In the process of completing my dissertation project, Dr. Richard Speaker has been patient and supportive with my research ideas. He has provided financial, intellectual and spiritual support all the way along. I feel very fortunate to have chosen Dr. April Whatley as my methodologist. She has been very supportive as Dr. Speaker did. She has been supporting my research ideas and been encouraging me to let my VOICE out. I must thank Dr. Charles Gifford, Dr. Cory Buxton and Dr. Teresa Christensen. All of them have been very patient with me and supportive as my major professor, Dr. Richard Speaker and my methodologist, Dr. April Whatley. They have many other doctoral students. But this does not reduce any attention that they have paid to me. They have sincerely commented on my research project and have been assisting me with perfecting the final product. Besides my committee, I have to thank George North, who has always been there for me. Whenever I had trouble, he has always been there for me to provide his suggestion and help. I must express my gratitude toward Dr. Renee Casbergue and Dr. John Barnitz for the Chancellor's scholar assistantship. It was their high recommendation that helped me win the competitive and prestigious award.

I want to thank my husband, Xuehe Li, a doctoral student in the department of Chemistry in the University of New Orleans for his support. He has taken care of me with his heart and soul. His support is one of the most significant reasons that have accelerated my doctoral research studies. I must mention my mother here, Jianhui Li. She has been inspiring through all these years. She has been encouraging me to be independent and strive for my personal dreams.

Lily Bruess and Joseph Ayers are the two friends I must say thanks. I have not known them long, but their precious friendship with me makes my doctoral experiences in UNO even more memorable.

There are many more people I should thank. I have been very fortunate that I was in Jeff Prentice's computer graphics class and Dr. Adlei DePano's computer science class. They have been very patient with me, who is an "outsider", by which I mean a student not from their area.

I feel fortunate I have been studying in the department of Curriculum and Instruction in the University of New Orleans. Every professor I have taken classes with is caring and supportive. Finally I have to say thanks to everyone who has contributed to my dissertation and supported me sincerely for years.

Table of Contents

I. Chapter 1(INTRRODUCTION)

Introduction2

Purpose of This Study4

Background of the Project.....6

Research Questions7

Methods of Investigation.....8

Need for the Study and its Significance.....9

Definitions of the Terms 11

Limitations 13

Summary 14

II. Chapter 2 (LITERATURE REVIEW)

Introduction 16

Educational Technology..... 17

Learning and Teaching.....20

Students and Technology 31

Technology Standards..... 35

Teachers and Technology.....36

Past Research and Studies on Teachers and Technology48

Implications of Previous Research Studies 56

Summary 57

III Chapter 3 (METHODOLOGY)

Introduction..... 60

	Pilot Study	60
	Research Stance	81
	Research Context	82
	Sampling Method and Informants	84
	Research Questions	85
	Procedures for Conducting the Study	86
	Log of Planned Activities.....	92
	Technology Used.....	93
	Triangulations.....	93
	Trustworthiness	94
	Threats.....	96
	Summary	97
IV.	Chapter 4 (FINDINGS)	
	Introduction	99
	Description of Informants	100
	Descriptions of Findings	105
	Emerging Themes.....	129
	Summary	137
V.	Chapter 5 (SUMMARY)	
	Introduction	140
	Findings of the Research.....	140
	Implications for Future Research	153
	Limitation.....	155

	Conclusion.....	157
VI	References	160
VIII	Appendices.....	173
	A. ISTE Recommended Foundations in Technology for All Teachers..	173
	B. ISTE National Educational Technology Standards (NETS)	177
	C. Consent Form	180
	D. Demographics Information Form	182
	E. Interview Questions (Pilot Study).....	183
	F. Interview Questions (Dissertation Study).....	184
	G. Observation Guidelines and Artifacts Analysis Guidelines.....	186
	H. Mapping List for Organization.....	187
	I. Code List.....	188
IX	Vita.....	189

Abstract

This qualitative research study investigated the experiences of five education faculty members about their experiences with technology. These faculty members come from different areas of education. They participated in a technology-based project, the purpose of which was to help faculty members integrate technology into their classrooms and implement technology in their instructions. Before the project, all of the faculty members had experiences with technology, such as emails, Internet searches and PowerPoint applications. During the project, most of them learned web page design and more technology integration into their curriculum and instruction.

The purpose of this study is to respond to the need to identify, study and disseminate examples of technology using teachers and portray a group of education faculty members after they experienced a federally funded technology-based project. Their practices, beliefs, and factors that influence their beliefs and practices with technology integration are the focus of this study.

Based on the literature and the research studies, the following questions were formulated in the following:

1. How has participation in the technology-based project influenced faculty members' beliefs and practices with technology integration?
2. What are the factors that influence faculty members' practices regarding technology?

The findings are the following.

All participants have always believed that technology is an important tool and should be integrated into the teaching and learning. However they believe that technology

is not the only tool that can be used to enhance teaching and learning. Their experienced in the grant project have increased their confidence and comfort in using technology by being exposed to presentations and having real hands-on activities within a certain time period that did not conflict their academic calendars.

Factors that influence their beliefs and practices are: experiences in the project, access to technology and technical problems, Administrative support (from the department and project directors) and technical support: from the students, from faculty, from technician, technological leadership, communication within the community and outside, time, and subject Issues. Internal factors identified include personal belief, personal feelings with technology use, demand of time to learn, learning style, and classroom teaching.

CHAPTER 1

INTRODCUTION

I am looking specifically for math because I don't see as many ways to integrate in my content area as I have hoped and even the people who do impact and tell us that there is a weakness from those areas.

Isabel Cherlin

The practices without mentorship are often very difficult. Finding a colleague or a student who also shares an interest made all the difference to me. When they were not interested in people whom they work with, I can still persevere. But my practices would be very difficult.

Corrine Miller

I think the project has helped me immensely, because had I not gone I would not really have made the effort to overcome the barriers. I would just allow someday else to do the work and not even bother. I feel I am comfortable...I think I am at least doing minimum stuff as other people have helped me as I go along. I know it's going to take me longer and I have to do it over and over. It's just time and availability.

Candice Schindler

My belief is still that technology should be integrated. My idea of integration has broadened. So it's not just the integration of technology. It's not just creating good lessons and teaching these concepts, and have the kids go to the Internet and use it to create lessons. It's not only that but it is to use the technology though the form of communication. It is using the form of communication as a form of sharing and delivering information.

Donna Sawhill

I think the biggest barrier I overcome is my own fear, my fear of my own inadequacy. ...Well I am just glad that I have conquered my fear and I am willing to appear foolish not as confident as I used to be, because that's the only way to learn.

Patricia Murray

Introduction

Since the day technology emerged in business and then permeated other fields, computers have evolved and advanced to more complex levels. As old technologies failed to bring revolution to education, people began to question the potential impact of technology. This study investigates the experiences of five education faculty members about their experiences with technology. These faculty members come from different areas of education. They participated in a technology-based project, the purpose of which was to help faculty members integrate technology into their classrooms and implement technology in their instructions. Before the project, all of the faculty members had experiences with technology, such as emails, Internet searches and PowerPoint applications. Some of them had more experiences with technology, such as web page design, and software applications within their areas. During the project, most of them learned web page design and more technology integration into their curriculum and instruction. They have started to adopt new types of technology and convert their syllabi into technology incorporating ones as they engage their students more in technological activities. All the participants enjoyed their participation in the project. After the project, they have been engaging themselves in constant learning with the resources available, and they are seeking ways of integrating technology into their content areas.

Technology has a significant impact on both teachers and students. Peck and Dorricott (1994) believe that technology can foster constructivist practices for teachers, promote students' learning interest, and enhance their learning outcomes. Peck and Dorricott state that it can help both teachers and students reconceptualize their ways of working and thinking and strengthen the relations with a rapidly changing world. Today

teachers and students encounter challenges for future application. Teachers, who are challenged to make effective use of technology and integrate technology into their classroom, are expected to carry the indispensable responsibilities of helping students meet the challenges.

The literature confirms that technologies exert great impact not only on students' learning, but also on teachers' teaching. Technologies help faculty improve their practices (Chickering & Ehrmann, 1996). According to Chickering and Ehrmann, technology increases contact between faculty and students, encourages interactions between faculty and students and among students, promotes cooperative and active learning among students, enables faculty to give prompt feedback, emphasizes time on task, communicates high expectations and enables faculty to show more respect to students with diverse talents and ways of learning.

Facing the increasing need for integrating technology into education, educators and organizations have been responsive to the increasing challenge. Standards and guidelines, intended to guide university faculty to integrate technology into their teaching and scholarship, have been developed that describe the essential skills required by all teachers in order to make effective use and integration of technology. Various organizations and associations have created committees to assist teacher educators' organizations to make better use of technology (Cooper & Bull, 1997). Cooper and Bull say that journals devoted specially to identifying methods for educators to integrate technology have been published; some accreditation organizations, such as the National Council for Accreditation of Teacher Education (NCATE) have launched action by incorporating technology standards into the accreditation process.

However, past studies show that teachers' professional development has not "kept pace with the rapid changes in the quality and quantity of information technology" (ISTE, 1999, p. 1). Factors that impede effective use and integration of technology have been identified as both external and internal factors. According to Ertmer (1999), external factors include access to technology, funding, and administrative and technical support, while internal factors are those factors that might be difficult to identify and intrinsic to teachers, which are usually more difficult to deal with, such as personal fear of technology, traditional teaching style, and reluctance to adapt.

Purpose of This Study

The first educational technology plan was released in 1996, and since then education systems have developed an increasing interest in making effective use of technology and integrating technology into instruction nationwide (Department of Education, 2000). The department of Education says, "This interest has been spurred by the widespread recognition of the transformation technology is having on the American economy, as well as by the potential for technology to transform the teaching and learning experience" (p. 2).

According to the study that was commissioned by the Milken Exchange and conducted by the International Society for Technology in Education (ISTE), and the Department of Education, it is important to identify, study and disseminate models that are making effective use and integration of technology in both teacher education and K-12 schools on an ongoing basis.

The macro purpose of this study is to respond to the need to identify, study and disseminate examples of technology using teachers and portray a group of education

faculty members after they experienced a federally funded technology-based project. Their practices, beliefs, and factors that influence their beliefs and practices with technology integration are the focus of this study. The findings will serve the following three micro purposes.

First, as technology demonstrates its potential to shake the foundation of education and becomes part of our daily life, the demand for teachers to make effective uses of technology in their classroom is increasing (Zhao, et al, 2001). However, Gilbert (1996) identified that over 75 percent of higher education faculty members are not integrating technology into their classroom while only 15 percent are using technology in their instructional programs. The Office of Technology Assessment (OTA) (1995) reported that technology has become part of the preservice teacher program but is not made part of the core of the preservice teacher education programs in most colleges of education (Gilbert, 1996; OTA, 1995; Thomas & Cooper, 2000). Based on this research, I believe that it is necessary and important to examine the attitudes, approaches and practices of technology using teachers, and I also believe it can “help policy makers, administrators, and teacher educators assess professional development needs” (Zhao et al, 2001, p. 25).

Second, as the demand for technology integration increases, many teacher organizations have developed standards and incorporated standards into the accreditation process (Handler & Strudler, 1997; National Council for Accreditation of Teacher education [NCATE], 1997; U.S. Congress, Office of Technology Assessment [OTA], 1995; Zhao, et al, 2001). Therefore before teachers make effective use of technology in their classrooms, they should know how to use technology for various purposes.

Third, researchers have been interested in identifying factors that influence teachers' use of technology in their instructional settings (Anderson & Harris, 1997; Ayersman & Reed, 1996; Birch, 1995; Dawson, 1998; Zhao, 1998; Zhao et al, 2001). So this study is to delineate a comprehensive picture of a group of education faculties who have experienced a technology-based grant project, their beliefs in using technology and how their practices change after this experience. This knowledge can help teachers develop the vision of designing professional development opportunities, because it can provide information of technology using teachers' beliefs, practices and related issues in technology using and integration, so that other teachers can follow the effective models and emulate to shape their own concept of technology infusion (Zhao, et al, 2001). This knowledge can also help teachers identify the possible problems and some possible solutions to help teachers build their confidence in using technology and increase their comfortableness with technology.

The group of education faculty members, the target participants in this study, experienced a federally funded project, which is technology based. How this experience influences their beliefs, attitudes, and practices in the classroom is the core interest of this study.

Background of the Project

This project, according to Speaker and Dermody (Speaker, et al, 2001) is part of a \$1.2 million grant from Preparing Tomorrow's Teachers to Use Technology (PT3), an initiative of the U.S. Department of Education, the goal of which is to make technology ubiquitous in the pre-service teacher preparation. The consortium is comprised of partner

schools that work closely with two universities, one of which is included in this pilot study, strategically implementing technology in the classroom.

The major purpose (Speaker, et al, 2001) of this project is to make modern multimedia computer technology ubiquitous in content and methods courses and field experiences for future teachers. This project consists of two southern universities, and is co-directed by two professors from the two universities. Faculty and students in teams from the two institutions participate in the project and implement instruction using technology in their courses and field experiences with children in partner school. This project (Speaker, et al, 2001) uses the model of teachers teaching teachers (TTT) developed initially in the Bay Area Writing Project to produce Teaching with Technology (TWT). The project will involve 60 university faculty, 150 university students as student technology mentors (STM), more than 3,000 other university students, and approximately 3,500 learners in 50 classrooms in 5 schools in the area, over the three years of the proposed project. The \$1.17 million project is funded through the U.S. Department of Education's initiative "Preparing Tomorrow's Teachers to Use Technology" (PT3). This project focuses on the training of both pre-service and in-service teachers through summer institutes, as well as through numerous mini-sessions of training. These training courses cover a range of topics including web design, Internet in the classroom, presentation software, integrated curriculum, and video on the web (Speaker, et al, 2001).

Research Questions

Along with the rapid developments of emerging technologies, teachers increasingly need to integrate technology into their classroom. However, many teachers still are not making effective use of technology in their classroom to enhance their

teaching and their students' learning. Factors that influence teachers' uses of technology are various. Some factors are external, such as insufficient technological facilities; some are internal, such as personal fear and anxiety (Ertmer, 1999). According to Ertmer, internal factors are intrinsic and more difficult to deal with. So, to overcome personal factors is the crucial point that helps teachers integrate technology into classrooms. According to Walker, Ennis-Cole, and Ennis (2000), workshops and conferences are good resources; teachers' positive experience in workshops and conferences help teachers "establish a healthy attitude toward technology and promote a sense of accomplishment or self-efficacy" (Walker, Ennis-Cole, & Ennis III, 2000, p. 117).

The group of faculty in this study participated in a federally funded technology-based project, the goal of which was to make technology ubiquitous in education and promote learning. They had some experience with technology, especially computers, before they participated this grant project. To investigate their experiences in this project, their beliefs toward technology and practices with technology integration are the core interests of this study. The research questions for this study are:

1. How has participation in the technology-based project influenced faculty members' beliefs and practices with technology integration?
2. What are the factors that influence faculty members' practices regarding technology?

Methods of Investigation

First, I completed a pilot study involving three faculty participants from the first year of the project. I collected demographic information on the participants and course syllabi from the summer when they participated in the summer institute to the semester

when I interviewed them. Based on the information I obtained from the literature reviewed, demographics and the course syllabi, I formulated the interview questions. My research questions intend to investigate the perceptions of faculty members' experience within a technology-based project. Since the research questions were formulated to "investigate topics in all their complexities, in context" (Bogdan & Biklen, p. 2, 1992), qualitative research design best suits this study. The data mainly come from the demographics forms, technology projects, course syllabi, observations and semi-structured interviews.

Second, based on the first year evaluation, the second year project was modified and implemented. The second year of the project recruited more faculty members; I continued my study by investigating both the first-year and the second year participants' perspectives on their experience of this project. Data collection methods include demographics, technology projects, course syllabi, observations and interviews.

Need for the Study and its Significance

Higher education faculty members have encountered the increasing need to make effective use of technology and integrate technology into their classrooms. Barker (2001) reports that much research has been focusing on the how technology has impacted students learning. Much research has been done on K-12 teachers. However little research has been done on higher education faculty use of technology in their instruction, especially in higher education settings that prepare preservice teachers.

This study will focus on two issues: (1) how participation in the technology based project has influenced their beliefs and practices with technology integration; (2) factors that influence the education faculty members' beliefs and practices.

This study will add to the body of research on higher education faculty use of technology, technology integration and implementation. The findings will be important for:

1. Teachers, especially education faculty members who have not started making effective use of technology, because it can provide information of technology using teachers of what they know, do, and believe to use technology, from which other teachers can use to develop their own vision of integrating technology (Zhao, et al, 2001). This information can also expose issues and problems with technology integration and provide some solutions. This is especially important information for technology-phobic teachers to help ease their nervousness and build their confidence.
2. Teachers, especially education faculty members who have already started integrating technology into their teaching and encounter issues and problems with technology, because this study also reveals specific problems and issues along with strategies and solutions to deal with;
3. Administrators and policymakers, because the findings display a systematic synthesis of teachers using technology. What teachers believe and their practices will help administrators and policymakers assess professional development needs, and help teachers design professional development opportunities (Zhao, et al, 2001).

Definitions of the Terms

Learning

Fincher (1978) says learning is:

a process of acquiring and integrating through a systemized process of instruction or organized experience varying from forms of knowledge, skill, and understanding that the learner may use or apply in later situations and under conditions different from those of instruction. (p. 420).

According to Fincher (1996), learning is specified as (1) learning does not necessarily occur in instruction and it can also take place in other forms of organized experience; (2) learning process includes “cognitive, behavioral, and experimental dimensions or components” (p. 58); (3) learning should be related to future application; and (4) learning and teaching are inseparable from each other, and must be treated systematically “if they are to make educational sense” (p. 58).

Educational technology

The definition of educational technology has evolved in the past years from “teaching programming, to utilizing drill and practice programs, to building computer literacy, to participating in electronic communities” (Ertmer, 1999, p. 49; OTA, 1995). Educational technology should not only include hardware and software, networks that tie devices together, but also include the “effective use of digital information to extend human abilities”(ISTE, 1999). Educators apply the whole structure of technology not only in their personal use, but also integrate it into part of their instructional programs to

create more dynamic instructions, to increase the interactivity between teachers and students and among students.

Seven Principles

The Seven Principles for Good Practice (Chickering & Ehrmann, 1996; Chickering & Gamson, 1996) were developed from research in college classrooms. Chickering and Ehrmann implemented the Seven Principles since technologies have become major resources for teaching and learning in higher education. They believe that technologies, tools with multiple capabilities, should be integrated into education consistent with the following Seven Principles:

1. Good practice encourages faculty and student contact;
2. Good practice develops reciprocity and cooperation among students;
3. Good practice uses active learning techniques;
4. Good practice gives prompt feedback;
5. Good practice emphasizes time on task;
6. Good practice communicates high expectations;
7. Good practice respects learners' diversity.

External and Internal Factors

Researches have synthesized the factors that impede teachers from integrating technology into classrooms. They are classified into two categories: external factors and internal factors (Ertmer, 1999). External factors, according to Ertmer, include access to technology, limited funding, and insufficient administrative and technical support. Internal factors, which are subtle and intrinsic to teachers, include personal anxiety toward technology and reluctance to change practices.

Exemplary Technology Using Teachers

Some research (Becker, 1994; Becker, 1999; Hadley & Sheingold; Vockell & Sweeney, 1994; Zhao, et al, 2001) has been done in investigating how exemplary technology using teachers differ from other teachers. According to Becker, Hadley and Sheingold, Vockell and Sweeney, and Zhao, Byers, Mishra, Topper, Chen, Enfield, Ferdig, Pugh, and Tan, exemplary technology using teachers share the following commonalities:

1. Teachers have positive attitude toward technology. Teachers are interested in technology and are not afraid of technology.
2. Teachers use a large variety of technologies frequently.
3. Teachers are enthusiastic about seeing their students using technology in their professional activities.
4. Teachers teach in a supportive environment, and they are well prepared to use integrate technology into their teaching.

FTP

Faculty Technology Participant

STM

Student Teaching Mentor

PT3

Preparing Tomorrow's Teachers to Use Technology

Limitations

Nothing is perfect in the world; neither is any research study. No single research study can provide all the answers to relevant questions. This study was conducted in an

urban university in a southern state of America, which received and continued to receive funding for purchasing technological equipments and facilities to make technology ubiquitous in education. I personally believe that faculty members are less likely to experience problems with access with technology.

As I planned to focus on teachers' perspectives on their experience of the federally funded project, I collected qualitative information only from teachers. However, to obtain the complete picture of how technology impacts on students' learning, it is important to collect data from students, too. This is the limitation of this study.

Summary

Educational technology can help teachers deliver course content in more effective ways and can enhance both teaching and learning. Educational technology includes both hardware and software, and other forms of media, for example, digital video cameras. Educational technology, according to Ennis III and Ennis (1995-6), also includes cognitive processing, such as information processing, learning and memory. Although most of the teachers have realized the importance of technology, the literature shows that a relatively small proportion of teachers are making effective use of technology and integrate technology into their classroom successfully.

“In order to provide models for change, researchers, professional societies, and education agencies should – on an ongoing basis – identify, study, and disseminate examples of effective technology integration that reflect current needs in both teacher education and K-12 schools” (ISTE, 1999, p. 3). So, to identify, study, and disseminate examples of higher education faculty members who are using technology is the main purpose of this study.

This study describes a group of higher education faculty and their experience in a federally funded project, which is technology based. To investigate how this experience has influenced their attitudes toward technology, how their practices of teaching has changed after this experience, how they develop a vision for their future teaching, or how they have implemented technology in instruction will provide precious information for teachers, administrators, policy makers and other potential stakeholders. Findings of this study will provide invaluable information for education faculty members. It would help faculty members identify successful models of using technology and negative individual experience with technology as well. From the positive model, faculty members can reflect upon their own use of technology and start to develop a vision of successful integration of technology. From the negative experience, faculty members who had not very successful experience with technology can reduce some nervousness and build some confidence by identifying problems and issues of the participants in my study. Therefore they can find possible solutions to resolve their situations. Finding of this study will be useful to education policy makers, school systems, education researchers, and government, because implications from this study are imparted for different groups to help education faculty members integrate technology into their teaching and students' learning more effectively.

CHAPTER 2

LITERATURE REVIEW

Introduction

The purpose of this chapter is to review relevant theories and relevant research studies on education technology, learning theory, technology standards, students and technology, and teachers and technology. This review first takes a general view of educational technology, which includes the definition, historical evolution of educational technology and public attitude toward the integration of technology. Then the review moves to learning theory, teaching styles and effects on learning and the historical background of college teaching, the intention of which is to link teaching and learning. In this section, seven principles are reviewed, and the manner in which technology can be utilized to implement these seven principles is discussed. In the learning environment, three key elements are: students, teachers, and course content; so how technology integration affects students and teachers according to the literature is also reviewed. As technology becomes part of daily lives, teachers and students are facing an increasing need to teach and learn technology in schools; schools should prepare both teachers and students to be technologically competent and proficient for today and tomorrow. Therefore, the review moves to explore the impact of technology on students' learning and the challenges they encounter as they prepare for tomorrow. Next the review will display a picture of the increasing interest of making technology a competency for all students and teachers, and the review continues with the discussion of how technology influences teachers' beliefs, their practices, and the factors that impede teachers from making effective use of technology in the classroom.

Following the review of teacher and technology, this review reports studies and research that intrigued me and that developed this research direction. Utilizing previous research helps refine and shape a clear view of how technology influences teachers' beliefs and practices and provides teachers, administrators, and other potential stakeholders with specific strategies.

Educational Technology

Education technology combines “instructional media,” “computerized tools,” and “cognitive processing” (Ennis III & Ennis, 1995-6, p.29). We all have witnessed the development of educational technology ranging from 1960s television, 1970s computers, and 1980s videodiscs and artificial intelligence, which were once predicted to profoundly transform America's classrooms; however, they all failed (Means & Olson, 1994). Today, technology has undoubtedly become part of our life. Not only has the technology advanced to a more complex and higher level, but also the accessibility of technology has tremendously increased in our daily activities. Governments have increased their investments in educational technology in schools and provide more funds for schools to purchase technological facilities. In such a technological environment, teachers are challenged to make effective of use of technology in their professional activities and in their instructional programs. They have started to provide training opportunities and some technical support on how to incorporate technological components into their instruction.

Definition and Development

The definition of technology integration varies over different time periods. According to Ertmer (1999), it initially was defined as teaching programming, and it evolved and later shifted toward utilizing drill and practice programs. In recent years the

definition of integration has moved to the stage of developing computer literacy and electronic communities (Ertmer, 1999; Office of Technology Assessment, 1995).

Educational technology should not only include hardware, software, and networks that connect devices, but also include the “effective use of digital information to extend human abilities” (ISTE, 1999, p. 5).

Educators and researchers believe that modern technology has the power to impact on both teaching and learning in America’s education significantly (Means & Olson, 1994) and promote active and cooperative learning among students. Dwyer says that technology has the power to “disturb the inertia of traditional classroom” (Dwyer, 1994, p. 8).

Marcinkiewicz (1993-4) says that there should be great support for educational technology. Government, academia, and educationally minded politicians all agree that use of educational technology could exert strongly positive impact on education (Marcinkiewicz, 1993-4; National Task Force on Educational Technology, 1986; Shanker, 1990; Sheingold & Hadley, 1990; United States Office of Technology Assessment [OTA], 1988). Although the public has been skeptical about the power of technology to revolutionize traditional education, it is recognized by the public that technology tools can be used to facilitate teaching and learning (McKeachie, 1990).

Educators have been exerting effort to transform the traditional didactic instruction whereby teachers simply transmit knowledge to students who receive the information. As teachers integrate educational technology into classrooms, students are challenged to engage in complex tasks, and they are pushed into multidisciplinary

projects working in cooperative learning groups. In this reform, technology plays an important role in helping educators transform traditional didactic classroom instruction.

Means and Olson (1994) say that technology is a very effective tool, which helps facilitate information retrieving and processing. Technology, as a tool, according to Means and Olson, is helpful in organizing and presenting various kinds of information. Moreover, the two researchers say that teachers do not necessarily know enough about the tools. “Students and teachers can acquire whatever technology skills for specific projects” (p. 16). Means and Olson say that teachers use certain types of technology that they know and model the use of the technology for their students who do not how to incorporate the type of technology into their activities and projects.

However, while technology has begun to demonstrate its power to shake the foundation of our education system, “many teachers’ colleges and education departments have not seen any wholesale revisions in their curriculum” (Willis & Tucker, 2001, p. 4).

To integrate technology into education constitutes a substantial change in curriculum and instruction (ISTE, 1999). It implies that faculty members need to increase their use of technology in teaching. Additionally external support, top-down mandates, and careful plans are important resources to help achieve success in technology integration (ISTE, 1999; Rogers, 1995). However, the actual practice of integrating technology by teachers has made little change (Ertmer, 1999; Havita & Lesgold, 1996).

Summary

Educational technology includes both hardware and software, and other forms of media, for example, digital video cameras. Educational technology, according to Ennis III and Ennis (1995-6), also includes cognitive processing, such as “information

processing, learning and memory” (p.29). Educational technology can help teachers deliver course content more effectively, and can enhance both teaching and learning. Technology has a significant impact on both teaching and learning. However, most teachers have realized the importance of technology, and a relative small proportion of teachers are making effective use of technology and integrate technology into their classroom successfully.

Learning and Teaching

When integrating technology into traditional classroom, teachers find tremendous enhancements not only in their teaching, but also in students’ learning outcomes. So what is learning? How can technology be woven into learning theory and then promote students’ learning interests and outcomes?

Learning Theory

What is the definition of learning? Opening Webster Universal College Dictionary, I find three pieces of the definition of learning:

1. knowledge acquired by systematic study in any field of scholarly application;
2. the act or process of acquiring knowledge or skills;
3. the modification of behavior through practices, training, or experience.

Bower and Hilgard (1981) define learning as “learning refers to the change in a subject’s behavior or behavior potential to a given situation brought about by the subject’s repeated experiences in that situation, provided that the behavior change cannot be explained on the basis of the subject’s native responses tendencies, maturation, or temporary states (such as fatigue, drunkenness, drives, and so on)” (p. 11).

Fincher (1996) thinks this definition fails to link learning directly to instruction. Fincher refines the definition to an obviously optimistic one. He says, “learning is a process of acquiring and integrating through a systemized process of instruction or organized experience varying forms of knowledge, skill, and understanding that the learner may use or apply in later situations and under conditions different from those of instruction” (Fincher, 1996, p. 420).

Obviously, in the second definition, several points have been specified. According to Fincher, the second definition specifies that (1) learning can occur in instruction and various organized experiences; (2) learning process includes “cognitive, behavioral, and experimental dimensions or components” (1996, p. 58); (3) learning should be related to future application; and (4) learning and teaching are inseparable concepts and processes and should be treated as a whole in order to make the two meaningful.

Teaching Styles and Effects on Learning

Learning is a dynamic process, progressing from one phase to another (Fincher, 1996). In much the same manner, instruction can be defined as “means by which we systematize the situations, conditions, tasks, materials, and opportunities by which learners acquire new or different ways of thinking, feeling, and doing” (Fincher, 1996, p.58).

According to Fincher (1996), individual differences of learners; the nature of the learning materials, tasks, and equipment; the nature and quality of instruction and situational or environmental variables may be identified within the learning situation as the major factors that influence learners’ learning outcomes.

Teachers have various teaching styles, which affect students' learning. Hardy and Dressel identified four prototypes of teaching styles: discipline-centered teaching, instructor-centered teaching, student-centered cognitive teaching and student-centered affective teaching (Hardy, 1976; Dressel & Marcus, 1996). According to Dressel and Marcus, discipline-centered teaching stresses the "content and structure of the discipline" (p. 495), and learning becomes the obligation of students; instructor-centered teaching emphasizes the teacher's role. In the classroom teachers teach and students listen. This picture displays that students are simply considered as audience, and followers of their professors. In this environment, learning is passive rather than active. Student-centered cognitive teaching emphasizes students' intellectual development as the goal of teaching and learning, in which both content and structures are selected and implemented to accommodate students' cognitive development (Dressel & Marcus, 1996). Dressel and Marcus say that student-centered affective teaching, the fourth prototype, puts students' personal and social development in the core as well as students' intellectual development. In this prototype, students are constructing their knowledge from their own perspectives rather than from their teachers. This prototype encourages students' involvement, interaction between students and teachers, and interactions among students.

Paradigm Shift

Barr and Tagg (1996) state a traditional paradigm, dominated by lectures and laboratory work in college teaching, has prevailed in American universities for too long. This paradigm reflects the mission of college, which is to provide instruction. The traditional paradigm does not put learners in the core of instruction.

The Transmission Model, the old paradigm, emphasizes the instructor's role in the classroom. It is best described as a process of lecturing. According to Edwards and Furlong (1978), teachers in this model are “mainly concerned with communication information” (p. 122). Teachers may employ various means of instruction to transmit information. Edwards and Furlong say that teachers may lecture, may use textbooks as references, or “elicit contributions” (p. 122) from students, but resources that have been used depend on the teachers' “talk”. In other words, teachers interpret their own perspectives to the students and impose on their students. There is no constant and ongoing dialogue between the teachers and students because of lack of interaction between instructors and learners. Learners' voices are silenced and learners' minds are not activated as a critically and creatively thinking mind. All learners do is sit in the classrooms, listening, and accepting.

Dixon (1992) believes that there has to be a shift in emphasis from pen and paper to electronic technology. Now the old paradigm is gradually shifted to a new paradigm, the goal of which is to change the traditional instructional paradigm to the one that addresses the importance of students' learning (Barr & Tagg, 1996). Addressing the importance of the learners' interest and outcomes is an important aspect of constructivist teaching.

In constructivist teaching model, teachers consider themselves learners, too. Instead of dumping information into students' heads and implanting teachers' perspectives in students' mind, teachers who teach in a constructivist way will act more as facilitators by helping students access information, process it, and communicate their understanding. The constructivist model of learning emphasizes that new understanding

results when a learner acquires and organizes new information (Becker, 1998; Fosnot, 1996). In this model, students are encouraged to be active learners and creative problem solvers. Edwards and Furlong (1978) suggests that teachers involve students in generating new meanings and constructing their knowledge “within the frame of reference provided by the teachers” (p. 121).

Technology Facilitating Constructivist Teaching

Many educators and policy makers believe that technology can be a catalyst for educational reform (Becker, 1998; Collins, 1991; Means, Olson, & Singh, 1995; Mehlinger, 1996; Newman, 1992; Sheingold, 1991). In construction or student-centered classrooms, teachers use tool software and information technology to allow students to work in active ways. The technology supports active learning; it becomes a tool with which the students may construct knowledge.

Seven Principles in Teaching and Technology

In this new paradigm, teachers play a key role in the shifting process because changing their beliefs and practices can tremendously influence students’ learning outcome. Chickering and Gamson (1996) articulate and implement Seven Principles for faculty members to improve their practices by mingling with the challenge of integrating technology.

According to Chickering and Gamson (1996), the Seven Principles of Good Practice were developed and synthesized out of reviewing fifty years of research on teaching and learning. Chickering and Ehrmann (1996) implemented the Seven Principles since new technologies have emerged in teaching and learning in higher education. They believe that technologies, tools with multiple capabilities, should be integrated into

education in ways consistent with the “Seven Principles” (Chickering & Gamson, 1996, p. 543).

1. good practice encourages faculty and students’ contact;
2. good practice “develop reciprocity and cooperation among students” (p. 543);
3. good practice “uses active learning techniques” (p. 543);
4. good practice “gives prompt feedback” (p. 543);
5. good practice “emphasizes time on task” (p. 543);
6. good practice “communicates high expectations” (p. 543);
7. good practice should respect “diverse talents and ways of learning” (p. 543).

The first good practice principle is to encourage faculty and students’ contact.

Chickering and Gamson (1996) believe that maintaining frequent contact between faculty and students motivates students and promote students’ active learning. Both of the researchers say that acquaintance with faculty members “enhances students’ intellectual commitment” (p. 544) and encourages students to construct their own values and develop their future plans. Chickering and Ehrmann (1996) believe that communication technology increases contact between students and faculty. They say that students who are shy and rarely ask questions or challenge their professor in class, may utilize technology such as telephone or email to communicate with their professors.

Contact through technology no longer limits contact to the level of face-to-face, and distant contact, which does not necessarily take place in the classroom, made available through technology. “As the number of commuting part-time students and adult learners increases, technologies provide opportunities for interaction not possible when

students come to class and leave soon afterward to meet work or family responsibilities” (Chickering & Ehrmann, 1996, p. 617).

The second principle is good practice develops reciprocity and cooperation among students. Chickering and Gamson (1996) emphasize that teamwork enhances learning. The two researchers believe that students should be encouraged to work with others, which increases personal involvement, such as sharing ideas, discussing with team members and critiquing others’ ideas. Chickering and Gamson say that the definition is “Good learning, like good work, is collaborative and social, not competitive and isolated” (p. 544). Technology promotes good learning. When students are engaged in cooperative assignments and projects, they share their ideas and discuss with each other, and, finally, they solve problems and fulfill some goal together as a group.

The third principle is to use active learning techniques. Real learning does not occur when students just sit in the classroom and watch what teachers do, then pass examinations, and get good grades. Rather students learn by getting involved in activities, and interpreting knowledge from their own perspectives, not from teachers’ perspectives. Chickering and Gamson (1996) say that students should reflect on past experiences and relate the past with the current learning. Learning with technology requires students’ active involvement and participation. Modern technologies “enrich and expand” (Chickering & Ehrmann, 1996, p. 618) opportunities that foster learning by doing. For example, teachers may require students to do an Internet search to gather some information, which is not available in local libraries

The third principle is to give prompt feedback. Chickering and Gamson (1996) say the fourth principle emphasizes prompt feedback to students because they think

students need appropriate feedback from teachers to assess their existing learning for further implementation and improvement. Apparently, how technology can provide prompt feedback is various. For example, in a virtual classroom, teachers can control the whole flow of discussion and comment on students' thoughts. Using listserv, teachers can distribute messages to a particular group to make announcements, or teachers can simply email one specific student to give feedback.

The fifth good practice is to emphasize time on task. Teachers' decisions on time management and task affect student learning. According to Chickering and Gamson (1996), good practice on time allocation and management promotes effective learning and teaching for both students and faculty members. Chickering and Ehrmann (1996) believe that modern technologies can help both faculty members and students to improve time on task. They also think that technologies increase the time both faculty and students contribute to study in order to make learning more effective.

The sixth good practice is to communicate high expectations. In China, there is a poem.

白日依山尽，
黄河入海流。
欲穷千里目，
更上一层楼。

The English meaning is: the sun is setting by the mountain, Huang river is flowing to the sea, if you want to view more of the distance, then step up one more floor. The meaning of the last two lines conveys the substance of this poem, which can be translated as "if you want to view more of the river, you need to stand in a higher

position”. This meaning exactly corresponds to the essence of the sixth principle, which expresses the relationship of outcomes and expectations. Teachers’ high expectations for students produce high motivation of students, which results in high learning outcomes. Chickering and Gamson say that the fifth principle emphasizes high expectation with a most concise sentence, “expecting students to perform well becomes a self-fulfilling prophecy when teachers and institutions hold high expectations of themselves and make extra effort” (1996, p. 546). Modern technology can “communicate high expectations explicitly and efficiently” (Chickering & Ehrmann, 1996, p. 620). Chickering and Ehrmann say that students are challenged and driven to learn through real-life experience and at the same time improve their “cognitive skills of analysis, synthesis, application, and evaluation” (p. 620), while with technology integrated, faculty can articulate evaluation criteria and learning goals and objectives more explicitly or even students can generate peer evaluation, which helps learning teams to learn together and everyone succeed.

The seventh principle, the last good practice principle, is to respect diversity of students and various ways of learning. Different people have different ways to construct their own way of learning. Teachers should respect and encourage such diversity and provide students with opportunities to show their talents and learn in ways that are effective for them. Technologies explore a large variety of ways for students to identify the most effective ways to them and encourage students’ self-reflection and self-evaluation (Chickering & Ehrmann, 1996). With technology, teachers can help students learn according to their own learning pace since different technological resources may require different learning methods. Utilizing different resources of technology, students

with similar talents and motives can cooperate with each other forming their sub-learning group and solve problems together (Chickering & Ehrmann, 1996).

Learning Community in an Information Era

Hossain and Hossain (2001) say,

“The learning community is core to emerging pedagogy in today’s technology mediated environment. The learning community is comprised of various interactions among the component elements of the learning process, i.e. learner, instructor, and content. Most importantly, learner to self-interaction, an introspection, allows learners to negotiate true learning”. (p. 161)

With technology emerging and evolving at a lightening speed, learners are challenged to be technologically competent and proficient in the future. So are the instructors. Our educational system is required to prepare instructors and learners to meet the challenge.

The new learning environment is to be reconstructed to integrate technology. Teachers should not teach their students as they were taught. Students should not learn in the same way as their teachers did in school. This self-replicating system should be deconstructed and should not isolate itself from the society’s anticipation and challenges when reconstructed into a new phase.

Learning, an active process, is optimized by engaging students in “constructing personally meaningful products” (Willis & Tucker, 2001, p. 5). Technology, when integrated into classrooms, promotes students’ learning interests and engages students more vigorously in class activities.

Educators and researchers have been involved in an ongoing debate on the effects of technology in learning. Clark (1983) believes that technologies are just tools that help

deliver course content, but Clark does not believe that technology would exert great and positive impact on students learning. Clark says it will not “influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition” (p. 445). Clark believes that the medium through which instruction is delivered is not the essential element in learning.

Clark is right to some extent. However, Clark did not see the difference of various tools of delivery regarding effectiveness. If groceries are delivered much faster by truck, why do we need to stick with the old fashioned way of delivery? So it is with technology. If we have proved that technology integration into instruction can be more effective in helping teachers deliver course content and enhancing students’ learning, why should we leave technology out of the picture?

First, we should realize the purpose of integrating technology into the classroom, which is not to change the course content that is delivered to students. The integration of technology is to ensure the effective delivery of instruction. The purpose of integrating technology is to change teachers’ and students’ attitudes and beliefs toward technology and, hopefully, change their practices, the change of which might promote teaching and learning.

Second, researchers have discovered that when integrated into instruction, technology can stimulate students’ interest and enhance learning. Technology is only a tool for learning, Clark did not see how technology allows students to construct their own knowledge and empower students as problem solvers and thinkers. Technology will not change the nature of education. Instead, when properly used, it will improve the learning experience for both teachers and students by creating a learning environment in which

teachers, students and technology are linked together. Engaging in technology activities, students are more independent in solving more complex problems, and it promotes collaboration among students (ISTE, 1999; Means & Olson, 1995).

Summary

In today's digital environment, a large variety of technologies have emerged, available to students to promote more effective learning in their own learning environment (Hossain & Hossain, 2001). Traditionally, education was delivered to students mainly through textbooks, from which students are supposed to learn real knowledge, which has been supposedly the outcome of instruction. With technology emerging, teachers have to change or adjust their role in traditional classrooms.

Cyrs and Conway (1997) and Hossain and Hossain (2001), say that teachers communicate with their students by lecturing, assigning exercises and small group projects, engaging students in activities, and these types of communication are part of an instructional strategy. According to Cyrs and Conway, and Hossain and Hossain, the physical means that facilitates instruction should also be included as part of the instructional strategy, which includes computers, multimedia production facilities, and so on. Breaking the traditional learning-by-listening style, technology supports the constructivist learning-by-doing theory and it maximizes the interaction between students and technology devices designed to enhance students' learning.

Students and Technology

To promote students' interest and to enhance their learning outcomes are the ultimate goals of integrating technology. The executive director of Milken Exchange on Education Technology, Cheryl Lemke (ISTE, 1999) says that students today are living in

a global, knowledge-based age; the teachers' responsibilities are to prepare their students for the information age by incorporating technology into students' learning in effective ways.

Technology can foster students' learning interests, provide them with opportunities to reconceptualize their learning and shape their perspectives of the world (Peck & Dorricott, 1994). Peck and Dorricott say that technology helps individualize instruction. They believe that students' learning paces are different, but through technology integration into the learning system, teachers can prescribe learning paths for each individual, so that students can "move at an appropriate pace in a non-threatening environment, developing a solid foundation of basic skills rather than the shaky foundation a calendar-based progression often creates" (p. 12).

Peck and Dorricott believe that technology increases students' thinking and writing in both quantity and quality. Additionally teachers serve as role models for their students. By watching how teachers use technology, students begin to shape their own views of using technology and start to apply technology to their class activities. Huang (1994) says teachers' use of technology and their attitudes have a significant impact on students. To prepare students using technology, faculty should, at first, utilize and increase their use of technology and model the use of technology in instruction. Under this condition they can provide their students with opportunities to use technology (Thomas & Cooper, 2000).

Preservice Teachers and Technology

Among students there is a subgroup, preservice teachers. Researchers believe that preservice teachers should learn knowledge of the ways technology can be used in the

classroom (Thomas & Cooper, 2000). Many teacher education programs now require preservice teachers to take at least three credit hours of technology courses. However, technology courses should not be treated as a separate subject. According to the president of ISTE (Schrum, 1999), requiring preservice teachers to take technology courses as stand-alone courses is not enabling them to learn techniques on how to integrate technology into content areas. Teacher educators should model the use of technology and teach effective use of technology in specific subject areas.

Most institutions have realized the importance of technology in education and have begun to weave technology requirement into their programs, especially preservice teacher programs. However, those technology courses, as Thomas and Cooper (2000) put it, are only introductions to knowledge and skills. Thomas and Cooper believe to learn how to translate what students know about technology and apply technology into specific content area is the ultimate goal that students should pursue in learning technology.

Preservice teachers should not only make effective use of technology in their professional activities, learning how equipment works, but also should learn techniques of how to integrate technology into classrooms effectively from their teachers. This depends on teacher educators who can model use of technology effectively in their classrooms. However, most preservice teachers do not have sufficient knowledge of how to make effective use of technology in education, and most teacher education programs are not providing adequate experience to prepare preservice teachers to work in a technology-enriched classroom (ISTE, 1999; Willis & Mehlinger, 1996; Willis, J., Thompson A., & Sadera, W., 1999).

To prepare preservice teachers to make effective use of technology and integrate technology into their classrooms in the future, teacher educators should serve as models or pioneers. Additionally, teacher education programs should provide preservice teachers with authentic technology-rich field experiences to envision technology integration and prompt preservice teachers to discuss technology application in classrooms and practice with technology (Dawson & Norris, 2000). Through this kind of technology-rich field experience, Dawson and Norris believe that preservice teachers are encouraged to participate and reflect on the implementation of technology application in classrooms.

Many organizations and researchers have been seeking the factors, and most of them have found that teacher educators are the key factors that influence preservice teachers' use of technology.

Summary

Teacher educators do realize the importance of technology integration for preservice teachers and do use technology in their routine tasks. However, lack of the knowledge of how to integrate technology into their practices effectively prevents them from further integration and implementation across their instructional settings (Bitter & Yohe, 1989). It is important for faculty to model technology integration in their classrooms for the future teachers, and it is even more important for faculty members to learn how to weave technology into their instruction. If teacher educators cannot model the use of technology effectively in their classrooms, preservice teachers cannot develop a vision of how to integrate technology into their future classroom from their teachers in classroom activities.

Thomas and Cooper (2000) summarize that to prepare future teachers to meet the challenge of being technology competent and proficient, faculty members should at first increase their personal use of technology, engaging students in activities using technology, and model the use of technology in instruction.

Technology Standards

Both teachers and students are facing the increasing need to make effective use of technology and be technology competent and proficient. Schrum (1999) says, in response to President Clinton's challenge, many organizations have recognized the importance of effective use and integration of technology by both inservice and preservice teachers. According to Schrum, such organizations as the "United States Department of Education, the CEO Forum, the Milken Exchange on Education Technology, the Association for Educational Communications and Technology (AECT), and the International Society for Technology in Education (ISTE)" (p. 83) have recognized the potential of technology and all agreed that universities and schools must ensure the effective use and integration of technology by both inservice and pre-service teachers.

Technology competency has become a requirement for faculty members, preservice teachers, inservice teachers and students (Handler & Strudler, 1997; National Council for Accreditation of Teacher Education [NCATE], 1997; U.S. Congress, Office of Technology Assessment [OTA], 1995; Zhao, et al, 2001).

Realizing the lack of standards for technology integration within teacher education program, the National Council for Accreditation of Teacher Education [NCATE] started to incorporate standards, intended to weave technology into standards for curriculum, students, faculty and resources, developed and proposed by the

International Society for Technology in Education [ISTE], the largest teacher-based, non-profit organization in educational technology, into the accreditation process (Handler & Strudler, 1997; Cooper & Bull, 1997). The Association of Educational Communication and Technology [AECT], and the International Technology Educational Association/Council on Technology Teacher Education [ITEA/CTTE] have developed curriculum guidelines for educational and computing technology programs and National Council for Accreditation of Teacher Education [NCATE] has endorsed the curriculum guidelines (Cooper & Bull, 1997).

Summary

To respond to the increasing need of technology integration, teacher educators and their organizations have been cooperatively developed standards and guidelines, intended to guide university faculty to integrate technology into their teaching, scholarship, and research, that describe the essential skills required by all teachers in order to make effective use and integration of technology. According to Cooper and Bull (1997), various organizations and associations have created committees to assist teacher educators in making effective use of technology; journals dedicated exclusively to identifying methods, and techniques for educators to integrate technology have been published. All those efforts that have been made to integrate technology as a component into curriculum and instruction are dedicated to providing guidelines for teachers to develop the concept of making effective use of technology in teaching.

Teachers and Technology

Many educators today are facing the issue of integrating technology into their lesson plans and curricula. They no longer limit themselves to textbooks, chalk, and

handouts to deliver course content. They have broken down the walls that traditional pedagogy established. In the process of teaching and learning, educators have faced an increasing need to adjust their approaches to “teaching, preparing contents and delivering learning materials in accordance with the emerging technologies” (Neo & Neo, 2001, p. 328). Some teachers have experienced great success in making effective use and integration of technology. They are identified as Exemplary Technology Using Teacher by a group of researchers.

Exemplary Technology Using Teachers

Some research (Becker, 1994; Becker, 1999; Hadley & Sheingold, 1993; Vockell & Sweeney, 1994; Zhao, et al, 2001) has been done in investigating how exemplary technology using teachers differ from other teachers. According to these studies, exemplary technology using teachers in K-12 share the following commonalities:

1. Teachers have positive attitude toward technology. Teachers are interested in technology and are not afraid of technology. They have higher motivation toward using technology and incorporating technology into their classrooms, and they are confident about themselves using technology. These teachers are active learners.
2. Teachers use a large variety of technologies frequently. Most frequently they use word processing software. Other types of technology they use are electronic communication, database system, spreadsheets and other types of computer software.
3. Teachers are enthusiastic about seeing their students using technology in their professional activities.

4. Teachers teach in a supportive environment, and they are well prepared to use and integrate technology into their teaching. They believe that technology can be integrated into the instruction to promote their learning interest and enhance students' learning.

Teachers today are facing the challenge of developing new skills and techniques of teaching, and at facing rapid changes of technology and greater diversity of their students (ISTE, 1999).

Many teachers wish to integrate technology into their classes; however, most of them have not achieved this goal (Ertmer, 1999; Parks & Pisapia, 1994). Most faculty members realize the positive impact that technology brings to students, and it is important to increase use of technology and integrating technology into classroom. The questions underlying this realization include teachers' fear of technology, reluctance to change, lack of access, and lack of technical and administrative support. For example, many faculty members feel they might look stupid facing technology. Using technology requires them to restructure instructional activities (Becker, 1999; Marcinkiewicz, 1994; Maurer & Simonson, 1993; Prawat, 1992), which might causes uncertainty and thus results in anxiety and reluctance to use technology.

Faced with the emerging modern technology, teachers realize the importance of keeping abreast of the changes and incorporating technology into their classroom. However, they still are not able to visualize the importance of technology integration and its impact on both teaching and students' learning. Therefore teacher professional development has not "kept pace with the rapid changes in the quality and quantity of information technology" (ISTE, 1999, p. 1). Many teachers do not provide sufficient

technology experience in their classroom. Factors that impede effective use and integration of technology have been identified as both external and internal factors (Ertmer, 1999).

Issues with Technology Integration

Ertmer thoroughly discusses external and internal factors. According to Ertmer, those issues pertaining to the lack of access to technology, limited funding to purchasing technology facilities, and insufficient administrative support and technical support are categorized as external factors, while internal factors are defined as intrinsic to teachers who feel uncomfortable before technology. They experience anxiety and lack of confidence when required to use and integrate technology into classroom.

Faculty members may easily identify the external factors, which are immediately apparent to faculty members (Ertmer, 1999). But the internal barriers, Ertmer says, are sometimes considered to be even more difficult to identify and overcome than the external factors, because they are “less tangible” and “more personal and deeply ingrained”(p. 51), and these barriers can tremendously block implementation.

Ertmer says that traditionally the focus on helping teachers integrate technology has been on grappling with the external factors, for example, providing access to technology facilities for teachers and training teachers. Ertmer points out that training programs have started to “incorporate pedagogical models of technology use as one means of addressing internal barrier” (p. 47), but Ertmer addresses the discussions on the relationship between the external and internal factors and the strategies to overcome the two barriers as insufficient.

Thomas and Cooper (2000) say that most faculty members have realized how important it is to integrate technology into their curricula effectively and they also expressed their concern regarding the increasing need to be more technology proficient; however, they do not provide sufficient technology experiences in their classes. To help faculty members incorporate technology into their classroom effectively, several issues (Ertmer, 1999) should be handled and dealt with efficiently.

First, before teacher integrate technology into the classroom, teachers should possess competency and proficiency with technology and should develop a desire to apply technology in their instructional settings (Ertmer, 1999). This set the premise that faculty should be provided with access to technology resources, and technical support and training are also necessary.

Second, Ertmer believes that teachers should possess the knowledge of how to integrate technology into their classroom. Throwing a computer or a bunch of software into the classroom definitely is not integration. Ertmer says that successful integration involves careful evaluation of the curriculum and learning goals; teachers should develop careful plans for improvement and assessment. And they should also be able to follow certain models that can help develop their own plans (Ertmer, 1999).

Strategies and Practices

Providing teachers with access to technology can only support their use of technology but it will not miraculously produce “technologically proficient” teachers. Brief exposure to technology may only ensure the use of technology, but effective use and integration is not guaranteed.

What School Systems Can Do?

To help faculty members make effective use of technology and integrate technology into their instructional settings, our systems should provide proper and sufficient training to faculty members, and technical support as well. Technology access combined with technical training, support, and assistance while using technology will possibly serve as a significant motivation (Department of Education, 2000; ISTE, 1999).

Strategies to help teachers integrate technology effectively into their instruction include training teachers, providing teachers with sufficient facilities, resources, access, and support, engaging teachers in positive experiences utilizing technology and allowing teachers to have plenty of preparation and planning time (Becker, 1994; Ennis III & Ennis, 1995-6; Ertmer, 1999; Gilmore, 1995; Hunt & Bohlin, 1993; Schrum, 1999; Strudler & Wetzel, 1999; Walker, Ennis-Cole, & Ennis III, 2000; Yildirim, 2000). Teachers need support and guidance on technology. Throwing them a bunch of hardware and software certainly will not help them adopt technology and integrate it into their instruction effectively.

Technology integration depends on facilities in some way, however, there are other factors that influence integrating technology, such as faculty “professional development or course-development time” (ISTE, 1999, p. 22), which leave little opportunity and time for teachers to concentrate on technology.

Giving teachers sufficient time to plan students’ technology experience is one practice that can facilitate technology integration. Teachers need to learn technology first and then need to spend sufficient time planning how technology integrated is going to function most effectively, and determine the best practice to enhance students’ learning

outcome (Ennis-Cole, & Ennis III, 2000). Teachers need to consider the necessary course content to be delivered in a normal class, in addition to that, teachers need to consider and evaluate the impact technology will have on teaching and learning, so teachers need time to explore and experiment (Walker, Ennis-Cole, & Ennis III, 2000; Lawler, Rossett & Hoffman, 1998).

Providing adequate access to teachers is another practice that promotes the use of technology. Before teachers can make effective use of technology and integrate it into their instructional settings, it is necessary to provide adequate access, training opportunities, and sufficient resources and support to teachers to empower them with modern technology and motivate them to integrate technology to their own instructional settings where teachers can promote and facilitate the efforts of students to use technology to prepare students to meet the challenges of the future (Macavinta, 2000; Walker, Ennis-Cole, & Ennis III, 2000).

Walker, Ennis-Cole and Ennis, III (2000) believe that when faculty members have available and convenient access to technology, faculty can start to construct their lesson plans that incorporate technology. It is common sense that availability is the premise of application.

Ongoing technical support is equally important as the availability of technological facilities. Faculty members are motivated to learn more if technical support is readily available and effective. In other words, to utilize technology and make effective instructional use of technology, teachers should be provided with adequate and competent technical support, which should be lengthy and ongoing (Walker, Ennis-Cole, & Ennis

III, 2000). So, solely placing computers in schools without providing technical and administrative support for teachers will not produce desirable results.

What Can Teachers Do?

Many teachers feel comfortable without bothering to learn technology and the skills of incorporating technology into their classroom. Many faculty members do not see the necessity and value of integrating technology into their classrooms (Palmer, 2000). To help faculty members realize the importance of integrating technology into their instruction, schools and universities should articulate the expectations for faculty and should provide teachers with unlimited access to resources and technical support.

Teachers themselves should realize that integrating technology into teaching has great impact on both students and teachers in various ways. Technology integration can change the interactions between teachers and learners, and interactions among student; change social dynamics of the classroom, and also change teaching and learning patterns (Walker, Ennis-Cole, & Ennis III, 2000). Technology integration can change the interactions of teachers and learners, because technology increases teacher-learner communication (Heflich, 1997; Liu et al. 1998; Walker, Ennis-Cole, & Ennis III, 2000). An obvious example is the utilization of email, which no longer limits the communication of teachers and students to office appointment. By integrating technology into teaching, teachers increase interactions with their students and teaching is no longer a one-way process (Heflich, 1997; Walker, Ennis-Cole, & Ennis III, 2000). Technology integration also brings changes in the social dynamics of the classroom due to a shift toward constructivist paradigm. Technology integration brings changes in teaching and learning patterns. Teachers incorporate technology into their practices and motivate students to

use technology in their professional activities. It encourages students' active learning and enhances the learning outcome, which promotes teachers to implement their plan to promote even higher levels of learning.

External factor is the premise of integrating technology. Ertmer (1999) says that the assumption was that teachers would start to integrate technology if they were provided with adequate resources. As long as teachers realize the importance of technology and how it will improve teaching and learning, external factors will be easily dealt with. And it will help teachers deal with personal factors, too. Ertmer suggests the following five strategies addressing those factors: developing a vision, identifying curricular opportunities, seeking and obtaining resources, managing technology resources and organizing classroom activities, and assessing students' learning.

To develop a vision is the very first step, a giant step for teachers to start integrating technology (Ertmer, 1999). "Most teachers will find little incentive to tackle the technical and scheduling problems associated with technology (first-order barriers, according to Ertmer) unless they have a clear vision of how the technology can improve teaching and learning" (OERI, 1993, p. 85). So how can teachers develop a vision? According to Ertmer, teachers can do on-site observations or video, or web-based case studies of those teachers who are integrating technology. Ertmer believes that by watching demonstrations of other effective models, teachers can start to shape their own vision of integrating technology. Reflection is one of the means to help teachers with developing vision, which is helpful to promote teachers to critique and evaluate their practices and implement their design if teachers communicate with each other by constant discussing and reflecting upon experiences of their use of instructional technology

(Ertmer, 1999; Persky, 1990). Collaboration among teachers and administrations also helps teachers to develop the vision and then start to incorporate technology into their professional activities (Ertmer, 1999).

Second, in addition to developing a vision of effective use of technology, teachers need to identify curricular opportunities (Ertmer, 1999). Ertmer says that this means teachers need to choose the type of technology that suits their needs and work effectively in specific areas. If teachers identify the area in which technology integration can function effectively, teachers should weave technology into their lesson plans. If teachers think technology will not help with delivering the course content, they may not consider integrating technology into their syllabus.

Third, teachers should seek and obtain resources. According to Ertmer (1999), teachers should obtain sufficient access to technology facilities, sufficient time for both professional and curricular development, sufficient training to develop technology competency and even proficiency, and should obtain sufficient support, support from both administrative and technical side. Workshops and conferences are good resources. Research has demonstrated that teachers' positive experience in workshops and conferences help teachers "establish a healthy attitude toward technology and promote a sense of accomplishment or self-efficacy" (Walker, Ennis-Cole, & Ennis III, 2000, p. 117). As a result, teachers are more confident and competent to address students' needs (Walker, Ennis-Cole, & Ennis III, 2000).

Fourth, Ertmer says (1999) managing technology resources and organizing classroom activities is also an important step. By integrating technology into the classroom, activities may be upgraded to a more complex level. So whether teachers can

make effective technology integration in their classroom hinges on effective management strategies that teachers have.

Fifth, Ertmer says assessing students' learning can help teachers monitor students' learning outcomes. Assessment here includes not only teachers' assessment using rubrics, electronic portfolios, but also students' collaborative projects to promote cooperative learning, and students' self evaluation to help students establish goals and assess students' learning progress by themselves (Ertmer, 1999).

Summary

To help teachers overcome those barriers, schools should solicit funding for teachers' training, and by employing instructional technologist and schools should provide technical support to teachers. Other professional development opportunities, such as inservice workshops, should be offered.

To assist teachers in integrating technology into their teaching, our educational system should create environments in which teachers are provided opportunities to learn technology, such as workshops and intensive institutes. In addition, schools should provide adequate resources, sufficient training, and both technical and administrative support. Teachers should also be allowed to have sufficient preparation and planning time so that they can effectively develop lesson plans which weave technology into the curriculum (Becker, 1994; Walker, Ennis-Cole, & Ennis III, 2000; Ennis, III & Ennis, 1995-6; Ertmer, 1999; Gilmore, 1995; Hunt & Bohlin, 1993; Schrum, 1999; Strudler & Wetzel, 1999; Yildirim, 2000). Teachers need support and guidance on technology. Throwing them hardware and software certainly will not help them adopt technology and integrate it into their instruction effectively.

Giving teachers sufficient time to plan students' technology experience is one practice that can facilitate technology integration. Teachers plan their practices carefully and effectively if they spend sufficient time planning and implementing new ideas (Walker, Ennis-Cole, & Ennis III, 2000).

Providing adequate access to teachers is another practice that promotes the use of technology. Walker, Ennis-Cole, and Ennis III say,

“When resources are readily available, faculty can schedule practice sessions, get assistance, and create technology-based lessons. They can also ask questions of others, share ideas, and demonstrate their finished products. This type of networking encourages brainstorming, dialogue, and discussion; it can be a catalyst that stimulates faculty and provides an incentive for experimentation. Other incentives might include monetary awards, classroom hardware and software, recognition, and equipment for personal use. These may stimulate faculty to integrate technology, but continued integration occurs when sufficient training and support are present.” (p. 117)

Effective integration of technology can transform and enhance the traditional classroom environment. Walker, Ennis-Cole, and Ennis III believe that effective technology integration benefits both teachers and students. To students, technology promotes their learning interest and enhances their learning outcome; to teachers, technology optimizes the instruction to more effectiveness, facilitate constructivist teaching practices.

Effective technology integration is not a solo mission to be accomplished by teachers alone. It involves administrators, staff, and all other components in our educational system. The cooperation and support of each other ensures the realization of the goal.

Past Research and Studies on Teachers and Technology

Education programs have lagged behind expectations and identified needs in technology integration and implementation. Gilbert (1996) reports that over 75 percent of U.S. undergraduate education programs are not integrating technology into their classrooms, and only 15 percent of faculty incorporate technology into their classrooms.

Melon (1999) believes that teachers should incorporate technology to ensure effective delivery of instruction. We all agree that when used properly, technology can improve the learning experience for both teachers and students. A national survey to education faculty members commissioned by Milken Exchange on education technology (1999), suggested that technology should be integrated into course activities, which means technology integration should focus not only on the use of facilities, but also on integration into teaching and learning in specific subject areas. Moreover, faculty members should be encouraged to model the technology use for their students.

The U.S. Department of Education Report

To help revise the educational technology plan for the year 2000, the U.S. Department of Education's Office of Educational Technology has solicited comments from educators, researchers, students, administrators, and policymakers on priorities for the future of technology in education (Department of Education, 2000). A variety of

comments on issues related to access to technology, teachers and technology, students and technology, e-learning, and research and development were submitted.

The Department of Education states that all teachers and students should have “ubiquitous access to state-of-the-art information technology” (p. 3). The Department of Education believes that technology should not be treated as a separate subject; instead it should be treated as a learning support system and should be integrated into curriculum and instruction. The website reports that one teacher, who has submitted comments, says that teachers should prepare students for the workforce, for what the students will be expected to know, because eventually students are going to the job market and to work. So schools are responsible to teach students the skills of using information technology and the associated tools for their future use (Department of Education, 2000).

As integrating technology into education becomes increasingly important, teachers are encouraged to make effective use of technology and to learn techniques of integrating technology into their classes effectively. According to the Department of Education, one commentator says that before teachers can model the use of technology and teach the skills and techniques to their students, and prepare their students for the future world, teachers themselves need to have sufficient training to be competent. It is hopeful to see that more and more teachers begin to realize the value and benefits of using technology and integrating technology into their instruction.

According to the comments that the Department of Education has collected, some teachers have already experienced tremendous success with technology integration, however, there are still many teachers out there that are struggling with technology integration. From those comments, Department of Education has identified several

factors that influence teachers' using and integrating technology. Those factors are reported as: teachers' fear and anxiety with technology, financial factor, time for training and planning, technical support and administrative support, and technology implementation.

Teachers' Technology Anxiety and Fear. Comments suggest that teachers find technology intimidating and scary (Department of education, 2000). Teachers are not confident in using technology and not very comfortable with technology, and some teachers still cannot envision the benefit of integrating technology into their classroom compared to the old standard teaching.

Financial Factors

The Department of Education reports that one administrator says, "technology availability ultimately hinges on available funding" (p. 5). Funding has been one of the key issues that teachers, administrators, and governments encounter. Limited funding constrains the availability of technology. As a result it limits access to technology facilities that teachers and students can obtain (Department of Education, 2000). In addition to limit funding to purchase technology facilities, teachers who have submitted comments to the website report that cost for training is a barrier that hinders them. According to the comments (Department of Education, 2000), individuals state that cost for training is high but the compensation is low. So providing teachers with sufficient financial support in further training would at least help teachers learn new technology, which is the first step to adopt and implement technology.

Time for Training and Planning

Some teachers in the website identify need of spending a large amount of time for training. They need to spend quite amount of time in learning technology while they have their regular teaching duties (Department of Education, 2000). Some teachers have expressed their pressure they have with the time to learn, and time to explore technology to become technology competent and proficient is not provided. Willis, Austin, and Willis (1994) report teacher educators realize the importance of incorporating technology as a component in the their instruction, however, mostly they use technology for word processing and do not integrate technology and model the use of technology in their classrooms. Willis, Austin and Willis say that one reason is that they do not have sufficient time to learn and to plan; the other reason is lack of support. Additionally, cost of training is also considered a factor that influences some teachers' adoption of technology (Willis, Austin, & Willis, 1994).

Lack of Technical and Administrative Support

Before teachers can make effective use of technology in their classroom, they need to be trained. As teachers start to integrate technology into their classroom, teachers should be provided with an ongoing technical support. Many schools still don't realize that it is essential to provide technical support to help teachers make effective use of technology. Department of Education (2000) reports that teachers do not have sufficient or available technical support, and many have little administrative support present. Some teachers report that administrative support is "superficial or unenthusiastic about technology" (p. 17).

Technology Implementation. Before teachers integrate technology into their classroom, they should possess the knowledge and skill of using technology. They need not only have convenient access to technology resources, but also should have training and ongoing support, which must go side by side, as one teacher comments (Department of Education, 2000). Another teacher says that requiring the training of teachers should be made a “national mandate” (p. 8) to make sure teachers themselves are prepared and that they are prepared to teach their students.

Suggestions and Implications

Sufficient training and careful planning require teachers to spend a large amount of time. The Department of Education (2000) reports that one administrator comments that “it is essential that time and resources be directed toward creating an understanding of the process of how technology can support student learning...i.e., the cognitive processes that are fostered by technology and methods of harnessing and directing those processes in the most productive ways to benefit students” (p. 18).

The Department of Education (2000) says that all individuals who submitted their comments, believe that technology should be integrated and implemented into education in a constructive way; otherwise ineffectiveness of incorporating technology into classroom will lead to the picture of technologies emerged in 60s, 70s, which claimed to bring revolutionary change to education but failed eventually.

The Department of Education synthesizes the comments and provides the following suggestions (2000). The first suggestion is give particular support and training to veteran teachers. Inservice training is of particular importance for teachers, especially for those veteran teachers, who graduated and started their profession when there was, no

or a few technologies around at the time. These veteran teachers might have problems in adopting technology. The second suggestion is using technology in professional development of teachers. Department of Education reports that commentators believe that teachers can utilize technology to share information, discuss with each other, and reflect upon their experience. The third suggestion is making technical support available for teachers. Providing technical support to teachers and making the support readily available can reduce the teachers' pressure in dealing with technology and facilitate their adoption of technology.

More Studies on Teachers and Technology

In the ISTE research study among colleges, schools and departments of education, commissioned by Milken Exchange on Education Technology (1999), it is reported that most institutions' infrastructures are "adequate or better in terms of carrying out their current programs" (p. 21); however, a third of them report limited technology facilities in their programs. This study reports that approximately only 20 percent of faculty members across the nation feel well prepared to integrate technology into their classrooms. Deficiencies in technology facilities constrain their access to technology, not to mention facilitating integrating technology into their classrooms.

Technologies force educators to reconceptualize their ways of thinking about teaching and learning (Kennedy, Odell, Sharp & Sharp, 2001). However, not all teachers have adopted technology for use even they believe that technology integration can improve the quality of teaching. The result of the survey shows that most faculty members do not model use of technology in their teaching (ISTE, 1999). Some teachers consider the integration of technology as more frightening than a traditional teaching plan

without technology (Hignite & Echternact, 1992; Robinson, 1995; Schrum, 1995; Schrum, 1999).

Successful integration involves careful evaluation of the curriculum and learning goals. Teacher should develop plans for improvement and assessment. Sheingold and Hadley (1990) surveyed teachers of grade 4 through 12, who had integrated technology into their teaching finding that teachers need extra time and effort to learn how to integrate technology into their instructional settings effectively. Improving students learning should always remain the primary goal of technology integration (Meghabghab & Price, 1997, Walker, Ennis-Cole, & Ennis III, 2000).

Providing teachers with training opportunities is an important way to help teachers in learning and integrating technology. These training sessions not only teach technologies that teachers have no knowledge of, but also teach them how to integrate specific type of technology effectively into their instruction. Workshop, training opportunities and sessions of technology learning help faculty members increase their personal use of technology, have positive impact on their beliefs and practices. Vannatta and Beyerbach (2000) report that education faculty members they investigated, who participated in a technology-based project adopted important beliefs as well as increasing their use of technology in personal level and instructional level. The important belief they have adopted is that technology can be used as a tool to empower their instructions to facilitate students' understanding and construction (Vannatta & Beyerbach, 2000).

Strudler and Wetzel (1999) evaluated four exemplary colleges of education programs, identified in the 1995 OTA report as exemplary, to study the common factors that facilitated technology integration and supported student learning (Schrum, 1999;

Walker, Ennis-Cole, & Ennis III, 2000). The following common features were identified as the common factors in the technology integration environment from the four universities (Strudler and Wetzel, 1999; Walker, Ennis-Cole, & Ennis III, 2000):

- 1). Through grant funds and other initiatives to support technology integration projects, faculty members are provided with adequate resources for faculty support, training and technology development;
- 2). Technical support for faculty, teaching labs, and technology classrooms are also available;
- 3). Education programs have been exerting a systematic effort to encourage faculty to integrate technology into teaching, and faculty members believe that the use of technology matches their teaching practices and beliefs;
- 4). Support of knowledge and informed leadership are present;
- 5). Curriculum and staff development specialists are available;
- 6). Access to technology is available to students and faculty;
- 7). Courses in educational technology are required.

To facilitate faculty's integration of technology, schools should create such a learning environment for them. Universities should provide faculty with initiatives and opportunities for faculty members to learn technology, provide ongoing individualized support to meet individual needs. To help faculty learn is a process that involves collaborative work between faculty and the administrations.

Summary

Bennett (2000) says, "a consensus has developed that technology in higher education is an exciting and impressive tool to be used in the conduct and activity of

teaching and learning” (p. 323). Effective use of technology in teaching and learning might help students achieve greater academic success (Walker, Ennis-Cole, & Ennis, 2000). To achieve the potential success, Walker, Ennis-Cole and Ennis III think that teachers should serve as the role model in making effective use of technology in professional activities; teacher should offer guidance about how to select and evaluate the appropriate technology tools, and should “assist students as they make efforts to enhance the traditional learning environment by using technology” (p. 115), and the university should provide sufficient support to help faculty members accomplish their goals.

Implications of Previous Research Studies

ISTE (1999) suggests that researchers should seek concrete evidence of effectiveness, including observations, interview with instructors, and technology based lesson plans. And it is important to, on an ongoing basis, identify, study, and disseminate examples of effective technology integration that reflect the current needs in higher education classroom.

In addition to collecting information on the models of faculty who are integrating technology into their curricula, it is also important to examine their attitudes, their approaches and their practices in their technology infusion across curriculum. To identify successful individuals and reasons for their success has been the increasing desire among researchers and educators.

By identifying any factors when integrating technology and strategies addressing those factors, it is important to help both preservice and inservice teachers to realize those practical and specific solutions, which help eliminate the factors that impede effective use and integration of technology (Ertmer, 1999). The identification of successful programs

and the reasons for their success will produce valuable information since teachers are the key factor that influences teaching and learning.

Teachers have risen to the challenge of making effective use of technology and integrating technology into their curricula. Technology integration requires them to reconceptualize the traditional teaching practices and teachers are afraid of making a change to what they have already felt comfortable with. Thus there is certain level of reluctance to change their practices. In the OTA's 1995 report, it is indicated that technology is not made to the core of to the teacher preparation experiences in most colleges of education (OTA, 1995; Thomas & Cooper, 2000).

It is important for researchers to investigate personal factors that influence teachers' technology integration. Helping teachers identify the factors that influence their adoption of technology and implementation is an important step for teachers to optimize their instruction (Marcinkiewicz, 1993-4). Understanding personal factors of integrating technology is also important to educational planners, too. Marcinkiewicz says that educational planners need to know what personal factors contribute to the performance of teachers and what individual characteristics influence their technology integration.

Summary

Educational technology can help teachers deliver course content in a more effective way, and can enhance both teaching and learning. Technology has significant impact on both teaching and learning. Along with the emerging technology and its rapid development, teachers are facing the issue that there is an increasing need to integrate technology into their classroom. However many teachers still are not making effective use of technology in their classroom.

Researches and studies have demonstrated that when technologies are properly used, they can increase the students' motivation, students' retention and engagement. Teachers should have proper training on the use of technology, and should develop planning carefully to incorporate technology into their instruction. Technologies have a positive impact on both teachers teaching and students learning, when properly utilized. The Department of Education appeals for more extensive research into how technology should be used to enhance student learning and achievement, and the exact nature of the impact technologies that have on teachers and students (Department of Education, 2000).

The Department of Education (2000) describes that the U.S. educational system has demonstrated an increasing interest in making effective use of technology and integrating technology into teaching and learning, since the 1996 release of America's first educational technology plan. "This interest has been spurred by the widespread recognition of the transformation technology" is having on the world economy, "as well as by the potential for technology to transform the teaching and learning experience" (Department of Education, 2000, p. 2).

The review of literature has displayed a picture of educational technology from a historical view, its definition and pros and cons toward application of technology and how educational technology involve with creating new learning environment, in which students become the active learner by engaging in activities, how teachers incorporate technology in their teaching to adjust their practices to deliver course content in a more effective way.

For this study, the author thinks it is important to take a view of the college of education faculty members integrating and implementing technology into their curricula

and let them share with us their experience, thoughts, and comments. In the study that was commissioned by the Milken Exchange and conducted by the International Society for Technology in Education (ISTE), the Department of Education (1999) stated that it is important to identify, study and disseminate models that are making effective use and integration of technology in both teacher education and K-12 schools on an ongoing basis.

CHAPTER 3

METHODOLOGY

Introduction

This study investigated the experience of a group of higher education faculty members who participated in a federally funded technology based project. The idea was inspired by Dawson and Norris (2000), who conducted a similar study but with different type of participants. In their study, preservice teachers who participated in a Technology Infusion Project (TIP) were the participants. This study adopted their data collection methods.

The purpose of this study is to investigate higher education faculty members' perspectives on their experiences with technology. How this experience has influenced their beliefs and practices, and other factors that have influenced them are the core interest of this study. This chapter describes the research context. How informants were selected and where they were obtained are discussed. Then the procedures for conducting the study were described and how data was analyzed are discussed, which includes triangulation, analysis of themes and validity issues. Before conducting the research study, I conducted a pilot study within the same group of participants. The purpose of pilot study was to help me understand the topic more thoroughly and design the study for the subsequent dissertation study.

Pilot Study

This pilot study was intended to help me develop deeper understanding of my topics. This study involved three first year faculty participants in the federally funded, technology-based project. To include this pilot study in my dissertation, I expect to

explore questions that are going to be covered in the dissertation study. By reviewing literatures on higher education faculty members' use and integration of technology, I formulated initial interview questions. By conducting analysis of faculty members' course syllabi and electronic journals, I refined and expanded the interview questions. This pilot study can serve as the foundation of the subsequent research study, because the methods used to collect data in the pilot study will be refined for the dissertation study. If new topics emerge from the interviews of the pilot study, later interview questions could be added on the basis of the interviews in the pilot study.

This pilot study was designed to serve as the foundation of the later research. To help me delineate a sketchy picture of teachers' application and integration of technology, I believe, this pilot study would direct me to the right track and analyze information collected from later studies. Descriptive report is provided for each participant for readers to develop a good understanding of participants as individuals.

Background of Pilot Study

In this grant project, faculty members are categorized as Faculty Technology Participant (FTP), as student participants are categorized as Student Technology Mentor (STM). Each faculty member was assigned an STM to assist with teaching. Both of them attended a summer institute, in which they learned technology, invited people who are using technology to share with their experience and demonstrated how they model technology use to their students. Faculty and students completed individual projects using technology or completed a project on cooperative basis. In the summer institute, I remembered at the first day of summer institute, the last day for faculty members I approached some faculty members to discuss their projects. One faculty member proudly

showed her web page that she was going to publish in the subsequent semester. However, I did not discuss further at that point in time their personal view of using technology and possible problems and issues arose in the teaching.

This federally funded, technology-based project can be actually divided into three phases: summer institute, summer break, and subsequent technology integration and implementation, the pilot study's findings will be synthesized in chronological order.

Design and Rationale

In this study, I started with a simple form to collect demographic information from three first-year-faculty participants. At the same time, I analyzed the course syllabi that they developed after they participated the summer institute. I intended to analyze the electronic journals that faculty participants submitted during the summer institute, however due to some unknown technical reason, journals were no longer available on the server. Later, based on the analysis and review of literature, I developed interview questions to delve deeper into the personal world of faculty members on integrating technology into their classroom.

I have attended classes in the doctoral program with various professors. Some of them use technology as a tool to assist their teaching. Some don't integrate technology into their teaching at all. At the classes aided by technologies, I felt highly motivated and always wanted to learn more. When required to complete individual and group projects, I was challenged by the fact that the quality of my learning should be maintained and technological skills need to be developed as well. Additionally, with group projects, I considered it more beneficial than individual projects, because I learned my group members' perspectives; I shared with them what I know and discussed with them.

However, in the non-technology courses, there were fewer cooperative projects. Most of the time, I was sitting in my seat listening to my peers or professors talking. I felt very intimidated by them and all I wished for at the beginning of the class was for class to be over soon. From the comparison and contrast of the two types of teaching, I could not help but wonder if technologies had a positive impact on students' learning, and why some faculty members could not make effective use of technology and integrate it into their teaching.

Most faculty members teach at least two courses each semester. In addition to teaching assignments, they have other time commitments. Why are some faculty members not making effective use of technology? Are there some underlying factors that impede them from integrating technology into their teaching, in addition to heavy teaching assignments and time constraints? These questions have been lingering in my mind since I experienced the two types of classes.

Pilot Study Methodology

Among research designs in information technology in education, mainly three paradigms have been employed: empirical, critical and interpretive (Willis, Thompson, & Sadera, 1999). Most of the research studies on information technology in education have utilized empirical design.

According to Willis, Thompson, and Sadera, empiricism believes that "scientific methods are the only proper method for studying human behavior" (p. 31). These three researchers say that most empirical research studies generalize a certain population by examining narrowly defined variables from a selected sample out of that population.

Most technology in education studies use the empiricism approach, such as the format of surveys and questionnaires to conduct research.

Critical theory is an “expansion of traditional Marxist ideology to include consideration of factors other than control of the means of production” (Willis, Thompson, & Sadera, 1999, p. 32). The critical theory originates from Marxism. According to Willis, Thompson, and Sadera, the critical theory paradigm embraces the methodologies of the historian and essayist and that of traditional educational research.

Third, interpretivism, the design I use in this study, is a “philosophy of science related to constructivist theory in psychology and to forms of research” (Willis, Thompson, & Sadera, 1999, p. 34), often described as qualitative. Interpretivists believe that it is difficult to make valid generalization about human behavior in social science due to individual differences. Instead of making generalization, Willis, Thompson, and Sadera (1999) say that interpretivism emphasizes understanding the individuals and interpreting them. What is true for a group does not necessarily stand true for another group, since each group might be unique in certain ways (Thompson, and Sadera, 1999). Different formats have been applied in interpretivism research, which include interviews and observations.

Willis, Thompson, and Sadera (1999) say the level of strictiveness from the highest to lowest is empiricism, critical theory, and interpretivism. According to Willis, Thompson, and Sadera the empiricist paradigm is the most restrictive because of its stringency in accepting studies as valid research, which should meet every detailed criterion; critical theory paradigm is the second most restrictive because it “imposes an

ideological framework on research”(p. 35); interpretivism is the least restrictive and very flexible because it embraces different forms of research.

Obviously, I have chosen the last paradigm, which allows a qualitative research design to conduct this study. The reason why I chose qualitative rather than quantitative design are:

1. My personal favor for qualitative research. Qualitative research is flexible and the least restrictive. Qualitative research is to understand the individuals. It does not require generalizations because interprets individual’s perspectives, which do not necessarily stand true for all, since each individual is unique in certain way and to some extent (Willis, Thompson, & Sadera, 1999).
2. My research questions determine that this study should use qualitative design because the purpose of this study is to investigate the perspectives of a group of higher education faculty members’ experience in a federally funded project. This study was completed in a natural setting and there was no experiment group and controlled group involved.
3. The third reason is a very objective one. Since the group of faculty members who have participated in this grant project is relatively small group, I am not able to obtain a sample size that is big enough to make valid and reliable generalization.
4. Past research studies have employed quantitative research designs on faculty members use of technology. ISTE (1999) suggests research that researchers should observe classroom activities, interview teachers, and analyze technology-based lesson plans to seek concrete evidence of effectiveness.

ISTE suggests that it is important to, on an ongoing basis, study examples of effective technology integration that reflect the current needs in higher education.

Pilot Study's Process

I have personally been involved in this project as a student and a graduate assistant. It is a backyard study. The approval from the Human Subject Review board was expedited because the participants involved are adults, who are college professors. After I received the approval, I started the data collection phase.

First, after I contacted the three participants by walking into their offices and emailing to explain my purpose of this study. Then, after I obtained oral approval from faculty members, I mailed them the consent form along with the demographic form. Then I searched the database, where I could locate their electronic journals in the first year summer institute, and I failed. At the same time I requested their course syllabi of the semesters subsequent to the summer institute.

Second, I scheduled interviews with faculty members. Based on the fact that faculty members have other commitments to make, appointments are totally adjustable and flexible to reschedule for faculty's convenience. Each interview lasted thirty minutes to an hour.

I audiotaped the interviews and I prepared a list of interview questions to cover. At the beginning of interview, I provided my synthesis from the analysis of the form to collect demographic information, the electronic journals, and course syllabi to confirm my analysis. During the interview, I probed at some questions that I was not sure or clear about and launched a few questions from the literature review. After the interview, I

transcribed the interviews myself and made three photocopies for each interview transcription. One copy is for original record. One copy is for the reading the coding. One copy of transcription is for cutting and pasting to categorize data.

Pilot Study's Findings

To protect faculty's privacy and ensure confidentiality, as I promised in the consent form, I have chosen a pseudonym for each of them in my transcription and report. Those individuals who have been mentioned in the interview have also been coded anonymously. Dr. Swanson, a male associate professor at the age of ranging from 45 to 55, has been teaching in university for 12 years. Dr. Bonnett, a female associate professor at the age of ranging from 45 to 55, has 18 years of teaching experience in elementary schools and has been teaching in university for 9 years. Dr. Greene, a female assistant professor at the age of ranging from 35 to 45, taught elementary schools for four years and has been teaching in university for 4 years.

Technology Use

Prior to the participation of the project, Dr. Swanson developed a website for the course he was teaching. Dr. Swanson used email for communication, Word Perfect for word processing, and Presentations, a kind of software, for classroom presentations. After the participation of the project, Dr. Swanson began to use Blackboard, which was reflected on the demographics form and the course syllabi. Prior to the participation of the grant project, Dr. Bonnett, a computer owner for fourteen or fifteen years, had a love-hate relationship with computers for sixteen years.

Prior to the project, Dr. Bonnett used computers as typewriters and found it very helpful in the writing process. Dr. Bonnett was completely satisfied with computers in that respect. In elementary teaching, Dr. Bonnett did games with children only for

motivational purpose. In higher education, Dr. Bonnett found computers to be essential. And prior to the project, Dr. Bonnett was involved in another project and became more familiar with the Internet. Dr. Bonnett attempted to have students email reflections before participating in this grant project. But it was totally unsatisfactory and aggravating due to frequent crashing problems with computers. Dr. Bonnett used computers as typewriters, used word processing program and some database and Internet. After the participation of the project, Dr. Bonnett began to use infocus and slideshows in class, and became more comfortable with Internet, database, spreadsheet and Powerpoint.

Prior to the project, Dr. Greene took a computer in education course, not required, while in a Master's degree program, and used computers mainly for word processing. Additionally, out of personal interest, Dr. Greene had a two or three-hour training session in PowerPoint. Dr. Greene developed a website for the course he was teaching. Dr. Greene used email for communication, Word Perfect for word processing, and Presentations, a kind of software, for classroom presentations. After the participation of the project, Dr. Greene began to use Blackboard to maintain communication with her students.

Experiences in the Project

About experience in the summer institute, Dr. Swanson did not "benefit that much per se". Although exposed to a number of different pieces of software in that summer workshop, Dr. Swanson is not using any of them. Out of that summer workshop, Dr. Swanson said it helped him recognize the limitations associated with all the alternatives available. So Dr. Swanson became more careful to study Hyper Text Markup Language (HTML) programming and got the File Transfer Protocol (FTP) program set up on computer. Again, Dr. Swanson emphasized the role of the summer workshop as a catalyst

to allow understanding the needs and how to meet those needs most effectively. When Dr. Swanson began to participate in the project, Dr. Swanson became more involved with the technical side of making technology happening in terms of website. Subsequently, Dr. Swanson found Powerpoint to be much more adaptable than the Presentation. Therefore Dr. Swanson made a transition from using Presentation software to the PowerPoint, which could upload to the website and to the Blackboard extremely easily. According to Dr. Swanson, a number of different things have happened as a result of the transition. The most important thing is the development of slideshow presentations. To make the transition, Dr. Swanson had to redo all the slideshows from the Presentation, which forced Dr. Swanson to rethink what should be presented in class, to analyze a bit more carefully, and to ponder how to present the information to the students. Dr. Swanson considers the grant project a catalyst. Watching other people using PowerPoint helped him realize the advantages of that software. Following that summer, Dr. Swanson redesigned the website from linear to less linear. Dr. Swanson made more external resources' links embedded in the course syllabus on the website to allow students to navigate more easily. As Dr. Swanson said, "I think I am more mature and sophisticated when I realized that once we moved and passed the initial developmental stage, where it was fun for you to do this." Subsequent to the summer, Dr. Swanson began to ask questions about the effectiveness of instruction through technology, and about how to facilitating the students' understanding and use of technology. When discussing the experience with the student technology mentor, Dr. Swanson reports not much accomplishment in terms of product. However, regarding the knowledge of the student technology mentor on Powerpoint, Dr. Swanson says that the student has been the one of the major reasons to move to

Powerpoint. The mentor has been very helpful and helped Dr. Swanson understand more about Powerpoint and other pieces of software.

About experience in the summer institute, Dr. Bonnett said it was okay, and there was a certain degree of frustration. But in terms of products, Dr. Bonnett thinks it is good, and in that summer he finished a website and had some experience with Powerpoint.

After the summer workshop and in the summer semester, the one thing Dr. Bonnett did different than before was utilizing PowerPoint presentation. The purpose of using PowerPoint is to help students see pictures in the book really large. At the end of the summer, Dr. Bonnett gave a technology assessment to students on their thoughts about technology used in the classroom. A couple of students liked it and some said that technology did not offer much more than a book would help. In the Fall of 2000, Dr. Bonnett tried Blackboard, which he was not completely satisfied with because of the superficial discussions online and unwillingness of one or two participants to join in. When discussing the experience with the student technology mentor, Dr. Bonnett showed great satisfaction with the first mentor, described as computer-savvy, knowledgeable, helpful with a lot of basic things, and exceedingly patient. The second mentor assigned knew less than Dr. Bonnett did and did not do much to help. The second mentor was willing to work, but she lacked knowledge of computers and made products that were of miserable quality or not the quality Dr. Bonnett expected. However, Dr. Bonnett said the relationship with mentors has been a valuable association on a personal and professional level. In the discussion of the word “mentor”, Dr. Bonnett suggested that mentors should be chosen in a more selective basis in terms of computer competency and proficiency.

About experience in the summer institute, Dr. Greene thought it was a little overwhelming to be exposed to so many different things. Dr. Greene learned a lot in that summer workshop. There were many types of technology introduced in that workshop, Dr. Greene thinks that some were too complex to learn in short time and chose to focus on developing web pages. Dr. Greene mentioned the exposure to the folk life website in one session was the very helpful in teaching social studies, and that was the first time Dr. Greene was aware of that. After the summer workshop, Dr. Greene, as required by the project, integrated PowerPoint into her courses. Dr. Greene asked the students to do oral history of family members using PowerPoint after she modeled the use of PowerPoint at the beginning of the class. When discussing the experience with the student technology mentor, Dr. Greene reported not much accomplishment. The mentor assigned to Dr. Greene was willing to do what Dr. Greene asked him to do, but lack of technological knowledge and difficulty in coordinating with the schedules of both parties, Dr. Greene said that the mentor had not done anything yet.

Current Application

Currently Dr. Swanson is doing three basic things with technology. One is the slideshows being used in all the classes that Dr. Swanson is teaching. The second is the website, and the third is the Blackboard website. Dr. Swanson displayed great satisfaction with Blackboard, particularly with the online testing capability and discussion board, which listserv cannot work as effectively regarding communication. Problems are always present in technology. But Dr. Swanson says the problems encountered are sporadic and relatively minor in nature. Some problems can be resolved with external technical support. Some problems are associated with students' attitude, while some problems result from the instructor's mistake. While tackling with technology, Dr. Swanson said

that it always required a large amount of time to solve problems and develop a plan. However, Dr. Swanson considers it worthwhile to spend a lot of time on such things as to meet the needs. In terms of the impact of technology that Dr. Swanson has incorporated into class, Dr. Swanson says that there is really no empirical evidence with the classes, but students have developed a more sophisticated level of understanding information than in the past. Dr. Swanson says that from the anecdotal data, students obviously benefit from the technology integrated into the classroom. Students are performing far better than four or five semester ago, and students are communicating more effectively than four or five semester ago. About fifty or sixty percent of the communication that Dr. Swanson has outside of the formal class meetings is electronic. While technology becomes a benefit to the students, Dr. Swanson has found it more beneficial because it allows rethinking and more targeting of the instruction.

Currently, Dr. Bonnett is using slideshows in one class, and using a website in another class offering links to the articles that the instructor has written. Dr. Bonnett is developing a Powerpoint presentation for the book she wrote and experienced frustration with the presentation. A number of authors that Dr. Bonnett has met do not use computers at all. It is much easier to carry those little slides around to do presentations than infocus machines and a computer, while computer crashes frequently due to insufficient memory or other reasons unknown. Dr. Bonnett says that uncertainty with technology causes fear and frustration. With regard to the Internet, Dr. Bonnett mentioned that it was amazing that someone who is interested in the course syllabus, articles and the books written accessed the website and contacted Dr. Bonnett.

Dr. Greene is teaching three classes. Dr. Greene does not feel confident in using things like LCD, because it causes trouble every time. However, Dr. Greene believes that motivation always overrules whenever needs come into play. Dr. Greene uses email as a tool to collect students' weekly reflections. According to Dr. Greene, using a Blackboard site for posting announcements, the sources of information are very helpful and readily available to check in every time. In one class Dr. Greene modeled the use of Internet to find sources of information for students. In another class, Dr. Greene said it was a class totally dependent on technology, which is done through compressed video. In the third class, Dr. Greene said that there was a lot of struggle in that class and nothing had been done regarding technology integration, because the course was expected to cover all the teaching reading methods in addition to many field experiences to engage students in practice. A large amount of time is definitely required for Dr. Greene to devote to the course content. Another problem that Dr. Greene encountered is the limited access to technology that those schools have where students have their field experience. However, Dr. Greene is hoping to integrate technology into that course because reading instruction is certainly a prime place to require students to do more with technology.

Future Vision and Plan

Regarding the future vision or plan with technology integration and implementation, Dr. Swanson says that reworking the website is imminent, not only in restructuring the site to be much less linear, but also in rethinking the content supposed to be covered in formal class and the content in class where technology is integrated. Dr. Bonnet will continually try to integrate technology into her courses. She does not see technology as the only way to enhance teaching and learning. Dr. Greene plans to incorporate more technology into instructions. Especially in training the students who are

going to teach young children, Dr. Greene thinks it is important to offer opportunities to those pre-service teachers to use technology in their coursework. At the same time, Dr. Greene expresses concern for the limited funding that schools have, which results in insufficient technology facilities and limited access to technology. However, Dr. Greene is hoping to make technology a larger component in courses in the future plan and it will be a gradual process to realize the goal.

Pilot Study's Discussions

Three participants were involved in this pilot study, two females and one male. Dr. Swanson and Dr. Bonnet are in their forties and fifties, while Dr. Greene is in her thirties and forties. Their teaching years of experience in higher education expand from five to thirteen years. Thus far I have displayed a picture of each faculty member's beliefs and practices with technology. There are some commonalities among the three faculty members and individual differences as well.

Project as a Catalyst

All three faculty members believe that technology is not THE answer to instruction. The purpose of using technology is to enhance teaching and learning. Technology is a tool, and so if one particular type of technology gets in the way, faculty should seek other alternatives.

The three faculty members all demonstrate certain level of satisfaction with the whole experience of the grant project. One is very happy to see the accomplishment in terms of product. The other two believe the project has provided a large variety of resources and expertise to motivate faculty's learning interest and rethink the goal of instruction. Walker, Ennis-Cole, and Ennis III (2000) say that teachers' positive

experiences in workshops and intensive institutes help promote a sense of accomplishment or self-efficacy.

Through the lens of the project, Dr. Swanson believes that the workshop served as a “catalyst” to move a little bit further and understand a little bit more clearly. Generally, Dr. Swanson perceives the project as a springboard that introduces a whole variety of opportunities, and helps participants move into directions. It has been a resource readily available, not only hardware and software, but also the expertise one needs at times and some conceptualizations of issues one is struggling with.

To Dr. Bonnet, generally speaking it is a happy thing to participate in this project, because she felt obligated to learn something new, which helps evaluate a large variety of students’ projects, such as web pages and PowerPoint presentations.

Dr. Greene thinks that the project has introduced a large variety of types of technology. And the whole focus on technology in the project has helped increase the level of confidence and require the instructor more to incorporate technology components into the classroom.

Individual Needs

Dr. Swanson says that it is necessary to have hardware that can serve the needs and not become cumbersome. The need to update hardware is always present. The second need for Dr. Swanson is the need of time to deal with the website, while Dr. Swanson is trying to structuring and organizing the website. He thinks it is important to update the hardware so that it can meet the increasing needs.

Another need is technical support. Faculty think that there are always problems with technology that they do not have sufficient technical skills to solve, so they are highly dependent on someone who is technologically savvy and has the expertise to deal

with the situation. Faculty members feel that there should be someone whom they can turn to whenever they encounter technological problems. So in this sense, technical support available plays an important role in helping faculty members ease from the pressure of learning new things and thus helps integrate technology into their classroom. Becker (1994) says available access to someone from whom teachers can learn or share experience with is very important in helping teachers incorporate technology, like computer software into their teaching practices. There is one issue in respect to current need of technology integration.

Network Influences

Another factor that has been identified in this pilot study that I believe influenced faculty's practices in integrating technology into instruction is the faculty member's social network. Dr. Swanson usually works in the computer with technical support around. He constantly discusses with the technician about the technology he is learning and expects to learn. He considers help from his colleague a very important and reliable source for him to learn.

Dr. Bonnet, has experienced a lot of frustration while learning technology. She mentioned that her friends in some schools simply gave up whenever they encountered problems with technology, even without bothering to seek technical support. The authors that this she has met do not use PowerPoint to do presentations; instead they use the traditional slideshows. So I believe that peer's view and practices might influence faculty members' beliefs and practices to some extent.

Personal Interests Influence Practices

It is not surprising to find out that faculty's personal interest in technology is highly related to their motivation and adoption of technology. Therefore, the more

interest one has, the easier it is to learn and incorporate technology into practices.

Personal interest is also related to self-confidence and comfortableness. If faculty does not have interest in learning technology and bringing technology into classroom, there is always reluctance to change the practices and resistance to learn technology, not to say technology infusion. As resistance exists, the level of confidence and comfortableness is crucially influenced even though faculty feels forced to bring technology into classroom to keep up with time.

One interesting finding related to personal interests discovered in this study is that among the three participants there are two female faculty members and one male faculty member. Male faculty demonstrates higher motivation than female faculty members and the youngest faculty member express more interest in learning more technology than the two older faculty members. Ertmer and Hruskocy (1999) say, the challenge that teachers face is to change the way one teaches, which is entrenched. In considering the idea of integrating technology into their in instructional activities, many teachers will find it difficult to confront their established beliefs about instruction and their traditional roles as classroom teachers. Ertmer says (1999) internal barriers, intrinsic to teachers, include teachers' beliefs about technology, traditional teaching style and reluctance to change and more difficult to deal with and overcome. In addition to faculty members' individual beliefs and practices, gender difference influence faculty's adoption and integration of technology. Becker (1994) reports that to extend teachers' practices that incorporate technology is not only dependent on teachers' personal interest in technological activities, but also highly correlated with gender. Becker believes this might be related to our culture, in which more males have patterns of personal interest that are "technical,

mechanical, and numerical” (p. 311), which is consistent with having a deep interest in technology, specifically with computers.

Technology’s Impact on Students Influences Instructor’s practices

All faculty members see technology has a positive impact on students’ learning to some extent. Through technology, students are no longer limited to communicate with others and the instructors. By using technology in their learning, students demonstrate enhanced learning outcomes in terms of products and activities.

One faculty member mentioned teaching preservice teachers by modeling and requiring technology use in instruction so that preservice teacher can follow and integrate technology into their academic activities and future classroom. By watching how the instructors model the use of technology, students are able to use technology in their own academic activities and explore different learning resources. Dawson and Norris report (2000) that their findings demonstrated that technology integrated into classroom by the instructor increased the possibility that preservice teachers transfer the computer skills into their classroom as compared to preservice teachers who learned computer skills in an isolated manner.

However, if students are not enthusiastic about technology in their classrooms, the instructors are less likely to integrate technology into classrooms. Dr. Bonnett says that some students are really excited about website. About the discussion board once used, Dr. Bonnett says that only two of her students were enthusiastic and the other three students did not like it. Dr. Bonnett says that discussion board did not go into more deeply in discussion as expected. And Dr. Bonnett mentioned that maybe age does play an important role in preventing the students from accepting technology because everybody

in Dr. Bonnett class is at least over 35, while in 1986 computers and Internet were barely unfamiliar to them when they were in college. Dr. Bonnett believes that the resistance results from the fact that the students could not feel the need or see the value of it. However generally students appreciate the resources available in the website so that students could access online rather than go to the library and find it themselves.

According to Dr. Greene, students usually choose to do project with the technology that they are familiar with or have some knowledge of. Many students express initial anxiety about doing anything related to technology, but at the end students are happy to have learned something new and solved problems. By comparing PowerPoint presentation and traditional presentation, Dr. Greene has seen enhanced presentation through PowerPoint. Another advantage that technology brings to students is students are no longer limited by classroom. In that compressed video class, Dr. Greene said that student did not need to drive for a few ours to campus to have class, neither did the instructor.

Time, the Biggie

All of the faculty feel time is always imminent because it always requires a large amount of time to deal with technology, with the techniques and problems. To the two female faculty members appears to have higher demand on time. In Becker's report (1999), the distinguished difference of exemplary technology use between female and male teachers in Becker' study indicates suggests that female teachers usually have higher demands on time. And if faculty members are not allowed sufficient time to construct their lesson plans, it may crucially result in ineffectiveness of integrating

technology into classroom. And obviously sufficient time is a very crucial external factor influencing faculty members' effective use and integration of technology (Ertmer, 1999).

Dr. Bonnett says that it is exceedingly time consuming to deal with technology. So most of the time, rather than trying to work out problem alone, Dr. Bonnett turns to some graduate assistant to get help. From the conversation, Dr. Bonnett demonstrated lack of interest and comfort, which results in certain level of resistance. And Dr. Bonnett says it is difficult to see the betterment with computers. Instead computers get in the way and computers, as a tool could be more effective in some courses than the others in terms of enhancing students' learning. Computers create uncomfortableness because Dr. Bonnett thinks that hiding behind computers takes a little bit of "Who I am".

Dr. Greene says that time is always an element to her. Dr. Greene wishes to learn more about designing web pages, but at the same there is no pressure of meeting this need because there is someone like a student technology mentor that one can depend on. However, having mentor do what the instructor would like to do requires time to pre-plan.

Implications for the Dissertation Study

The pilot study is the foundation of the subsequent dissertation study. It helps discover the research questions identified in the literature review, identify the issues that are consistent and inconsistent with the previous studies. From the data analysis of this pilot study, several issues such as gender, social network, and resource constraints were raised, which helps refine and expand the interview questions to be used in the subsequent dissertation study. This pilot study helped improve the methods of collecting data; therefore it helps navigate the dissertation study and focusing more on the topic and

methods. The interview questions were revised and reorganized. Course syllabi were continually included data to be collected. To support the interview data, I developed guidelines for observations in university classrooms. Technology projects the participants were working on during and after the summer institute were included as one source of data collected for the dissertation study.

Research Stance

This dissertation study investigated perceptions of faculty members who participated as both the first year and the second year participants in the grant project. Qualitative research best suits this study. Bogdan and Biklen (1992) say that the characteristics of this kind of study are that data collected is termed soft. Rich descriptions of people, places and conversations are provided. According to Bogdan and Biklen, the purpose of this kind of research is not to seek yes-or-no answers. Instead, it is to understand people's reality constructed in their specific context.

The methods that were used most frequently in qualitative research are participant observations and interviewing. Bogdan and Biklen say that participant observations allow the researchers to enter the world of the people and helps researchers "systematically keep a detailed written record of what is heard and observed" (p. 2). According to Bogdan and Biklen, use of interviewing leads the researcher to spend considerable of time with subjects to understand the subjects more deeply by asking open-ended questions. In addition to the methods mentioned above, Bogdan and Biklen state that materials such personal documents, artifacts and official documents are used as supplements to understand subjects.

The nature of this study is an interpretive study. According to Glesne (1999), the purpose of interpretive study is to “understand and interpret various participants in a social setting construct the world around them” (p. 5). Glesne says that interpretivist researchers interact with participants about their perceptions.

In this grant project, faculty members were recruited to participate in the technology-based project to learn technology and make effective use and integration of technology into classrooms. Four data collection methods were used in the dissertation study: documents, artifacts, observation and interviews. Documents include demographics information on the faculty members, course syllabi from the current semester, and some artifacts, such as the projects they completed as required by the grant project. Most of the observations were conducted in the whole session. This study used the form (see Appendix D) to collect demographics information, such as age, experience with technology, expertise. Interview questions were initially formulated in the pilot study. Based on the literature reviewed and the data analysis of the pilot study, interview questions (see Appendix E and F) were refined and the scope of information to be collected is expanded. Review of the evaluation data of this grant project is partially contributed to the modification of the interview questions of this study. Observations were scheduled during the interviews and were conducted for every course that the participants were teaching current for three consecutive times. Each observation lasted at least half of the session if the course is a three-hour-class, (see Appendix G).

Research Context

The institutions investigated are located in a city of a southern state. Informants were selected from two institutions, one public and one private. The public institution

was established by the state legislature to bring public-supported higher education to the state's largest urban complex. In the early 1960s, the name of the public institution was changed from some name affiliated with the state institution to a fully independent one. This institution and eight other member schools of the National Universities Degree Consortium (NUDC) began the country's first bachelor's degree program for "distance learning " courses delivered exclusively by cable television and satellite broadcast.

The private institution is located in the same city as the public institution. Chartered in 1912, the private institution is one of America's 28 Jesuit institutions of higher learning. The private institution is a Catholic university, and its educational commitment is to emphasize the valuable Jesuit tradition of educating the whole person.

This study involved both first-year faculty participants and second-year faculty participants who participated the grant project. Totally six informants coming from public and private institutions were selected. Three informants came from the public institution and three came from the private institution. All of the informants are faculty members in Education. The reason for selecting this group in the area of education is that, as technology demonstrates its potential to shake the foundation of education and becomes part of our daily life, the demand for teachers to make effective uses of technology in their classroom is increasing as well (Zhao, et al, 2001). However, it is identified that over 75 percent of higher education faculty members are not integrating technology into their classroom while only 15 percent are using technology in their instruction (Gilbert, 1996). In the OTA's 1995 report, it is reported that technology is not made to the core of the preservice teacher education programs in most colleges of education (Gilbert, 1996; OTA, 1995; Thomas & Cooper, 2000). Based on the studies and research, I believe that

it is necessary and important to examine the attitudes, approaches and practices of those technology-using teachers. The information will be important to both teachers and policy makers to help teachers make effective use and integrate technology.

Sampling Methods and Informants

Five informants participated from two institutions, one public and one private. The sixth potential informant was unable to participate. They came from the first year and second year of the project. Both the public and private institutions are located in the same city in a southern state. Selecting faculty members from different sites rather than from just one helps increase the credibility. The faculty members selected in this study come from different departments in areas of education. I believe the variety is another way to increase credibility.

All five faculty members come from one public institution and one private, Catholic institution. Whether the informant is from education is the first criterion for selection here. I first emailed all participants from year one and year two projects. Then eliminate the one who lacked of interest in participating. Then I did further investigation and eliminate the part-time instructors and full time faculty members who are doing completely on-line courses and distance teaching. The number of potential participants left was eight with teaching experience in higher education ranging from five years to thirty years. Among the eight, one is male. I did not intend to compare gender differences in technology use. Therefore, the male informant was eliminated from the list. Finally, six participants were selected to be involved in my study. However, due to heavy teaching and research responsibilities, the sixth participant had a difficult time with

schedules. So, close to the middle of the study, the number of participant was reduced to five.

Research Questions

Technology has significant impact on both teaching and learning. However according to the limited research on higher education faculty members, many faculty members are not making effective use of technology and are not preparing their students for their future application effectively.

Along with the emerging technology and its rapid development, teachers are facing the issue that there is an increasing need to integrate technology into their classrooms. However many teachers still are not making effective use of technology in their classrooms. This situation is related to the environment where the teachers are working and their personal pedagogical beliefs and practices. Some researchers indicate that positive experience with technology will facilitate teachers' use and integration of technology.

So based on the literature and the research studies, the following questions were formulated in the following:

1. How has participation in the technology-based project influenced faculty members' beliefs and practices with technology integration?
2. What are the factors that influence faculty members' practices regarding technology?

With the two questions on my mind and the literature reviewed on teachers' use of technology, I formulated the initial interview questions for my pilot study. The interview questions covered questions about faculty members' attitude toward their

participation of the technology based grant project, questions about their previous experience with technology prior to the grant project, their current application of technology in classrooms, and their perceptions of various factors such as ongoing technical support, that influence their use of technology. Based on the data analysis from the pilot study, interview questions were refined based on the data analysis in the pilot study. More sub questions under each question were probed, such as class size to consider more factors that might have influenced faculty members. In the interview questions, faculty members were asked about their technology application in classroom and how they model the use of technology. So, I asked the informants for permission to conduct observations if they were integrating technology into their classroom activities. At least one observation from each participant was conducted.

Procedures for Conducting the Study

I had a broad review of literature in higher education faculty members' use of technology before my pilot study. The pilot study helped me develop a better understanding of my topics and refine the interview questions used in this study. Review of evaluation data, which includes interview questions and transcription, and reading publication and reports of this grant project, was another source that I depended upon to broaden the range of information I should collect for my study.

Since the research questions determine the purpose of this study is to understand and interpret how individual participants in a natural setting “construct the world around them” (Glesne, 1999, p. 5), qualitative design is used to fulfill the goal. Various participants have various perspectives. To explore their internal world, the researcher should establish in-depth, and long-term interaction with people to have a deeper

understanding. After obtaining the consent form from the two institutions, I started to contact faculty members who participated in the grant project.

Establish Rapport

I had an initial contact with each participant by email. I stated my research goal and showed my neutral standpoint no matter what level they are with respect to technological proficiency. Then I made phone calls to schedule a specific time for them to meet me to allow me to discuss the details about my research study.

I composed a letter to each participant. This letter introduces myself and provides the rationale of my study. The need to identify education faculty members' use of technology and technology integration is emphasized in the letter. A few statistics displaying low percentage of teachers using technology was provided and this further emphasizes the importance of this study and the valuable information that faculty members would provide to identify the factors of successful integration of technology or their uncomfortable experience. Faculty participants were notified that the information would be extremely helpful for other teachers who have not started to integrate technology into their instruction and help them build their confidence in using technology.

Along with the letter, the consent form was mailed after I made the initial contact. The consent form was to assure them of their rights and ensure the confidentiality of this study would be protected. A gift made by myself was given to them with the letter to show my appreciation of their cooperation. This gift is a piece of traditional Chinese paper-cut handcraft. I consider it a very important factor that influences the relationship that I was trying to establish at the beginning, because I do not want to give the

participants the impression that I, as a researcher, am just using them as variables in my practice. A gift that is made by myself and expresses my culture would be the best and appropriate way to establish trust and rapport at the beginning.

Data Collection

Qualitative methods were used to collect data. There were initially six faculty members that participated in my study. Three came from a public institution and three from a private institution. In the final study, the number was reduced to five because the sixth participant was unable to participate. Data came from five sources. The first is the form that faculty members filled out to provide some demographics information, such as age, name, gender, teaching experience, expertise, and technology experience. This form was mailed to them or given to them after the first contact. The second is artifacts informants had made when participating the grant project, such as web pages they developed. The third source is documents from the participants. Documents include course syllabi of the current semester and journals submitted in the summer institute. Journals were collected after the interviews from only two faculties who reported that the summer institute had no significant impact on them their journals submitted in the summer institute and their course syllabi from the current semester. The fourth source is in-depth, semi-structured interviews, one interview for each participant. The number of observations depends on the classes into which the participants are integration technology. The last source is my observation notes. Fifth, observations were conducted after interview with each participant. I scheduled the first observation in the first interview with the participants' suggestions. Following the first observation, two consecutive observations were conducted after the first one in the same classrooms.

At the beginning of the interviews, I first introduced myself and explained the purpose of my study, the goal of which was to investigate higher education faculty members' use and integration of technology as well as to complete my dissertation project. I assured faculty members that I was not personally biased toward the use of technology, so both negative and positive information were invited.

At the beginning, I assured faculty members of the protected confidentiality and their rights to participate or withdraw at any point of the procedure. I offered them the choice to choose a pseudonym for coding. If faculty members were not concerned about this issue, I chose a pseudonym to represent the participant to follow the use of human subjects regulations. Faculty members were assured that transcriptions would be kept in a confidential place and the tapes of interviews would be destroyed after I transcribed the interviews.

I transcribed all the interviews myself. Because I am an international student and my first language is not English, during the process of interview transcribing and transcription analysis, I might have misunderstood or missed some important information. To ensure the accuracy, I gave them a copy of the transcription after data collection was completed to verify my interpretations. In addition, I gave each informant a copy of my summary of the whole group at the end to read and reflect on their experiences. I was hoping this could help the informants identify some information they forgot to add or I misinterpreted. The summary of the whole group was anonymous. All informants were welcome to give me feedback and correction. According to Glesne (1999), this method is called member checking, which allows participants to verify the accurate representation and interpretation. At the same, I kept constant communicating

with the methodologist I chose in my committee and my major professor for identifying flaws and accuracy of my interpretation and summary. With the assistance of external auditors, I believe that it increases trustworthiness along with other methods I used.

During the interviews, I settled observation dates with my participants. Observations were conducted after interviews.

Data Analysis

Based on the demographics information about previous experience with technology, interview questions (Question 1 and 2, Appendix F) that address this question were prompted and probed on an individual basis.

The observation notes, course syllabi, journals and technology projects collected were evaluated to see if they conform to the information that informants provided in the interview. And the information yielded from the three sources was used to facilitate the interpretation of interview questions.

With the interview transcriptions, I first grouped the interview questions into four categories: beliefs and practices with technology prior to the project, experience during the project, current application and future vision, and their future vision and plan regarding technology integration. Then I mapped the information using quotes from the transcription into each category. I compared all 5 participants' four categories, and I was able to develop a whole vision of my findings. The technique used to present data was quotes and tables. Bernard (1994) says quotes can lead the reader to understand quickly, and using tables, charts or map helps the researcher and readers understand what data say. Tables are especially helpful in organizing large amounts of data. By laying out data

using tables, researchers organize and display data in a way that facilitate understanding and interpretation more clearly and effectively.

Observation data and information from course syllabi were used as back-up data to support the section of current application in the interview. Journals and artifacts were used to verify their report of their experiences and learning process in the summer institute. By mapping out multiple streams of data in chronological order (see Appendix H), I identified emerging themes from the data.

Directions for Analyzing Themes and Emerging Themes

According to Wolcott (1994), there are three major means to transform data: description, analysis, and interpretation. To find themes and make connections of themes, I used all three methods.

The demographics information, interview transcriptions, and observation notes are the major sources of data. With the demographics, background information of each participant was described according to the original recorded data. Description was used here to represent participant's demographics.

Interview transcripts were coded. I developed a code list (see Appendix I) for one participant as within-case analysis. Data from other sources were coded and added into the list. After I developed the code list, I started coding other participants' data and compared the other participants' data with the first one as cross-case analysis. If more themes emerged, they were added to the code list.

A conceptually ordered display, which was developed based on the code list imbedding the interview data and other sources of data, for factors that influence faculties' teaching and learning was used in facilitating identifying themes and presenting

findings. Among themes, I have identified the commonalities among the participants and discovered the relationship among the themes. This method, according to Wolcott (1994), termed analysis, extends description in a systematic way and helps research develop patterns in data analysis. The data display the commonalties as well as individual uniqueness.

Log of Planned Activities

All participants involved in this study are faculty members. My research study did not put any participant in any risk, and I assured confidentiality of voluntary participants. For the above reasons, getting consent was expedited. Then I started the planned steps.

The first step was mailing out the letter, consent form, demographics information form and the thank-you gift. This step is a crucial step in my study because without participants' consent, I would not be able to continue.

The second step was analyzing the demographics information form so that I was able to have a brief understanding of particular participant.

The third step was contacting the participants to schedule an interview to investigate further about their experience of this grant project, their beliefs and their practices.

The fourth step was transcribing the interview. I transcribed the interviews using transcriber and word processing. After I finished the initial transcribing, I listened to the tapes again to verify the transcripts' accuracy. For each interview, I developed a summary and sent it to the participants to make sure of the accuracy of the transcriptions.

The fifth step was doing observations in informants' classrooms and collecting artifacts from informants. Organizing observation notes and analyzing artifacts were

followed back from the field. Data collected from observations and artifacts analysis were imbedded in the summary of interviews and were mailed out to the participants.

The sixth step included two activities. The first activity was writing the analysis on my part. Then I mailed out the summary along with a copy of transcription to each informant. When I received feedback from my participants, I was able to revise my part of interpretation based on the participants' corrections and comments, which was my second activity.

Technology Used

Faculty members in this study were contacted by either telephone or email. Email was extremely helpful and convenient in terms of effective communication. Another technology used in my study was tape recorder and computer. A tape recorder was used to record interviews to help me complete my notes that I scribbled during the interviews. And all transcriptions, observation notes and artifacts were saved in my personal computer. I used tables in Microsoft Word to organize and display data.

Triangulations

According to Glesne (1999), triangulation is one of the important ways to augment trustworthiness of research. By triangulations, Glesne means use of multiple sources, methods investigators and theoretical perspectives. Observations, documents, artifacts and interviews were used in this study as the major methods to collect data. The evaluation data of this grant project, previous interview transcriptions, reports and publications of this grant project contributed tremendously in identifying all the important questions and issues before the study. This study includes multiple streams of data, which form good triangulation. And I believe the data collected identify all possible

questions and issues among this particular population and had answered analytic questions to full extent.

Trustworthiness

My Background

Before I conducted the pilot study, I spent a summer reviewing literature and reading reports. I believe that reading the topics that I am interested in is the key to understand my topics and what I am expecting from my study. I have been a member of Association of Educational Communication and Technology (AECT) for 12 months, and I receive a bi-monthly issue from the organization, a source that can broaden the scope of my knowledge about the topics of my dissertation. As an AECT member, I have the priority to log on in their website to read articles online and review previous issues. From all different sources of information, I can develop a comprehensive understanding of my research theoretically and practically.

Personally I was involved in this grant project from the spring of 2000. I was hired as a Student Technology Mentor (STM) then. I participated the summer institute in the summer of 2000 and had some discussions with some faculty members in that summer. After that, I was assigned to some faculty member to help with technology integration and implementation projects. In the spring of 2001, I was hired by the project director and had been working as a graduate assistant. I have been an observer, an assistant involved in the technical support and evaluation process. I consider all the activities that I have participated other than a research have helped me develop a better understanding combined with the literature I have reviewed. So I know whom I am investigating and what I am supposed to discover. Personally I am biased toward the use

of technology. On one hand I believe technology can enhance the students learning interest and outcome. On the other hand, if faculty members think technology is not enhancing their teaching and students learning, they may not use it at all. But I need to know the reason, which might help them develop possible solutions. The goal of this study is describing and interpreting participants' subjective perspectives and activities. Findings were not favored toward any particular participant or model. To objectively demonstrate faculty members' beliefs and practices with technology after they participated in the technology-based project is the main focus and goal of this study.

Method

Glesne (1999) says that trustworthiness is a very important issue to consider in a qualitative research. There are multiple ways to augment research trustworthiness (Creswell, 1998; Glesne, 1999; Lincoln & Guba, 1985). According to Creswell, Glesne, Lincoln and Guba, prolonged engagement and persistent observation is one way to develop trust, and learn the culture. Before this study and my pilot study, I personally participated at the first institute for student back in the year 2000 and I have been involved since then. I have been assisting some faculty members in technical parts, such as software application; I have been involved in the evaluation process. I believe that I have developed a good understanding of this particular group before I conducted the study.

Multiple methods of data collection are the other ways to increase trustworthiness. In this study, I selected participants in multiple sites, and I refined interview questions based on my pilot study and the evaluation data. Even though in-depth semi-structure interview is the major method to collect data, selecting participants from different sites

and reviewing evaluation data of this project help reduce the potential danger to jeopardize the trustworthiness.

Member checking is used in this study to increase validity. I shared interview transcriptions, analysis with the participants to verify my correct understanding of their ideas. According to Creswell, Glesne, Lincoln and Guba, member checking ensures the accurate representation and interpretation of the researcher.

External audit, another important way to increase trustworthiness, is used in this study. My major professor has been supervising my study, and I had maintained constant communication with my major professor. Besides I have chosen a faculty member in my department to be my methodologist, who has been examining my research process and product. She is highly qualified to be the external auditor because she personally is a qualitative researcher. She used qualitative design in her dissertation research, and she has studied with Lincoln using qualitative designs. I have maintained an on-going discussion on methodology with the two important auditors. I believe their guide has been one of the utmost important sources that I have depended upon.

Threats

It is very unlikely that participants have experienced any risks in the investigation. Time and effort are the main contribution that faculty participants have made. Their participation was voluntary and they could withdraw from the investigation at any time.

At the beginning of this study, every faculty participant received the letter that explained the purpose of my study. I could continue collecting data only after I received consent from faculty participants. Frequently I assured the faculty participants of protected confidentiality in the letter, and in the interviews. I offered them the choice to

choose pseudonym for coding purpose. Even though they do not mind me using their real name, I have chosen pseudonyms in the interpretations.

However confidentiality is promised from the beginning to the end of the study, I could not guarantee that future readers could not trace the possible identification of some participants in the interpretation because I personally was involved in this grant project before and during this study. I believe people are able to recognize this grant project from their knowledge about my background. Therefore readers might be able to identify some of the participants.

Summary

This study, like any study has boundaries and limitations. The population of this study deals with higher education faculty members and their experience in a federally funded technology based project. The informants in my study come from private and public institutions. However the purpose of this study was not to make generalization to this population, I am not concerned with the generalizability of my study. The purpose of this study was to investigate faculty members experience in this grant project and their beliefs and practices with technology. In one hand, I deal with the subjective world of faculty members, and in the other hand, I interpret their internal world in an objective way. I am not biased toward any model of using technology or beliefs. As long as faculty members share with me their experience and their sincere comments and thoughts, I think my goal is achieved.

There are several issues concerning trustworthiness that have been addressed in the particular section. Different sites selection, member checking, external auditor, and

triangulation were the primary ways to increase trustworthiness of this study. I believe trustworthiness is augmented to its fullest extent.

CHAPTER 4

FINDINGS

Introduction

Yes, I was (intimidated by technology). I have to tell you this, that in the early 90s, I got a computer by participating in a grant. I really used it like fish tank. I had a pretty screensaver with fish on it. I really turned it on everyday just to use it as an aquarium, because I didn't know what else I could do with it. (Laugh). So I was very intimidated.

----Patricia Murray

This study involved five education professors from two institutions, one public and one private. All five participants are females with their ages range from 45 to 65. The pool of participants is small. Only thirteen education faculty members from both public and private institutions participated in the technology-based project. After I eliminated the faculty members who were teaching distance education courses and those who did not respond my contact emails, I had only eight participants, one of whom was male. I did not intend to compare the gender differences in technology use. Therefore I eliminated the male participant. To have the years of teaching in higher education expand as broad as possible, I chose six participants and ended with five informants. The purpose of this dissertation, which involved all female professors is to report how they are learning and teaching technology in their areas, not to compare the gender differences in using technology. To protect participants' confidentiality, the institutions they come from and their subject areas are not revealed.

Description of Informants

The five informants involved in this dissertation project are Patricia Murray, Corrine, and Isabel Cherlin, from a private institution, and Donna Sawhill and Candice Schindler, from a public institution. Two of the three informants from private institution are in their forties and fifties, and the other is in her fifties and forties. Patricia has been teaching in higher education for 30 years; Corrine has been teaching for 18 years in higher education level, while Isabel has 21 years of university level of teaching experiences. Donna Sawhill and Candice Schindler both are in their forties and fifties. Donna has 9 years of teaching experience in higher education, and Candice has 7 years of experience teaching at the college level. All five participants have doctorates and are full time faculty members in the two institutions. Their years of teaching experience in higher education range from five years to thirty years.

Four participants are in their forties or fifties, have teaching experience in higher education from seven, nine, fifteen to twenty one. One participant is in her fifties or sixties and has been teaching undergraduate and graduate for thirty years. All of them have had some experiences with technology prior to the project. Types of technology that the five participants learned and used includes email, PowerPoint, word processing, web publishing tool, audio-visual equipment in long distance education Internet searches and computer software in specific content areas, such as mathematics and research. Isabel Cherlin developed a web page prior to the project and the rest of the participants did not have a web page. The five participants developed their own web pages during the participation in the project. Currently types of technology they are using are PowerPoint, LCD projector, Web publishing tools, digital camera, digital video camera, and

Blackboard in addition to the ones they used prior to the project. From the tables that display the types of technology that the participants were using prior to the project and they currently use, we can see the tremendous increase of personal use and the expansion of the scopes of technology.

TABLE 1

Demographics and Professional Experience

Gender: Female 5 Male 0

Age: 15 - 25 _____

26 - 35 _____

36 - 45 _____

46 - 55 4

56 - 65 1

above 65 _____

Years of Teaching Experience in Higher Education:

0 0

1 - 10 2

11 - 20 1

21 - 30 2

> 30 0

TABLE 2

Technology Use

Technology Use Prior to the Project

PowerPoint and Similar Presentation Software	1
WebPages Design	1
Email	5
Spreadsheet	5
Word Processing	5
Software in Mathematics	3
Software in Research	3
Internet Search	5
Graphics	1
Video	1

Technology Currently Used

PowerPoint and Similar Presentation Software	5
WebPages Design	5
Email	5
Spread Sheet	5
Word Processing	5
Blackboard Course	5

Internet Search	5
Digital Camera	5
Digital Video Camera	5
Video Camera	4
Videos	5
LCD	4
Web Xing	1
Stereo Microscope	1
Software in Mathematics	3
Software in Research	4
Software in Social Studies	3
Graphics	3

Descriptions of Findings

All five participants are active learners in learning technology. Two of them are more comfortable with learning at this stage. There are some integrating technology activities reflected on the course syllabi and the artifacts such as websites. The other three participants had more experiences with technology and participated in some workshops offered through the state. They are using technology frequently in their classrooms and require their students to use technology extensively. After they participated in the project, they continually seek opportunities such as conferences and workshop to learn technology.

Description of findings will be organized in four categories: beliefs and practices with technology prior to the project, experience during the project, current application, and their future vision and plan regarding technology integration. The structure of data analysis will follow the categories of the interview protocol. I wove the information using quotes from the interview transcription into each category and data collected from the observations and analysis of artifacts.

Beliefs and Practices with Technology Prior to the Project

All participants perceived themselves as students regarding learning technology. They all believed that constant practices improve their learning. Four of the five participants participated in some workshops offered either through the universities or through the state. The reason that they took the workshops is because they all believed that they should constantly reeducate themselves and keep abreast with the current literature. One participant benefited from the workshops significantly and practiced right after the workshop. However in the workshops some participants attended, two of them

did not consider it a large impact on their subsequent practices with technology. One reason is the pace of those technology workshops was too fast and intense. Since the pace was too fast, some participants did not get opportunity to practice the skills and they said to me that they just forgot to do it if they did not practice. Candice says, “As a learner, I participated in one web design class that I didn’t complete and I didn’t get much out of it. Because there were like 25 people in the class and the instructor didn’t have time to go to each individual who need help. So I just learned the terminology. I figured if I take some time and sit down with it, I would have learned it better.” The other reason is lack of individualized support. But there was certain impact individually such as learning with other teachers in the workshop and increase of comfortableness and confidence. Isabel experienced how individualized support helped contributed to her survival in a workshop. She said, “ [workshop] They were going like this (snap). The assumption of everybody was that everyone had used a computer already. And I didn’t know my way around and I was really at my learning curve with the first course....It was terrible. The lady who sat next to me had been the most wonderful and patient person I the world. Her name is Amy. Although I didn’t want to bug her, stop her from what she was doing course it was really fast paced.

As a Learner

Patricia Murray took two courses prior to the project and reported that the two courses “really built my confidence about some simple things.” She learned word processing, PowerPoint and a spreadsheet. But most of the time it was “pretty much limited to email and using word processing” for her academic work. She considered herself as “very much a beginner”. And she felt she “didn’t know where to go.” She said

prior to the project she was “very intimidated”. But learning in a group helped her relax, because she “really much prefer than alone”.

Corrine Miller’s learning style is project driven and learned technology on her own. She like to be “engaged in inquiry in curriculum and that’s what leads her to find out how to use technology better.” She said she used directories, guides for technology use. But she tended to want to learn more only as she felt the need. Moreover, she said, “my comfortable level often depends on how much privacy, in sense of dignity, project and learning situation accommodates.” If the pace had been really fast and her colleagues around impatient with her mistakes, then she would become very impatient with her mistakes. She identified herself as a learner as well. She says, “Part of me is still a student.” “When there is some freedom to explore, mistakes are counted, and it seems that there are opportunities to learn,” she is willing to make mistakes, even publicly. “To learn something like technology, I repeated, repeated and repeated”. That’s how Corrine Miller was learning technology prior to the project.

Isabel Cherlin was a Macintosh user. She started word processing a good many years ago. Prior to the project, she went to two courses, each a workshop offered through the state. The workshop was offered primarily for K-12 teachers and the whole course was taught on IBM -compatible platform. She says, “And the whole course was taught on IBM. So while I had to learn the applications and such and I also had to learn how to use this computer. They were going like this (snap). The assumption of everybody was that everyone had used a computer already. And I didn’t know my way around and I was really at my learning curve with the first course. But the second course that same semester, I knew my way around IBM. So it is much much easier. And then at the same

semester, we had to do what we called redelivery. These courses each were 7 days long from 8:00 in the morning to 5:00 in the afternoon. So they were really intensive courses. Well, we learned a lot of applications. And they showed us how to develop lesson designs based on the technology standards and whatever content standards we have.” Fortunately, in the first course she persevered to learn her way around the new platform as well as new applications under the quick and intense pace. She met a woman who was “very patient” to help her around in that first course. At the second course in that same semester, she felt it much easier because she had adapted herself to the new platform. And then in that same semester, she practiced what they called a “redelivery” courses. Isabel Cherlin said that in those redelivery courses she learned many applications and was introduced how to develop lesson designs based on the technology standards and content standards. In the following fall, she took another course through the state. She felt frustrated and panicked while learning technology, but she “practiced those skills a lot”. She said “if you learn something new like this, you need to immediately use it before you forget how to do it.” In the workshop, instructions were easy to follow and helpful. But much of what she was doing was a lot of self-teaching. She demonstrated her significant motivation to learn and her strength to survive.

Donna Sawhill took technology workshops prior to the project, but she said those workshops were not as “mobile” as this project, and “too much and scattered”. Those workshops did not have much impact on her practices. Candice Schindler preferred “hands-on activities” and believed “learning by doing”. She reported, “As a learner, I participated in one web design class that I didn’t complete and I didn’t get much out of it. And that was it. Because there were like 25 people in the class and the instructor didn’t

have time to go to each individual who need help.” She learned the terminology from that workshop. She practiced and experimented especially on a laptop.

As a Teacher

All five participants had were using some technology in teaching prior to the participation of the project. Their use of technology ranges from word processing, Internet, audiovisual equipment used in long distance education, to PowerPoint presentation and web page design such as Netscape composer. All participants used emails and word processing prior to the project. Some of them use more software in specific areas such as Math and research. One participant developed web pages prior to the project. What the participant did on her web pages was provide information from communication, self-introduction to course links, links of her interest, and her research projects’ links.

All participants believed that technology is a tool that can be used in curriculum and instruction to enhance their teaching and students’ learning and an important way to deliver information and communicate. However, they believed that technology is not the only way and there are other alternatives. They believe that technology should be incorporated into the curriculum and instruction as an important component because their students come and live in a technological world and deserve to learn from the instructors. Patricia says, “And my students are coming from high school and even grammar school, you know where they learned technology, so they knew more that I sis. So I just felt I have a personal obligation.”

Patricia Murray saw her students know more and more each year and realized how much she did not know. So she took two introductory courses concentrating on

windows and windows environment such as EXCEL, ACCESS, and WORD processing. She said, “I truly feel in my students’ lives (technologies) were put in a much central role, for instance it didn’t in mine certainly when I was about their age. And I felt that I had to model the use, not just tell them that they need to do this that I need to learn to know how to do this also. I saw it not the center of teaching, but I saw it as a extremely important learning and communication tool.”

Corrine Miller was mainly responsible for teaching faculty and teaching a course in distance education technology prior to the project. She believed that technology is valuable to some degree when dedicated to some purpose. The purpose for her was the “relationship between the knower and what has been learned and what’s to be known.” She was selective in choosing technology because she considered it important to know why she would be using it and if she was able to control. Corrine Miller learned technology more often without the mentorship and she said practices without mentorship were often very difficult for her, because finding a colleague or a student who also shares an interest made all the difference to her.

Isabel Cherlin was always forced herself to think about if the lessons or projects could stand alone without technology incorporated and whether technology could enhance students’ learning. She said “the key to me about technology though is that could do exactly the same thing without any technology. If the technology failed, so pulling out the technology, it is still a worthwhile learning project.” So if anytime her students were using technology in developing their lesson plans, Isabel Cherlin required her students to have back-up plan in case the technology did not work. Isabel Cherlin practiced and

developed web pages using composer and used other computer software frequently such as PowerPoint or TradeCard.

Donna Sawhill took a few workshops which she perceived as helping to get her up to date on how she can help her preservice teachers become comfortable with the use of technology on their own on teaching. She believes that technology is important in helping students to get a job. In 2000 the organization that Donna Sawhill joined put up a revised standard where “the technology is the big thing” and so important and stresses it should be “integrated into course work and into the preservice teacher education”. She said, “I have always felt that technology is tool that should be used, should be integrated into the instruction. Well, but I will tell you this, even I may have that beliefs, I can still do different things. ...So I have... in addition to the technology I want them to use, there are other things, other tools like manipulatives.”

Candice Schindler was a believer, too. However, she was intimidated by the capacity of technology , and she said, “I thought it was so much to learn that I didn’t feel comfortable with it, so I didn’t use it in the classroom.” The technology she was using prior to the project was mainly emails for communication and word processing.

All five participants have demonstrated different experience with technology and an almost unanimous point of view toward the integration of technology. It is reasonable for some of the participants to feel nervous and uncomfortable about learning technology and the way to integrate, because, as one participant stated, at their age in college and early teaching, technology was not stressed at all. Technology is new to all of them and requires a lot of time and training to learn and to integrate. As all of the five participants say, they are “beginners”, “learners” and “doodlers” in learning technology.

Experience During this Project

All five participants consider their experiences in the project positive. They demonstrate levels of satisfaction with the whole experience of the project. Most of them have benefited from the resources and support that the project has provided. They consider the availability of resources and support as “big factors” that influence their teaching and learning. In the summer institute, they all learned something new to them and practiced on the technology they wanted to focus on. They all enjoyed the presentations made by the invited speakers who shared their experiences and practices with technology. By seeing other people’ ways of integrating technology, all of the participants started to practice their own and develop their visions of integrating technology. One participant did not consider the summer experience a significant impact on her teaching and learning with technology. But by analyzing the journals she submitted during the summer, I found out that she enjoyed the presentations in the summer. She mainly was concentrated on some project involving PowerPoint she was had been working on during the summer institute. Three of the five participants developed web pages out of the project with the assistance of their student technology mentors or their students. One participant converted her web pages developed prior to the summer institute using the web page publishing tool she was introduced in the summer institute. Based on the analysis of the artifacts, which were web pages, web pages constructed include links to their background information, contact information, links of their research projects, links of organizations in specific content area, and course syllabi for students to retrieve the online version.

The Summer Institute

Patricia Murray rated her participation in the project as “one of the best experiences in academic career”. She thought the summer institute was very helpful. She enjoyed the relax pace of the summer institute and the presentations made by guest speakers who were invited from K-12 schools and demonstrated their integration of technology. She said the summer institute really pushed her “to a higher level”. And she plans to take more workshops that “would do the same”.

Corrine Miller did not consider the summer institute and even the whole project a significant impact on her learning and teaching. So I requested a copy of her journals she submitted in the summer institute since she was the only one who reported the minimum impact. Based on the analysis of her journal, she documented that she had “good colleagues on either side” to help her and work together. The “Collegialities” developed in those relationships were “very important” to her because the mentoring she received from both sides was very specific. She also enjoyed the presentations in the summer institute. However she expected to work on the project she had been working on but the institute did not address much on that specific area. So she had to continually withdraw from the institute in order to stay focus on what she had already been doing and something that she was interested in. She also expected “more clear directed subset of each project” presented by the guest speaker, however she felt that there were no directions about how the project was developed. So, during the whole summer, she was concentrating on the “big” PowerPoint project. She used a digital camera to capture photo images and PowerPoint application to document a university-student initiated Saturday music Informance Program. According to Corrine Miller, “the project emerged as a

viable and very important student-initiated and student organized volunteer program at a neighborhood school.” The PowerPoint Program was presented along with an Informance at an International Conference. In the following semesters, the PowerPoint Program was shared with new Education Foundations students as a documented account of what students are capable of creating and contributing to school communities in their service-learning hours.

Isabel Cherlin mainly was working on converting her web page from using Composer to FrontPage. The whole institute was very relaxed compared to the previous ones she attended. She thought that she learned better when relaxed. She considered some teachers’ presentations very helpful for her to learn, because the teachers invited to give presentations helped her be more aware of good teaching practices.

Donna Sawhill, like many other participants, enjoyed the summer institute and appreciated the natural environment of the summer institute and the rest of the project. She actually came back for an extra day when it was over. She went to some workshops before, but did not “get much”, because those workshops were “too scattered” to her and “too much”. The major difference that the summer institute made was it allowed her to have the whole week do something she wanted. She was mainly working on her web pages during the summer. She said, “It was wonderful. I actually came back for an extra day when it was over. Because I think...I have seen those snapshots of the programs, but have that in-depth within a couple of days, with the support that the project provided, I have never had that experience like that. I have been to another workshop, which is a state technology workshop, I have done that but I found it was to me too scattered. I think they were too much. You know I got to see a whole range of software things like that. But not

to the point that I am really comfortable of using it, I can say, yeah, this is something neat, I should try. But with this project, we had the time to sit there. Tried to create a web page, go through the process you need to. I think that's the different it makes to me."

Candice Schindler, did not feel comfortable with technology prior to the project. But, she did enjoy the summer institute, and she wished there would have been another week. She was working on her web pages and used digital cameras, which she reported that she would have never done that before because she was so afraid of trying anything. Specifically what she enjoyed in the summer was the hand-on and having people around to help, because she believed learning by doing while support is present. She considered the presentations very informative. Her experience in the summer institute helped her build her confidence level. She said, "After the summer institute, I felt when I came back from that week I was able to do something like that. It's very positive. I think the institute has helped me immensely because had I not gone I would not really have made the effort to overcome the barriers."

Generally, experiences in the project helped the participants perceive a large variety of applications in technology. They enjoyed spending a whole week, which did not conflict with the academic calendar, to learn technology in a leisurely pace. The presentations provided by teachers from K-12 and college levels provided a whole spectrum of technological applications currently used in classrooms.

Changes Made in Personal Beliefs and Practices

All five participants believed that technology is a very important tool and should be integrated into curriculum and instruction to the extent that it can enhance teaching and learning, as Zhao, et al, (2000) reported. After experiencing the project, all

participants still hold their belief. Two participants did not report any change made resulting from participation in this project, but from their previous experiences or participation in other workshops. The rest of the participants did demonstrate an increase in personal use of technology and they have incorporated technology into curriculum and instruction to some degree due to the participation in this project.

Patricia Murray reported to have incorporated more technology into her teaching, such as a digital camera and LCD with the laptop which she had never used before. She now tended to use the broad term of technology not limited to computer. “Now I tend to use the broad term of technology. I don’t think it’s limited to computer. I see media as part of technology. In other words I see it as a information delivery system and that’s the way I try to use it.” Under the inspiration of the project, she was driven to take more workshops after she participated in the project.

Corrine Miller stated that most of the changes that she made were from the training that she received from another workshop offered through the state. Through that training she converted all her syllabi into technology significantly integrated.

Isabel Cherlin was the one who had more experiences with technology than the rest of the participants. She said that this project had not made much change to her because she had started some things prior to the project. She developed her web pages prior to the project, and she integrated technology she learned from the workshops offered through the state. She believed, “For a lot of people who didn’t know where to start developing web pages trying to integrate technology doing powerpoint and it (the project) had been a wonderful vehicle for them. One of the things that I have seen the

project to me is a lot of students come to me in the project who serve as faculty's mentor. They know many things before they come to the classroom."

Donna Sawhill was "more open up to working more with technology," and she started to incorporate webs into her teaching. In spite of previous experience with web discussion, she said she would like to try it again. She would post assignments on the web and required students to respond. Reflections and lesson plans were required to post on the web. She said, "I think the level of doing that is because of the project. There is a boost of confidence." Through the lens of the project, Donna Sawhill perceived the concept of integration has broadened. She believed that "integration of technology is not just creating good lessons, having the kids go to the Internet", but it is to "use the technology through the form of communication."

Candice Schindler was intimidated by technology prior to the project. However after the summer institute, she experienced a boost of confidence and comfortableness. She started to take more workshops to learn and incorporated things in her curriculum for my classes. She developed a website where she had links to her courses. She reported her experiences in the project "encouraged me to ... now I fell that I can do it with a little bit help. And I've also registered and attended some extra classes from constructional resources the computer center over there. And I incorporated things from ... in my curriculum for my classes. One of the courses right now is blackboard... I'm getting my students involved in blackboard for communication and also sending things to me an I've done a couple of Powerpoint presentation that I can... have never done it before. So I'm doing it in a very slow pace. I'm getting my website finally under some condition that I can use for my class. So I'm getting there."

All participants have started incorporating technology into their teaching. Their degrees of integrating are related to their personal experiences with technology and personal comfortableness. All participants have demonstrated increases in personal use of technology, in integrating technology in teaching either directly through the project or through other workshops. As one participant said, “Even the pace is slow now, I am getting there gradually.”

Mentorship with Students Technology Mentor

All participants were assigned one or two student technology mentors (STM) after the summer institute. Most of the participants reported a positive, reciprocal and beneficial relationship developed with their STMs. Only one participant reported that her STMs were not doing anything at all.

Patricia Murray perceived herself as a learner while working with her STMs. She was glad to see that her STMs would also make her do the work and not just do it all by themselves. She enjoyed what her STMs showed her by giving her hands-on experiences and spending a lot of time with her. When they ran into problems, they would solve the problems together.

Corrine Miller was assigned an STM, who was a “wonderful person”. The work she planned to do with her STM was not in line with this project, so they did not work cooperatively on the planned work. Her STM developed some web pages for her using description of one of her research projects.

Isabel Cherlin was mainly using her STM as a tutor in her classes. Since her STM was well trained though the institute, she asked her STM to act as a tutor to the students in her class. Isabel Cherlin reported that her STM had been able to talk with her

“candidly about where we need to do tough things and where to stress things.” She considered the assistance from her STM very beneficial and helpful.

Donna Sawhill benefited from the mentorship tremendously. One reason is that she and her STM worked on her web pages cooperatively. Her STM would go for help from other sources such as graduate assistants in this project to solve the technical problems. The second reason is that Donna Sawhill asked her STM to present in her classes to demonstrate for her preservice teachers technology lessons to use for their children. Basically she told her STM what she was expecting, and they “look at graphing”, and “talked about what lessons would it be like.” Then they revised it over and over until it met the need.

Candice Schindler was assigned two STMs after the summer institute. But she disappointedly reported that her STMs never showed up.

Most of the mentorship was developed in a friendly and productive way. It not only helped the participants to learn technology better with more individualized support, but also facilitated their teaching in their classrooms.

Current Applications

All of the participants know how to design web pages for themselves and incorporate web pages into their teaching. Based on the analysis of their web pages, the web pages have been constructed as a form of information delivery and communication. They put up their resume and contact information in the web pages and provide links of the projects they are working on, links of the courses they are teaching, and links that the instructors consider as valid websites.

Technology Use in Teaching and Research

In teaching, three participants are integrating technology in their classrooms from making PowerPoint presentations, videotaping, to web pages design. The other two participants are still learning technology on their part and seeking the way to integrate, but they do require students to choose technology as one of the sources they use to retrieve information. And they demonstrate an increase of comfortableness in utilizing technology in their research. For their research, all participants are integrating more technology. They are conducting research on technology use in their areas to seek how to integrate technology into their teaching more effectively.

Patricia Murray is continually working on her web pages to update and revise. She is using the Internet quite extensively for her research now, because she had experienced an increase of its efficiency. Through the Internet, her research is no longer limited to her office; she can do research anywhere as long as she has a computer with an Internet connection. She is very aware of the ethics and validity of Internet resources and addresses this issue in her classes. In her classes I observed, she tried to integrate more technology into classes, such as video taping students' presentations, which she did not use before. Corrine Miller has converted her courses into technology courses. In her secondary curriculum course I observed, it was "fully technology integrated" and the undergraduate secondary was a "fully technology course". She requires students to make electronic portfolios about creating six different lessons with technology standards, creating rubrics and directing web surfing activities. In her classes, she usually models the use of technology, such as developing a web page at the beginning of her class. For the rest of the time, she has her students do many hands-on activities in pairs or triads.

For her research course, she continually uses qualitative database for her qualitative study and model the organizing process of research for her students, by giving handout, and giving students appropriate citation for the uses of different sites, photos, images that they could borrow, and providing places where they can go and copyright free resources.

Isabel Cherlin is continually taking more workshops to learn technology. She has learned more software applications than other participants and demonstrates it in her classes. From the observation of her classes, she usually made her students work in pairs or triads to discuss and have hands-on experience. She requires her students to be aware of the copyright issue if they “get anything off the Internet”. She said that students were required to “give credit for it just like any other work they have done in the paper world”. Along with the copyright issues, Isabel Cherlin addressed issues like inappropriate sites and parental concerns to her students.

Donna Sawhill has completed her web pages and is incorporating web pages into her research grant to maintain the communication and share information through her website using a software package. Even though she reported that she did not have a positive experience in similar activities before, she said she would like to “open up for a try”. In her classes, she does not address issues related to technology use much, but she lists the standards for students to follow regarding technology integration in the specific area in the course syllabi. The second reason is Donna Sawhill is using some software package that provides links for students to explore, which are authoritative and trustworthy.

Candice Schindler currently is using Blackboard to maintain communication and PowerPoint to do presentations. She encourages her students to integrate what she has

modeled. Now she is more comfortable with technology and is doing “a lot more research on the web”. Using standards in her organization is her way of addressing issues related to technology use in her area. She said, “our association has a set-up standard, part of it has to do with the Internet and confidentiality.” She arranges a section exclusively on ethical consideration for her students usually at the beginning of each semester.

All participants demonstrate an increase of using technology in personal level, in teaching and research. Most of them feel more comfortable with using technology after they experienced various workshops. They continually use emails, word processing and Internet search functions for professional activities. All of them perceive themselves as learners, and they are trying to learn more technology, which they can incorporate into their teaching and research.

Technology Use in Evaluation

All five participants have incorporated technology into their evaluation and evaluate students’ use of technology. From the observation data and course syllabi, students are required to submit electronic versions of assignments through emails or disc and are addressed about the ethical, legal and other issues in using some technological sources, such as the Internet, through the constant participants’ classroom instructions or using the standards in specific areas that participants provide in their course syllabi.

The participants developed two concepts of integrating technology. One concept is using technology to evaluate their students’ projects. The other concept is to evaluate students’ technology use in projects and assignments. According to their course syllabi, the three participants who have more experience and use more technology in their classrooms and professional activities require their students to include some form of

technology in their projects. Most of the time, students use PowerPoint and web pages as the technological components incorporated into their projects.

Patricia Murray gives assignments that are technology based. She requires her students to email their assignment to her, and she critiques their assignments and emails them back her feedback. When her students use Internet resources, she evaluates the depth and width with which students have used the Internet. She explores the links that students have visited and the validity of the content.

Corrine Miller incorporates technology into evaluation in a different way. She uses a survey at the beginning of every course to get the baseline information about where her students are and what they expect to learn out of the class regarding technology. She uses the same survey in the middle of the course and at the end of the course. Using the survey and technology standards combined is an efficient way to get her students “really direct on technology”. Corrine Miller models assessment measures in technology for her students and requires her students to practice technology skills in teaching and learning.

Isabel Cherlin is using a technology survey like Corrine Miller does. At the beginning of the semester, she develops course syllabi based on the results of the surveys received back from her students. She requires students to develop both paper and electronic version of portfolios through emails or discs, which include their journal entries, worksheet, newsletters resumes, and lesson designs. She does not evaluate the content of students’ portfolio, but typically “how they use technology in the classroom”. Students are required to do a PowerPoint presentation on a specific concept they are learning.

Donna Sawhill is the one who defines two concepts of evaluating. In terms of using technology in evaluation, she said, "I haven't gotten there yet; I haven't seen an example of all the various software by grade book." In terms of assessing students' use of technology, she said, "I assessed students' use of technology if they took independent course with me." However, she is planning to develop a technology-based course in the near future. Current she is using standards in her area and requires students to go to the web and find articles that connect with the standards.

Currently Candice Schindler is using evaluation features on Blackboard to evaluate her students' assignments. She requires her students to get information not just from books, but also other resources such as the Internet to complete their assignments. She asks her students to email their work and then she would post grades on Blackboard. She said, "what I'm doing is I have students submit their written work electronically and I post my grades on blackboard. I try to get them not just go to the library but also get into the internet and unstructured internet ... I ask them to evaluate and to be careful not to quote things that are not necessarily supported at any time."

Most commonly in the classrooms I observed, participants required their students to do peer teaching, promote discussions, and submit portfolios and journals to assess students learning. Students critique themselves and their peers. The participants gave their comments on students' projects after peer critiquing and students' self-critiquing. Participants used emails to retrieve students' assignments and email back the feedback. It is an easy way to communicate between instructors and students. Two of the participants used a technology survey at different times to assess students learning and expectations.

This form of formative evaluation helps instructors observe their students learning and develop their lessons more dynamic and directive.

Instructors' Perceptions of the Impact of Technology on Students

All the participants believe that technology is a very important tool and should be integrated into teaching and learning. They have seen the positive impact that technology has on their students. Students are more engaged in learning actively and cooperatively.

Patricia Murray sees the efficiency of using technology. It enables students to access information easily and equally. She senses “really collegiality” developed among her students and the excitement and proud of her students to demonstrate their learning. “It was just so much greater. It’s just going to make the information easy to access and equally access. Well I think they just learn a lot from each other. They come in with various skills and definitely more advance that I was. I think working together in pairs I have them do or triads whatever the particular task is. They teach each other a lot. ... That’s really wonderful.”

Corrine Miller described, “My students seem to develop very playful and exploratory experiences and share with one another in dramatically more significant way and when we are in the classroom we go and use them a lot. In the summer secondary course dedicated to the lab they did not just to use technology they began to share technology forms of expression and completion showing how they share sites they went o a lot of things together because they became embedded within that environment of that class.”

Isabel Cherlin’s students are practicing technology in a natural way. In other words, as Isabel puts it, students “may decide not to participate in technology, but

technology is like part of them now and they cannot think of a reason that not to use technology.”

Donna Sawhill has definitely witnessed increasing use of technology in her students. What mostly pleases her is that she sees students have been exposed to various types of technology before they come to her class. So that makes her integration of technology much easier, because she does not have to be “too concerned about teaching them to use the technology.”

Candice Schindler like the rest of the participants have seen how her students “could actually talk with each other about their assignment more cooperatively because I have groups, we have a lot of group work. They are responsible for communicating with each other. Out side of the class, and I can say they can work more cooperatively using Internet and email real-time communication that a computer can do that.”

All of the participants have witnessed the positive impact that technology has on their students. Their belief is strengthened though their positive experiences with technology, even though nervousness and discomfort do exist. Their belief in integrating technology is also strengthened by that fact that they see positive impact of technology on their students and the need to incorporate technology into their fields. Their students are learning more actively and cooperatively while using technology. Through technology, students are not confined geographically and chronologically. They can communicate with each other more efficiently. Therefore faculty members are prompted to learn more technology now and develop plans for integrating more technology. As one participants said, “ I feel obligated to learn as my students come to the class and expect to learn from me.” So they persevere either with mentorship or practice alone, and they are developing

technologically gradually by learning more and sketching future plans to push themselves to a higher level.

Future Vision and Plans Regarding Technology Integration

All participants have had positive experiences in the project or in other workshops they attended. All of them are active learners and have developed vision and plans of technology use broadly and specifically.

Patricia Murray plans to take more workshops in the near future. She said, “I do plan to take the workshop. And then to find out from them to see if there are other workshops I could go to, because it forces me to concentrate on...nothing else distracts me.”

Corrine Miller decides to continually work on the project she was during the summer institute of this project. She envisions a web wall library, which is fingerprint and signature sensitive, and people in the public will be able to come in by signature or contact. People can come in and use the web wall of the lab. She sometimes asked help to understand what kind of hardware that she might use that can create that kind learning experiences. She said that she felt it was possible, but she did not know how. Her goal is to have a fully integrated technology lab with the capacity of all the methods for teacher preparation, so students who are early in their preparation program would understand the ways to integrate technology when they teach, for example, “making their own video, giving animated presentation, archive them in a way.”

Isabel Cherlin said, “I’m always looking for was the way to integrate ... I have to say I’m looking for something with everything. But I’m looking specifically for (my area) because I don’t see as many ways to integrate in my content area as I have hoped

and even the people in the other workshop say that there is a weakness from those areas. They will be glad to see people (in my area) come into there because we were trying to put us together to design some lesson, lesson design and integrating. But the kind of that I have done in the past is the history of mathematics. I can pull that in but it's not really being able to integrate. So that's still a challenge for me." She sees weaknesses in her area and is concerned about the real integration of technology into that area.

Donna Sawhill is currently working on redesigning a course which is technology based. She plans to integrate technology into other courses, but not as much as the one she is planning. Her new course will focus on the use of technology in that area, and students will have more field experience with technology.

Candice Schindler is planning more on learning on her part. She plans to take more workshops to develop technology competency and proficiency, which is the first step to integrate technology. She said, "I'm trying to take some classes. The last one I took was canceled. Since they are going to be offered on campus I will try to go there and make effort to go there. Get it done by just a couple of hours during the day. I can plan to continually do that."

Different participants have different visions and plans for their learning and teaching. Their learning depends on their individual needs and motivation, their experiences in the workshops, the availability of time and support. Whether there is some model of how technology could be integrated in their areas also serves as a factor that affects some participants' learning. In other words, participants' learning is influenced both externally and internally.

Emerging Themes

The data collection method in this study includes observation, artifacts and interviews. According to Glesne (1999), observations can only allow us to partially understand what we infer from what we see. However, Glesne says that in-depth interviews can get detailed explanation from the participants. Glesne believes that in interviews researchers can ask what participants' perceptions and opinions' about relevant topics, which explores alternative explanations and add unexpected learning that might emerge from the questions researchers evoke. According to Bogdan and Biklen (1992), materials such personal documents, artifacts and official documents are useful as supplement source to understand subjects.

In this research study, faculty members experienced a federally funded and technology-based project. Their experiences and other factors that influence their technology learning and integration in general were the core interest. Faculty members were honest about their experience since I assured them the anonymity and explained the open-ended feature of the study at the very beginning of the study. The study was to explore the pluralism of individual faculty members' experience in a federally funded technology based project, to investigate their experiences and factors that influence their use of technology and technology integration. They were addressed the importance of reporting issues and problems that emerged from their learning. I clarified my purpose of the study constantly, which is not to seek technologically competent and proficient individuals. Every participant displayed their story in the interviews, in the observations and in the artifacts. Every participant's story is considered a very important piece of a puzzle that constructs the whole picture. During the investigation, the following themes

emerged from the study, and the themes serve as the factors that have influenced faculty's beliefs and practices.

First, all participants perceive themselves as learners. As learners, they inevitably experience nervousness and discomfort in learning technology. Modern technology was not stressed at all, or even did not exist, when they were in their undergraduate and graduate studies and started teaching. Even though the intimidation of technology still exists, the participants do not resist learning technology, which is new to them and challenging. Faculty members consider themselves active learners, and they all believe that constant practices reinforce what they learn. Isabel Cherlin said, "If you learn something new like this, you need to immediately use it before you forget how to do it." Three participants explicitly stated that to "open myself up" to learning technology is very important. Willingness of "taking risk" motivates them to reeducate themselves to meet the students' needs.

Second, all participants' classrooms are learner-centered. From the observations conducted in the classrooms, Corrine Miller's classes are very much learner centered. She encouraged her students to express their concerns and expectations constantly in the classrooms and encouraged students to discuss. When encountering technological problems, for example, no connection to the Internet, she prompted some questions related to their course content for students to discuss while solving the technical problems herself. She had some of the students detect the problem. If the problems were not solved after several attempts, she would go ask for the graduate assistant or some faculty member in her department to solve the problem. While seeking ways to solve problems, Corrine Miller always guided the flow of discussion. Trying not to have the problems

frustrate her students while waiting, she brought up interesting questions to her students. When problems were solved, she smoothly transitioned the topic of discussion into what they were talking about before the problems emerged. In her classes, students were doing hands-on work with laptops. She usually demonstrated some technology use, integrated into their course content, and then allowed students to choose partners to work with. Sometimes she would ask students who know some of the technology use to be covered in that day to demonstrate for their peers. Students were very proud to demonstrate and the rest of her students were very eager to learn by really working on the computers.

Third generally the participation of this project increases faculty members' confidence and comfort using technology. Three out of five participants reported that they used to feel so intimidated, but now they felt more confident and comfortable in using technology after this project. The other two attended some workshops prior to the project and did not report significant impact due to the participation in the project. According to Walker, Ennis-Cole, and Ennis (2000), workshops and conferences are good resources. Positive experience in workshops and conferences help teachers "establish a healthy attitude toward technology and promote a sense of accomplishment or self-efficacy" (p. 117). All of the participants have demonstrated certain level of satisfaction about their experience in this project. Three of them reported that his experience has helped them increase use of technology in their personal use, made changes in curriculum and instruction. Summer institute that meets individual needs are considered helpful and directed.

Developing effective mentorship helps the participants to learn technology. One

of the distinguished examples is how Donna Sawhill has been working with her student technology mentor. She considers having a mentor working together as a significant factor that is “pushing fast to use technology appropriately.” On the contrary, practices without mentorship were often very difficult. Corrine Miller said, “finding a student who also shares an interest made all the difference to me.” Candice is the one who needs technical help most, but she experienced some frustration without support around when she encountered problems.

All participants enjoyed the presentations made by the teachers invited to the Institute followed by real hands-on experiences. They said that having teachers from other schools to share their experience was a very helpful way to help them develop visions of integrating technology into classrooms. Donna Sawhill said, “That really got me to start changing. I am more comfortable thinking about what to do and I am ready to roll.” She said what she had experienced in those workshops got her “up to date” with how she could help her preservice teachers become comfortable with the use of technology on their own on teaching. Isabel Cherlin, the more advanced participant, enjoyed those presentations like the others. She said, “when we have teachers come in from the outside about what they did in their classroom which made me aware of more application and what is reasonable in this elementary school at certain period of time. I know what they are supposed to do in math in the 1st grade and in the 2nd grade. I’m not even great with that now, but I do have a better sense because of the presentations giving us the teachers to talk with.” Candice Schindler considered those presentations very informative. She did not feel very comfortable with technology prior to the project and could not “adequately portray” what she needed to integrate in the classroom. However,

after she was involved in the project, she reported that she was feeling more confident in using technology and motivated to learn more. She is incorporating technology in her teaching now, such as using presentation applications, more Internet resource for research, and requiring students to go online.

Another distinguished factor that has been identified is the access to technology and to updated equipment. Getting access to technology is the first step to getting faculty members to learn. Donna Sawhill and Candice Schindler were very amazed to have technological facilities provided by the project. Laptops, digital cameras and other equipment can be checked out very conveniently. Corrine Miller describes some of her experiences when she did not have immediate access to technology, “I go down to the hall and ask if they have a piece of equipment. They would say I don’t know and I will check, and come back in 20 minutes. Later they would say here is the schedule and would you like to check it out? But I better need it now. I found it very counter – motivational.” However, if equipment is not up to date, it poses as a serious problem for faculty members. Corrine Miller, Isabel Cherlin, and Patricia Murray all complained about the lab they had. The malfunctions of some equipment caused frustration to the participants. All three participants demonstrated the urgent need to update the equipment in their labs.

Fourth, communication within the faculty community is an important factor that influences faculty’s learning. Some faculty members are more advanced than the other faculty members regarding technology competency and proficiency. They rely on the support from each other and learn together. Their learning is motivated and enhanced through the collegiality established. Patricia Murray, Corrine Miller and Isabel Cherlin have established the network of learning technology. Isabel Cherlin is the more advance

one considered by the other two. Patricia Murray says that they travel together to the workshops and it makes “really good relationship”. She said “I was very intimidated by technology. I really enjoy learning in a group like that. And I really much prefer than alone. As a group, we reach out goals in integrating technology into the acquisition of knowledge.” Corrine Miller said, “Isabel is much more able and had a lot more training and many more years of experiences. So influences from her are really encouraging. So it is the influence from the advisor. Three of us really mentor, help each other and support each other to get feedback to our teaching. Because technology fails, when we are just learning, whether it is technology failing or learner’s failing or a combination of both, having Dr. Moore and my colleagues Isabel, I can always go and ask them. So they help me become a technician of my own development as well. I found it very motivational.” On the contrary, learning without communication makes learning more difficult. Candice Schindler said one of her current needs regarding technology was “access to the support, and people for help.” She said, “People I know don’t use technology, because they don’t know how to use them. Don’t know how bring in the laptop and use the projector. They just don’t know how to use a PowerPoint projector. Our department, we are just so traditional.”

Fifth, time is a very important factor that influences faculty’s practices. All of them unanimously agree that technology is time consuming. Learning how to integrate technology demands even more time than learning technology itself. One way to allocate time for learning technology is through taking workshops that they can spend sometime concentrating on learning technology. So most of the participants enjoyed the summer institute because that there was really time for them to “explore, concepts and ideas,”

software, time to “explore differently,” and “use different technology,” as Patricia Murray, Candice Schindler and Donna Sawhill put it. Isabel Cherlin, who had more experience with technology before participating in this project, took three intensive workshops prior to the project. The other way to save time for learning technology is using technology at home. All of the participants use computers at home. They use emails to maintain effective communication, or write reports, or do research using Internet at home. The third way is good time allocation. Candice Schindler usually stays all day in her office. In the morning she checks email and does students advising. She cuts one day, which is Friday, for her research. She takes technology workshops to learn more.

Sixth, external pressure and internal expectation promotes participants to learn more. Pressures come from that fact that technology is becoming ubiquitous in our daily lives, and its importance in education has been increasingly addressed. Expectation has resulted from the external pressure and personal belief and motivation.

All participants believe that technology is a very important tool in education and should be integrated into teaching and learning. They feel that as instructors of their students and students in preservice programs, they are responsible for their students to model the use of technology in their teaching. Candice Schindler believes that technology is evolving and changing so quickly. It becomes more and more important in students' lives. It is useless to address how important it is and that the world is going to be how technologically oriented. What instructors should do is model the use and “get students attuned to using technology.” Donna Sawhill said that she had always felt that technology was a tool that should be used and should be integrated into the instruction. That is what motivates her to learn. Corrine Miller's “expectation is very high”. Using a technology

survey to assess students' needs regarding learning technology in their classrooms facilitates her learning and teaching. Patricia Murray always feels in her students' lives, technology was put in a central role, but not in hers when she was about their age. And she felt that she had to model the use, "not just telling them that they need to do this, but she needs to learn to know how to do this also". So she does not want to be the "laggard within the department." And she is always seeking workshops to technology in a step-by-step way.

Isabel Cherlin described her motivation as coming from her beliefs that her students came to the classrooms to learn something and she should be prepared to teach them. Motivation is the biggest factor that has "pushed" Isabel Cherlin thus far. She said, "Had I not had that motivation, even if I might have wanted to learn much of this, I probably wouldn't have taken as much as course as I did just because of time."

Seventh, on-going technical support is needed. Some participants rely on technical support whenever problems emerge. Donna Sawhill always goes to Frank and Joseph. She said these people had been "very good in terms of working out those corks." Candice Schindler expressed urgent need for technical help. She said, "Sometimes I have found questions that I can't answer my own. Then I have to seek help. So to have somebody, somebody specifically that I could go to and get answers in the real time not just for them to get me is what I need now."

Eighth, easy to use applications help faculty members to learn and teach. Donna Sawhill is using Blackboard now because "Blackboard has all that stuff". She is trying to incorporate some software packages similar to Blackboard into her course in the near

future. Candice Schindler did not use Blackboard before and now involves one of her courses in Blackboard to maintain communication.

Ninth, subject area becomes an issue in faculty's adoption of technology and integration. For examples some participants come from the areas that have been strictly traditional. One participant reported that their department did not use technology much because their career was face-to-face business with their clients. Technology tends to decrease the human interaction that was supposed to promote in their career. Faculties from other areas reported that they have mainly been using technology to cover the history of the subjects. They reported lack of models in their areas for them to model in their learning and teaching.

Summary

The data collected and analyzed include interviews, observations, artifacts, such as their web pages and course syllabi. It displays a picture of the experiences of each individual participant. They experienced learning technology prior to the project and in the project. They are seeking effective way to integrate technology into their teaching through constant reeducating themselves. They all believe that technology can exert great impact on learning. However, as one of the participant said, "Believing is one thing and practice can be another." So, investigating how they were practicing with technology prior to the project, during the project and currently, and factors that facilitate and hinder their learning was the focus of this research study.

After I analyzed multiple streams of data and compare and contrasted features of each individual participant, I have identified the following themes that have emerged. First, all the participants perceive themselves as learners and believe that they should

open themselves up to learning technology. Second, participants teaching style in their classrooms relate to their integration of technology. Third, generally their participation in this project has been a positive experience to them. Most of them experienced a “boost of confidence” and increased their personal level of using technology. They are motivated to learn more and seeking different sources to learn. Mentorship, access to technology and the summer institute have been identified as important factors that influence the participants’ practices. Fourth, whether the participants have established certain an interpersonal technology network is an important factor that influences faculty’s technology use and learning. Fifth, all participants consider technology time consuming and time is always imminent in their development. Sixth, external pressure and internal expectation influence the participants’ beliefs and practices. They all feel technology has become gradually important in their lives and their students’ lives. They have realized the importance of technology in education. They believe they should model the use of technology for their students. Seventh, all the participants expressed their need for on going technical support. This support comes from either within faculty community or some external technician. Eighth, easy to use software application helps participants to adopt use of technology easily. Ninth, faculty needs to have models to follow in their subject areas. Especially for faculty who are teaching in areas well known for their long tradition of using traditional materials and instructional activities, it is more important to provide models for faculty from those areas to facilitate their learning and teaching with technology integration.

Based upon the findings disclosed, more analysis and interpretation using research studies and my own opinion will be provided in the subsequent chapter.

Implications for education faculty's technology integration were developed based on all participants' stories and my personal opinion. Suggestions for future research were included in the subsequent chapter.

CHAPTER 5

SUMMARY

Introduction

This study investigated five education faculty members' participation in a technology-based project. Data collected included interviews, observations, demographics, documents and artifacts. From the multiple streams of data, themes emerged. Participants' beliefs and practices with technology integration prior to the project and currently were revealed. Factors that influence the participants' beliefs and practices were identified in the investigation and implications for faculty members' technology integration were imparted.

Findings of the Research

From the demographics, five participants started teaching at least 25 years ago, which was the mid 70s. They had their doctoral studies and started their practice in teaching in a time when modern technology was not stressed, or even did not exist. They participated in the technology-based project, and they all experienced different impact that the project exerted on them. To disclose findings, I think it is necessary to answer the two research questions.

1. How has participation in the technology-based project influenced faculty members' beliefs and practices with technology integration?
2. What are the factors that influence faculty members' practices regarding technology?

Influence on Beliefs and Practices

Participation has influenced their practices more than their beliefs. All participants indicated that they always believed that technology is an important tool and should be integrated into the teaching and learning. However, they believe that technology is not the only tool that can be used to enhance teaching and learning. Their experience in the grant project increases their confidence and comfort in using technology by being exposed to presentations and having real hands-on activities within a certain time period that did not conflict their academic calendars. All of them were please to learn something. Walker, Ennis-Cole, and Ennis III (2000) believe that positive experience helps teachers increase their confidence and “establish a healthy attitude toward technology and promote a sense of accomplishment or self-efficacy” (p. 117).

All participants used computers for word-processing and communication prior to the project. Many of them started to view computers and other types of technology as a way of effective communication and information delivery. This finding is consistent with the previous study on changes in attitudes toward computers and use of computers by university faculty (Mitra, Steffensmeier, Lenzmeier and Massoni, 1999). They report that traditional use of computers, word processing, is gradually transformed to a multidimensional construct. According to Mitra, Steffensmeier, Lenzmeier and Massoni, using computer and network capabilities for communication is one of the changes.

Based on the analysis of observations and course syllabi, I found there are generally three kinds of teachings from the participants currently. The first is the participants are not integrating much technology in their teachings. They concentrate

more on the course content in their classrooms. They require their students to use certain forms of technology, such as retrieving electronic information to complete projects.

The second kind of class I have observed is the kind in which instructor is integrating some technological components into their classrooms, and they require their students to use technology to complete assignments using technology as an important component. The participants incorporate using technology into the evaluation process. These participants use PowerPoint presentations and video taping in their classrooms. Their students incorporate technology such as PowerPoint presentation and other software and Internet resource into their projects when they do the presentations.

The third kind of classroom is heavily based on technology. Both course content and technology integrated are addressed. Many classrooms are hands-on activities with computers and Internet based. At the beginning of the courses, the participant modeled the use of technology such as web page design for her students in a slow pace. While modeling the use, the participant divided students into groups to work in pairs or triads with computers, and practice.

From the interview and observation, I discovered that some participants are not integrating much technology into their classrooms, possibly because they have had some negative experience with technology use. Some of them are still struggling with technology integration because they do not see how technology can be integrated into their content effectively. They expressed their needs to see models of how technology can be integrated into their content areas.

Factors Influencing Beliefs and Practices

All participants have experienced a technology-based project, in which they were exposed to different types of technologies. All of them increased their use of technology in their professional activities. However, two of them are integrating very little technology into teaching. They feel more comfortable with learning and experiment at this point. But they do plan to integrate technology more into their classrooms in the future. Ertmer (1999) has identified external and internal factors that impede effective use and integration of technology. According to Ertmer, external factors include access to technology, funding, and administrative and technical support, while internal factors are those factors that might be difficult to identify and intrinsic to teachers, which are usually more difficult to deal with, such as personal fear of technology, traditional teaching style, and reluctance to adapt. To the participants, the following factors (see table 3) have been identified that influenced their beliefs and practices.

TABLE 3

Factors That Influence Faculty Members' Beliefs and Practices

External Factors:

1. Access to technology and technical problems
 - Funding (purchase equipment)
 - Facilities (up-to-date equipment, availability and access)
2. Support
 - Administrative support (from the department and project directors)
 - Technical support: from the students, from faculty, from technician
3. Technological leadership
 - By some faculty members
4. Communication
 - Within the community (with more advanced faculty, with the other faculty members)
 - Out-side (friends, relatives)
5. Project experiences
 - workshop
 - Self-confidence
 - Mentorship
 - Increasing use and integration
6. Time needed
7. Subject Issues

Internal Factors:

1. Personal Belief
 - Technology, important tool
 - Should be integrated into teaching and learning
 - Students expect to learn from the instructor
 - Not the only tool that can used to enhance teaching and learning
2. Personal feelings
 - a. Fear
 - b. Anxiety
 - c. Not seeing how to integrate

- d. Confident and comfortable
3. Time
 - a. Time not a problem, motivation conquers all
 - b. Time is the big problem, needs more time to learn
4. Learning Style
 - Learning by doing, hands-on activities helpful
 - Learning with mentorship and alone
5. Classroom teaching
 - Learner centered classrooms

External Factors

Apparently all participants had positive experiences in the project. Three participants enjoyed the summer institute, in which they were exposed to different types of technology and were able to choose what they wanted to focus on. However, two reported that the summer institute did not have significant impact on them because they felt their needs were not addressed directly, and it did not meet their individual needs. However, their positive experiences, either in this project or in other workshops prior to this project, gave them more confidence in using technology and exposed to them the possibilities of integrating technology into their classrooms. However, some participants are still struggling with ways to integrate because they do not see how they can integrate technology into specific content areas effectively. Participants are learners and students. To help them integrate technology effectively into their teaching, they need to have someone who can model the use in their subject areas. Having someone model the use helps participants develop the vision of possible technology integration.

Most of the participants are very satisfied with their access to technology provided by their departments and the project directors. Easy access to technology is how the administration supports faculty members' professional development. However, some of them expressed urgent need for updated equipment. Problems resulted from the non-updated equipment causes frustration to the faculty members when they use technology and involve their students in technological activities. Technical support is important to the participants. They consider the ongoing and individualized support a very important source that they rely on when technical problems emerge. Stellwagen (Spring/Summer, 1999) reported findings about a middle-aged veteran high school teacher demonstrating

that receiving financial support and a help network from administrative offices and school district were quite helpful and beneficial. This teacher benefited from the help network that the school district established for classroom teachers who needed quick support. The teacher said that assistance was especially invaluable when struggle and frustration became a stage in learning how to use and integrate technology.

From the participants' data, technical support usually comes from three sources. One is from some one within the faculty community whom has been identified as the technological leader. The second source is within faculty community: someone who is at the same level regarding technology competency and proficiency. The third source comes from students. Participants and their student mentor each other while learning together. Communication with their sources of help not only helps participants solve the technical problems, but also increases the communications and discussions among faculty members and between faculty members and students.

From the interview data and observation, subject emerged as an issue. Three participants reported that they lacked of models be follow in their area, because their areas have been so traditional and have been dealing with traditional course materials. They were not seeing how technology could be integrated into their instruction and could not envision the value of it.

Internal Factors

Prior to the project, all of the participants experienced certain level of intimidation, fears, and discomfort with technology use. This is understandable because while the participants pursued their doctoral degrees, and when they entered the higher educational settings to teach, modern technologies such as computers were not stressed at

all in their daily lives, not to mention integration. All of a sudden, technology becomes ubiquitous in their lives. They see the need to learn and the need to integrate, because students come to classrooms and expect their instructors to use technology and model the use of technology in the lessons, especially when preparing future teachers. According to Dias (1999), a crucial factor to teachers is change. To change means to adopt tools that are relatively new to them. Dias says to change also requires teachers to adjust their practices, such as changing their roles and physical arrangements of the classrooms, and teachers feel nervous about these changes. They are not certain about how much advantage integration will bring. They lack confidence in controlling the complexity of technology, which might enhance teaching and learning or may create chaos in the classrooms (Dias, 1999).

All participants perceive technology as an important tool but do not exclude other possibilities to enhance teaching and learning. Two math professors believe that in their areas, using manipulatives is a good alternative. They believe technology is important, and students deserve to learn from their teachers. So I think their belief promotes their interest to learn. Personal interest in technology is highly related to their motivation and adoption of technology.

To all the five participants, time is always a big problem. There are activities in teachers' professional development other than learning technology. They have students to advise, and they have their own research to conduct. Learning technology appears to be an add-on activity. Participants expressed their need of time to reeducate themselves. However, their motivation or time allocation always find them the time to learn.

All participants have shown their motivation to learn. They all demonstrated that they were active learners, and they valued learning by doing and mentorships. This typical constructivist style contributes to their learning of technology. Two participants always have back up plans for technology. They require their students to have back ups. In one of the participant's classrooms, I observed how the participant solved the technical problems in the classrooms. This participant did not show any anxiety or panic over the problems, instead she solved the problems while talking with her students, promoting some questions for discussion. If problems were not solved, she would seek external help.

All participants have learner-centered classrooms either with technology involved or not. Most of the time, it is students who do all the talking and discussing. The participants encourage students to reflect upon their experience and do self-critiquing through journals and portfolios. They involve students in cooperative learning by dividing students in groups completing projects. Participants require students to critique each other and would give comments on their students at the end. In participant's classrooms, students are involved in many hands-on activities including making web pages. They used digital cameras, computers and Internet. At the beginning, the participants modeled the use, or students who knew were asked to demonstrate. Then rest of the time was students' learning by doing time. According to Dias (1999) and Jonassen (1995) technology is most likely to be incorporated into instruction which is learner-centered, which is active, constructive, collaborative, intentional, conversational, contextualized and reflective. Dias says that in this environment, teachers serve as facilitators; students participate in meaningful activities, collaborate with each other and construct their knowledge by solving real world problems they have experienced.

Implications for Technology Integration

Technology integration is not a solo accomplishment for education faculty members. From this study, we can envision it as a collaborative work to be done by faculty members, administrations, and systems. There are many ways of helping faculty members integrate technology effectively into their instruction. Factors that influence faculty's technology integration include formal training, sufficient facilities, resources, access, support, and time to prepare and plan (Becker, 1994; Ennis III & Ennis, 1995-6; Ertmer, 1999; Gilmore, 1995; Hunt & Bohlin, 1993; Schrum, 1999; Strudler & Wetzler, 1999; Walker, Ennis-Cole, & Ennis III, 2000; Yildirim, 2000). This study has implications for different groups and levels.

Faculty Members

Learning technology is a big challenge to education faculty members, especially to those who are veteran teachers. Education faculty members first need to open themselves and allow themselves "to appear foolish" with learning technology. They need to be courageous to face their fears and conquer their fears that impede their learning by getting involved in hands-on learning. Teachers should believe in themselves on their ability of using technology and should establish confidence in technology about its ability to effectively promote learners' interests and outcomes instead of creating disturbances and chaos (Zhao & Cziko, 2001). One of the solutions is to seek grants and workshops that provide formal training. These training sessions and grants opportunities give faculty members training on learning technology, sufficient access to technology, and help faculty members develop visions of integrating technology into teaching (Ertmer, 1999). Faculty members need opportunities to develop professionally.

According to Ertmer, faculty members need to develop a vision of integrating technology, which is the very first step, a giant step to start. Ertmer says constant communication among faculty members is an effective way of developing visions and learning. Persky (1990) says that communications promote teachers to critique and evaluate their practices and implement their design. Communication promotes the development of collegiality, which enables faculty members to reflect upon their learning experiences, discuss issues and problems with learning and be able to develop lesson plans incorporating technology cooperatively. Walker, Ennis-Cole and Ennis, III (2000) says that when they are constructing their lesson plans, they can share their ideas with other faculty members, discuss with them for further implementation. “This type of networking encourages brainstorming, dialogue, and discussion; it stimulates faculty and provides an incentive for experimentation” (Walker, Ennis-Cole and Ennis, III, 2000, p. 117).

Ertmer suggests the field experience is an effective that helps develop the vision of integrating technology. Through observing field activities, faculty members know where the problems are and how they can infuse technology by watching others’ demonstrations and presentations. Collaboration among teachers and administrations also helps teachers to develop the vision and then start to incorporate technology into their professional activities (Ertmer, 1999).

Some of the participants express the learning activities as need-directed. They learn to meet their needs in specific areas. According to Ertmer, identifying curricular opportunities is one way to help teachers integrate technology. The teachers need to identify the technology that suits their needs and work effectively in their areas.

Some participants suggested that student learning was much more enhanced by involving technology by assessing students projects using technology and their electronic portfolio, and using surveys. And these learning outcomes promote the participants to integrate and learn more technology. Ertmer says formative evaluation can help teachers monitor students' learning outcomes. It helps the teachers to be more aware of students' needs.

Administration and Policy Makers

Many faculty members do not see the necessity and value of integrating technology into the classroom (Palmer, 2000) because their external environment does not provide the opportunities for them to learn and develop the vision. To help faculty members realize the importance and start integrating technology into their instruction, schools and universities should articulate the expectations for faculty and should provide teachers with unlimited access to resources, funding, training opportunities and on-going technical support. Training sessions should address participants' needs directly and specifically.

Schools and universities should allow faculty members to have plenty of time for preparation and planning (Becker, 1994; Ennis III & Ennis, 1995-6; Ertmer, 1999; Gilmore, 1995; Hunt & Bohlin, 1993; Schrum, 1999; Strudler & Wetzal, 1999; Walker, Ennis-Cole, & Ennis III, 2000; Yildirim, 2000), because faculty members need time to learn and explore (Lawler, Rossett & Hoffman, 1998), and need to spend sufficient time planning how integrated technology is going to function most effectively, and determine the best practice to enhance students' learning outcome (Walker, Ennis-Cole, & Ennis III, 2000).

Giving technical and administrative support to faculty members is as important as providing them with access to technology. Support, according to Dwyer et al. (1990), includes training teachers to use various pieces of software to produce products related to instructional activities. Creating the environment of discovering alternative pedagogies and discussion is another way to provide support. Teachers' personal attitudes become the benchmark in instructional evolution. Faculty members are motivated to learn more if support is readily available and effective. In other words, to utilize technology and make effective instructional use of technology, teachers should be provided adequate and competent technical support, which should be lengthy and ongoing (Walker, Ennis-Cole, & Ennis III, 2000). This technical support may come from some faculty members who have been identified as technological leadership.

School Systems

All participants teach at least one course in a preservice program for future teachers. Most of them expressed their concern about students' access to technology when their students went to the field. Many schools, especially public schools, have limited funding and are not able to purchase sufficient equipment. This limits preservice teachers' activities in the schools to integrate technology and involve their students in integrating technology into their K-12 classrooms. So, for the school system, it is important to seek external funds from corporations and governments to purchase equipment. Purchasing equipment gives access to students and teachers, which is the first step to involve students in technological activities.

Implications for Future Research

As ISTE (1999) suggests for future research, researchers should observe classroom activities, interview teachers, and analyze technology-based lesson plans to seek concrete evidence of effectiveness. ISTE suggest that it is important to, on an ongoing basis, study examples of effective technology integration that reflect the current needs in higher education. Zhao and Cziko (2001) say that it is important to investigate institutions that have been successful and report their strategies and practices, especially those pioneer teachers. They say that there is little empirical evidence on how these teachers get started. For all teachers, it is important to report their problems to their institutions, to the states and to the government to seek possible assistance. Since there is little research conducted in education faculties and their technology integration, this study adds to the body of literature on how education faculties' learning and teaching with technology, and factors that influence their beliefs and practices.

Because the five participants have undergone the same training project, I have not identified much difference regarding technology competency and proficiency. This study should enlighten education faculties who have not started making use of technology, because it can provide information of technology using teachers of what they know, do, and believe to use technology, from which other teachers can use to develop their own vision of integrating technology (Zhao, et al, 2001). All the participants in this study have experienced discomfort, frustrations and various problems, some of which still exist. However, they all agree that they should allow themselves to “appear foolish” is the first step in learning. They all have involved themselves in reeducating themselves. This

attitude helps conquer fears. Therefore this piece of finding is helpful in helping technology phobic teachers to ease their nervousness and build their confidence.

This study is important for education faculties who have already started integrating technology into their teaching and encounter issues and problems with technology because this study also reveals specific problems and issues along with strategies and solutions to deal with. For this group of faculties, they should be able to realize how their establishing technological leadership within their community and communication with other faculties are going to influence and motivate other faculties' learning and teaching with technology integration.

This study has implications for administrators and policymakers, because the findings reported a small group of education professors' using technology, issues and problems. It delineates a picture of the factors that influence their teaching and learning. To the administration and policymakers, they should be aware of these factors and be supportive to create the supportive environment for them to learn and encourage their communications. They should provide initiatives for education faculties to motivate them to learn and teach with technology integration. To administration or policy makers, it is essential to develop courses such as technology methods courses required in the curriculum. This need appears as even more important since two participants suggested that their students' background and experiences had made integrating technology more easy.

Limitations

This research is limited to five education faculty members. For future research, I would suggest that faculty members from different disciplines should be included.

Faculties from other disciplines such as Science and Humanities should be included in future research study to investigate how they are integrating technology into their areas of teaching and learning. Different levels should be taken into consideration in addition to disciplines. Teachers from K-12 settings should be involved in future studies.

Another limitation of this study is its focus on faculty members rather than students. Students in general and students in preservice programs, K-12 students should also be involved in research as indicated in the diagram. Information from each component in this diagram will provide a comprehensive picture of how technology is integrated into specific content areas, issues and problems related to technology integration. Observation data and interviews display that many students I observed in the classrooms did not integrate technology into their lesson plans. According to their instructors, some of them expressed anxiety of using technology because of lack of knowledge or lack of being modeled the integration.

This research study is limited to gender. All five participants are females. Becker (1994) believes that to extend teachers' practices that incorporate technology is not only dependent on teachers' personal interest in technological activities, but also highly correlated with gender. There is a stereotype that more males have patterns of personal interest that are "technical, mechanical, and numerical" (p. 311), which is consistent with having a deep interest in technology, specifically with computers.

This research is limited to age. Due to the small number of participants, the largest expand of age is from age group 25-35 to group 55-65. Young faculties use technology differently than older faculties. They started their doctoral studies and higher education teaching career in a time when technology had already advanced to a more

complex level. They have had more experiences with technology than veteran faculties. There are only two faculties coming from the youngest group, one male and one female. This research has limitation in terms of methods. More follow-up interviews could be conducted. I could conduct a focus group interview for the whole group. However, since all the participants have been involved in the evaluation process of this project and have been interviewed by the graduate assistants for several times, I decided not to interview them more than once.

Conclusion

This study investigated five education participants who participated in a technology-based project. All faculty members have had different experiences in learning and integrating technology. They have different needs regarding technology integration. They all demonstrated a positive experience in the project. They all agree that sufficient access to technology, time to learn and integrate, hands-on learning, on-going technical support and support from administration are the factors that have influenced their learning and teaching. Some faculty members are still struggling with learning and integrating because of lack of time and lack of models to follow in the areas. Promoting faculty members to learn technology and integrate technology into their teaching is an important goal to be achieved. This increasing need stems from the requirement of faculty members' professional development, and social expectations. To achieve this, faculty members should actively involve themselves. They should involve themselves actively and constantly in reeducating themselves through participating in workshops and writing their own grants with technology; discussing and communicating with their colleagues about issues and problems about technology integration in their content areas.

The education system should accommodate faculty members' development, emotionally and financially. Administration should be aware of and create environment for faculty members' learning and teaching environment. They should increase an investment in purchasing and updating technology facilities to ensure faculty members' equal and convenient access to technology. They should sponsor workshops for training purpose and develop forums to promote discussions between faculty community and administration and among faculty members.

According to Zhao and Cziko (2001), creating a better environment will lead teachers to use technology and integrate technology into their classroom, eventually. By creating environment, the two researchers mean providing workshops for training, offering on-site support for individual teachers and establishing a reward system. Zhao and Cziko believe that support is an important component in creating environment. They say support should be individualized because it helps to identify individual teachers differences. Thus teachers can be assisted and supported more effectively with respect to their individual needs. Zhao and Cziko say that support from peers is very important. The two researchers state that the major reason that some teachers are not using technology in their classroom is that they do not perceive the need of using technology. They believe that teachers are promoted to use technology while listening to their peers' stories. Technological experts are not helpful because they, not teachers themselves, intimidate teachers. Zhao and Cziko say that creating environment includes allowing teachers to maintain their pedagogical beliefs while promoting the use of technology. To reduce the nervousness and anxiety among teachers, we should allow current technology to fit their beliefs and practices.

Helping faculty members to integrate technology into their teaching and learning is important in faculty members' development. To achieve this accomplishment, not only should faculty members actively involve themselves in learning, but also our educational system should accommodate faculty members' development emotionally and financially. Since this study has involved a very small number of participants from education departments, more research should be conducted in different levels from administration to faculty, from students to their family, to seek the factors that influence technology integration. Therefore, we can get information from each component in the educational system. Using the information, we can map the small pieces of information into the big picture and then solve the puzzles.

REFERENCES

Anderson, S. E., & Harris, J. B. (1997). Factors associated with amount of use and benefits obtained by users of a statewide educational telecomputing network. Educational Technology Research and Development, 45(1), 19-50.

Ayersman, D. J., & Reed, W. M. (1996). Effects of learning styles, programming, and gender on computer anxiety. Journal of Research on Computing in Education. 28(2), 148-161.

Barker, L. (2001). Planning for educational technology integration: Data on faculty and student needs and concerns. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at June 27-29, 2001, Samos Island, GREECE. 27-32.

Barr, R. B., & Tagg, J. (1996). From teaching to learning: a new paradigm for undergraduate education. In K. A. Feldman and M. B. Paulsen (Eds.), Teaching and Learning in the college classroom (pp. 697-709). Massachusetts: Simon & Schuster Custom Publishing.

Becker, H.J. (1994). How Exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. Journal of Research on Computing in Education. 26(3), 291-321.

Becker, H.J. (1998). Running to Catch a Moving Train: Schools and Information Technologies. Theory-into-Practice. 37(1), 20-30.

Becker, H.J. (1999). Internet use by teachers: conditions of professional use and teacher- directed student use. Teaching, Learning, ND computing: 1998 National Survey. Report #1. Irvine, CA: center for Research on Information Technology and

Organizations, University of California, Irvine. Available online:

<http://www.crito.uci.edu/TLC/FINDINGS/internet-use/>.

Bennet, J.B. (2000). Teaching and Learning, Technology, and a Collegial Ethic of professionalism and hospitality. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at August 25-27, 2000, Samos Island, GREECE. 323-328.

Bernard, H. R. (1994). Research Methods in Anthropology: qualitative and quantitative approaches. 2nd ed. Walnut Creek, CA: AltaMira Press, a division of Sage publications, Inc..

Bitter, G. & Yohe, R.L. (1989). Preparing Teachers for the information age. Educational Technology, 29(March), 22-25.

Bogdan, R. C., and Biklen, S. K. (1992). Qualitative Research for Education: an introduction to theory and methods. 2nd ed. Boston: Allyn and Bacon.

Bower, G. H., & Hilgard, E. R. (1981). Theories of learning. 5th ed. Englewood, N.J.: Prentice Hall.

Chickering, A. W. & Ehrmann, S. C. (1996). Implementing seven principles: technology as lever. In K. A. Feldman and M. B. Paulsen (Eds.), Teaching and Learning in the college classroom (pp. 617-621). Massachusetts: Simon & Schuster Custom Publishing.

Chickering, A. W. & Gamson, Z. F. (1996). Seven principles for good practice in undergraduate education. In K. A. Feldman and M. B. Paulsen (Eds.), Teaching and Learning in the college classroom (pp. 543-549). Massachusetts: Simon & Schuster Custom Publishing.

- Clark, R.E. (1983). Reconsidering research on learning from media. *Review of Educational research*, 53(4), 445-459
- Collins, A. (1991). The role of computer technology in restructuring schools. *Phi Delta Kappan*, 73, 28-36.
- Cooper, J.M., & Bull, G.L. (1997, summer) Technology and teacher education: Past practice and recommended directions. *Action in Teacher Education*. 19(2), 97-106
- Einsenstein, B. (2000). "Make no small plans..." engineers in the frontlines of education. *TIES Magazine*, 1-2.
- Creswell, J. (1998). *Qualitative inquiry and research design*. Thousand Oaks, CA: Sage.
- Cyrs, T.E. & Conway, E.D. (1997) *Teaching at a distance with the merging technologies (An instructional systems approach)*, Center for Educational Development, New Mexico State University.
- Dawson, K. (1998). Factors influencing elementary teachers' instructional computer use. Paper presented at the SITE 98, Washington, DC.
- Dawson, K. & Norris, A. (2000). Preservice teachers' experiences in a K-12/university technology-based field initiative: benefits, facilitators, constraints, and implications for teacher educators. *Journal of Computing in Teacher Education*. 17(1), 4-12
- Department of Education (2000). [online]. Overview: your comments Revising the 1996 National Educational Technology Plan Available: http://www.air.org/forum/pdf/Five_Summaries.pdf
- Des Dixon, R. G. (1992) *Future schools and how to get there from here: a primer for evolutionaries*. Toronto, Canada: ECW Press.

Dias, L.B. (November, 1999) Integrating Technology. *Learning and Leading with Technology*, 27(3), pp. 10-13+.

Dressel, P. L. & Marcus, D. (1996). Teaching styles and effects on learning. In K. A. Feldman and M. B. Paulsen (Eds.), Teaching and Learning in the college classroom (pp. 495-501). Massachusetts: Simon & Schuster Custom Publishing.

Dwyer, D. (April, 1994) Apple classroom of tomorrow: What we've learned. Educational Leadership. 51(7) 4-10

Dwyer, D. C., Ringstaff, C., & Sandholtz, J. H. (1990) Teachers beliefs and practices part II: Support for change (Apple Classrooms of Tomorrow Research Report 9) Online document. Cupertino, CA: Apple Computer. Available: www.apple.com/education/k12/leadership/acot/library.html.

Edwards, A. D. & Furlong, V. J. (1978). *The language of teaching: meaning in classroom interaction*. London: Heinemann Educational Books Ltd.

Ennis III, & Ennis, D. (1995-6). One dozen ways to motivate teacher education faculty to use technology in instruction. Journal of Computing in Teacher Education. 12(2), 29-33.

Ertmer, P.A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. Educational Technology Research & Development, 47(4), 47-61.

Ertmer, P. & Hruskocy, C. (1999) Impacts of a university-elementary school partnership designed to support technology integration. Educational Technology Research and Development. 47 (1), 81-96.

Fincher, C. (1978). What is learning? Engineering Education, 68, 420-423

- Fincher, C. (1996). Learning theory and research. In K. A. Feldman and M. B. Paulsen (Eds.), Teaching and Learning in the college classroom (pp. 58-115). Massachusetts: Simon & Schuster Custom Publishing.
- Fosnot, C. T. (1996). Constructivism, theory, perspectives, and practice. New York: Teachers College Press.
- Gilbert, S.W. (1996). Making the most slow revolution. Change, 28(2), 10-23.
- Gilmore, A.M.(1995). Turning teachers on to computers: Evaluation of a teacher development program. Journal of Research on Computing in Education. 27(3), 251-269.
- Glesne, C. (1999) Becoming qualitative researchers: an introduction. (2nd ed) New York: Addison Wesley Longman.
- Hadley, M., & Sheingold, K. (May 1993). Commonalities and distinctive patterns in teachers' integration of computers. American Journal of Education, 101(May), 261-315.
- Handler, M.G., & Strudler, N. (1997) The ISTE foundation standards: Issues of implementation. Journal of Computing in Teacher Education. 13(2), 16-23.
- Hardy, N.T. (1976). A survey Designed to refine an inventory of teaching styles to be used by individuals preparing for college teaching. Unpublished dissertation, Michigan State University.
- Hartiva, N., & Lesgold, A. (1996). Situational effects in classroom technology implementations: unfulfilled expectations and unexpected outcomes. In S.T. Kerr (Ed.), Technology and the future of schooling: Ninety-fifth yearbook of the National society for the study of Education, part 2(131-171). Chicago: University of Chicago Press.

Heflich, D.A. (1996). The impact of online technology on teaching and learning: attitudes and ideas of educators in the field. Paper presented at the Annual meeting of the Mid-South Educational Research Association in Tuscaloosa, AL.

Hignite, M., & Echternact, L. (1992) Assessment of the relationships between computer attitudes and computer literacy levels of prospective educators. Journal of Research on Computing in Education, 24(3), 381-391

Hossain, P. & Hossain, Z. (2000) Digital revolution ad the (De)Construction of learning community. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at June 27-29, 2001, Samos Island, GREECE.161-164.

Huang, S.L. (1994) Prospective teachers' use and perception of the value of technology. In J. Willis, B. Robin & D. Willis (Eds.), *Technology and Teacher Education Annual*, (61-66). Charlottesville, VA: Association for the Advancement of Computing in Education.

Hunt, N.P., & Bohlin, R.M. (1993). Teacher education students' attitudes toward using computers. Journal of Research on Computing in Education. 25(4), 487-497.

International Society for Technology in Education (1999) Will new teachers be prepared to teach in a digital age?: a national survey on information technology in teacher education. Santa Monica, CA: Milken Family Foundation, commissioned by Milken Exchange on Education Technology

Jonassen, D. H. (1995). Supporting communities of learners with technology: A vision for integrating technology in learning in schools. *Educational Technology*, 35(4), pp. 60-62.

Kennedy, T.J., Odell, M.R.L., Sharp, J.M., & Sharp, R.L. (2001) Enhancing pre-service teacher preparation through the integration of technology and the internet. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at June 27-29, 2000, Samos Island, GREECE. 181-186.

Lawler, C., Rossett, A., & Hoffman, R. (1998). Using supportive planning software to help teachers integrate technology into teaching. Educational Technology, 38(5), 29-34.

Liu, X., Macmillan, R., & Timmons, V. (1998) Assessing the impact of computer integration on students. Journal of Research on Computing in Education. 31(2), 189-203.

Lincoln, Y., & Guba, E. (1985). Naturalistic inquiry. Beverly Hills: Sage Publications.

Macavinta, C. (2000, January). Microsoft, Intel pour money into teacher training. CNET news.com [on-line]. Available: <http://news.cnet.com/category/0-1005-200-1528083.html>.

Marcinkiewicz, H.R. (1993-4, winter) Computers and teachers: factors influencing computer use in the classroom. Journal of Research on Computing in Education, 26(2), 220-237.

Maurer, M., & Simonson, M.R. (1993). The reduction of computer anxiety: its relation to relaxation training, previous computer coursework, achievement, and need for recognition, Journal of Research on Computing in Education, 26(2), 295-319

McKeachie, W. J. (1996). Research on college teaching: the historical background. In K. A. Feldman and M. B. Paulsen (Eds.), Teaching and Learning in the college classroom (pp. 19-35). Massachusetts: Simon & Schuster Custom Publishing.

Means, B., & Olson, K. (1994, April) The link between technology and authentic learning. Educational Leadership.15-18

Means, B., & Olson, K. (1995) Technology's role in Education reform: Findings from a national study of innovating schools. Washington, DC: Office of Technology Research and Improvement, U.S. Department of Education.

Means, B., Olson, K., & Singh, R. (1995). Beyond the classroom: Restructuring schools with technology. *Phi Delta Kappan*, 77, 69-72.

Meghabghab, D.B., & Price, C. (1997). The impact of a technology-rich environment. In *Information Rich but knowledge poor? Emerging issues for schools and libraries worldwide*. Research and professional papers presented at the Annual Conferences of the International Association of School Librarianship Help in Conjunction with the Association for Teacher-Librarianship in Vancouver, Canada, 137-141.

Mehlinger, H. (1996). School reform in the information age. *Phi Delta Kappan*, 77, 400-407.

Mellon, C.A. (1999, Fall) Technology and the great pendulum of education. Journal of Research on Computing in Education. 32(1), 28-35

Mitra, A., Steffensmeier, T., Lenzmeier, S. & Massoni, A. (1999, Fall) Changes in attitudes toward computers and use of computers by university faculty. Journal of Research on Computing in Education. 32(1),189-202

National Task Force on Educational Technology. (1986). *Transforming American Education: Reducing the risk to the nation*. A report to the Secretary of Education, United State Department of Education. *T.H.E. Journal*, 14(10), 58-67

Neo, K. & Neo, M (2001) Multimedia technology: Using multimedia authoring tools to enhance teaching and learning in the classroom. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at June 27-29, 2001, Samos Island, GREECE. 327-331.

Newman, D. (1992). Technology as support for school structure and school restructuring. *Phi Delta Kappan*, 74, 308-315.

Office of Educational Research and Improvement, (1993). Using technology to support education reform. Washington, DC: U.S. Government Printing Office.

Office of Technology Assessment, (1995). Teachers and technologies: Making the connection. Washington, DC: U.S. Government Printing Office.

National Council for Accreditation of Teacher Education. (1997). Technology and the new professional teacher: preparing for the 21st century classroom, Washington, DC: Author.

Palmer, M. (2000) Partnerships for progress: Stimulating faculty use of technology. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at August 25-27, 2000, Samos Island, GREECE. 151-154.

Peck, K.L., & Dorricott, D. (1994, April) Why use technology? Educational Leadership 11-14

Persky, S.E. (1990). What contributes to teacher development in Technology? Educational Technology, 30(4), 34-38

Parks, A., & Pisapia, J. (1994). Developing exemplary technology-using teachers: Research brief #8. Metropolitan Educational Research Consortium, Richmond, VA. ERIC Reproduction Document No.: 411360.

Prawat, R. (1992) Teachers' beliefs about teaching and learning: A constructivist perspectives, American Journal of Education, 100(3), 354-395

Robinson, B. (1995) Teaching teachers to change: the place of change theory in the technology education of teachers. Journal of Technology and Teacher Education, 3(2/3), 107-117

Rogers, E.M. (1995). Diffusion of innovations (4th edition). New York: The Free Press.

Shanker, A. (1990, September 23). Equipping teachers for productivity: From chalkboards to computers. The New York Times, Section E, 7.

Schrum, L. (1995) Educators and the Internet: A case study of professional development. Computers and Education, 24(3), 221-228

Schrum, L. (1999). Technology professional development for teachers. Educational Technology Research & Development, 47(4), 83-90

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. Phi Delta Kappan, 73, 17-27.

Sheingold, K., & Hadley, M. (1990). Accomplished teachers: Integrating computers into classroom practice. New York: Bank Street College, Center for Technology in Education.

Speaker, R.B., Dermody, M., Knighten, B., Wan, L., & Parigi, A. (2001). Student/Faculty relationships, methods courses and K-12 classrooms: examples of

integration of technology in teacher education. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at June 27-29, 2000, Samos Island, GREECE. 307-313.

Stellwagen, J. B. (1999). Social studies teaching and technology: reflections of a veteran teacher. International Journal of Social Education, 14(1), 118-129.

Strudler, N., & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. Educational Technology Research and Development, 47(4), 63-81.

Thomas, J.A., & Cooper, S.B. (2000, fall) Teaching technology: A new opportunity for pioneers in Teacher education. Journal of Computing in Teacher Education. 17(1), 13-19.

U.S. Congress, Office of Technology Assessment. [OTA] (1988, September). Power on! New tools for teaching and learning (OTA-SET-379). Washington, DC: U.S. Government Printing Office.

Vannatta, R. A., & Beyerbach, B. (2000, Winter). Facilitating a constructivist vision of technology integration among education faculty and preservice teachers. Journal of Research on Computing in Education, 33(2), 132-148.

Vockell, E., & Sweeney, J. (1994). How do teachers who use computers completely differ from other teachers? Journal of Computing in Teacher Education, 10(2), 24-31

Walker, M., Ennis-Cole, D., & Ennis, III, W. (2000) Down to the Nuts and Bolts: Considerations for the Infusion of Classroom Technology. Paper presented at the Annual Conferences of Technology in Teaching and Learning in Higher Education: An International Conference at August 25-27, 2000, Samos Island, GREECE.115-120.

Willis, J., Austin, L., & Willis, D. (1994). Information technology in teacher education: surveys of the current status (a report prepared for the Office of Technology Assessment). Houston, TX: University of Houston, College of Education.

Willis, E.M., & Tucker, G.R. (2001, winter) Using constructionism to teach constructivism: Modeling hands-on technology integration in a pre-service teacher technology course. Journal of Computing in Teacher Education, 17(2), 4-7

Willis, J.W., & Mehlinger, H. D. (1996) Information technology and teacher education in J. Sikula, T. J. Buttery, & E. Guyton, (Eds.) Handbook of Research on Teacher Education (2nd edition). New York: Simon & Schuster Macmillan, 978-1029.

Willis, J., Thompson A., & Sadera, W. (1999). Research on Technology and teacher education: current status and future directions. Educational Technology Research & Development 47(4), 29-45 ISSN: 1042-1629

Wolcott, H. (1994). Transforming qualitative data: Description, analysis, and interpretation. Thousand oaks, CA: Sage.

Yildirim, S. (2000) Effects of an educational computing course on pre-service and in-service teachers: A discussion and analysis of attitudes and use. Journal of Research on Computing in Education. 32(4), 479-495.

Zhao, Y. (1998). Design for adoption: The development of an integrated web-based education environment. Journal of Research on Computing in Education. 30(3), 307-328.

Zhao, Y., Byers, J., Mishra, P., Topper, A., Chen, H., Enfield, M., Ferdig, K., Pugh, K., & Tan, S.H. (2001, Winter) What do they know? A comprehensive portrait of exemplary technology-using teachers. Journal of Computing in Teacher Education. 17(2), 25-37

Zhao, Y., & Cziko, G. A. (2001) Teacher Adoption of Technology: A perceptual control theory perspective. *Journal of Technology and Teacher Education*, 9(1), pp. 5-30.

APPENDICES

- A. ISTE Recommended Foundations in Technology for All Teachers
- B. ISTE National Educational Technology Standards (NETS)
- C. Consent Form
- D. Demographics Information Form
- E. Interview Questions (Pilot Study)
- F. Interview Questions (Dissertation Study)
- G. Observation Guidelines and Artifacts Analysis Guidelines
- H. Mapping List for Organization
- I. Code List

Appendix A:

ISTE Recommended Foundations in Technology for All Teachers

I. Foundations. The ISTE Foundation Standards reflect professional studies in education that provide fundamental concepts and skills for applying information technology in educational settings. All candidates seeking initial certification or endorsements in teacher preparation programs should have opportunities to meet the educational technology foundations standards.

A. Basic Computer/Technology Operations and Concepts. Candidates will use computer systems-run software; to access, generate and manipulate data; and to publish results. They will also evaluate performance of hardware and software components of computer systems and apply basic troubleshooting strategies as needed.

1. operate a multimedia computer system with related peripheral devices to successfully install and use a variety of software packages.
2. use terminology related to computers and technology appropriately in written and oral communications.
3. describe and implement basic troubleshooting techniques for multimedia computer systems with related peripheral devices.
4. use imaging devices such as scanners, digital cameras, and/or video cameras with computer systems and software.

5. demonstrate knowledge of uses of computers and technology in business, industry, and society.

B. Personal and Professional Use of Technology. Candidates will apply tools for enhancing their own professional growth and productivity. They will use technology in communicating, collaborating, conducting research, and solving problems. In addition, they will plan and participate in activities that encourage lifelong learning and will promote equitable, ethical, and legal use of computer/technology resources.

1. use productivity tools for word processing, database management, and spreadsheet applications.
2. apply productivity tools for creating multimedia presentations.
3. use computer-based technologies including telecommunications to access information and enhance personal and professional productivity.
4. use computers to support problem solving, data collection, information management, communications, presentations, and decision making.
5. demonstrate awareness of resources for adaptive assistive devices for student with special needs.
6. demonstrate knowledge of equity, ethics, legal, and human issues concerning use of computers and technology.

7. identify computer and related technology resources for facilitating lifelong learning and emerging roles of the learner and the educator.
8. observe demonstrations or uses of broadcast instruction, audio/video conferencing, and other distance learning applications.

C. Application of Technology in Instruction. Candidates will apply computers and related technologies to support instruction in their grade level and subject areas. They must plan and deliver instructional units that integrate a variety of software, applications, and learning tools. Lessons developed must reflect effective grouping and assessment strategies for diverse populations.

1. explore, evaluate, and use computer/technology resources including applications, tools, educational software, and associated documentation.
2. describe current instructional principles, research, and appropriate assessment practices as related to the use of computers and technology resources in the curriculum.
3. design, deliver, and assess student learning activities that integrate computers/technology for a variety of student group strategies and for diverse student populations.
4. design student learning activities that foster equitable, ethical, and legal use of technology by students.

5. practice responsible, ethical and legal use of technology, information, and software resources.

Appendix B:

ISTE National Educational Technology Standards (NETS) And Performance Indicators Educational Foundations for All Teachers

I. TECHNOLOGY OPERATIONS AND CONCEPTS.

Teachers demonstrate a sound understanding of technology operations and concepts.

Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education [Technology Standards for Students](#)).

B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES.

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

B. apply current research on teaching and learning with technology when planning learning environments and experiences.

C. identify and locate technology resources and evaluate them for accuracy and suitability.

D. plan for the management of technology resources within the context of learning

activities.

E. plan strategies to manage student learning in a technology-enhanced environment.

III. TEACHING, LEARNING, AND THE CURRICULUM.

Teachers implement curriculum plans, that include methods and strategies for applying technology to maximize student learning. Teachers:

A. facilitate technology-enhanced experiences that address content standards and student technology standards.

B. use technology to support learner-centered strategies that address the diverse needs of students.

C. apply technology to develop students' higher order skills and creativity.

D. manage student learning activities in a technology-enhanced environment.

IV. ASSESSMENT AND EVALUATION.

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.

B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.

C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. PRODUCTIVITY AND PROFESSIONAL PRACTICE.

Teachers use technology to enhance their productivity and professional practice.

Teachers:

- A. use technology resources to engage in ongoing professional development and lifelong learning.
- B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- C. apply technology to increase productivity.
- D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. 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:

- A. model and teach legal and ethical practice related to technology use.
- B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
- C. identify and use technology resources that affirm diversity
- D. promote safe and healthy use of technology resources.
- E. facilitate equitable access to technology resources for all students.

Appendix C:

Consent Form

1. Title of research Study

Investigating Higher Education faculty's perspectives of their experience in a PT3 grant project -Implications for faculty integration of technology

2. Project director

Principle Investigator: Li Wang, doctoral student, Department of curriculum and Instruction, University of New Orleans, New Orleans, LA 70148. Telephone: (504) 280-6606

Faculty supervisor: Richard Speaker Jr., Associate professor, Department of Curriculum and Instruction, University of New Orleans, New Orleans, LA 70148. Telephone: (504) 280-6534

3. Purpose of the Research

The purpose of this research is to investigating Higher Education faculty's perspectives of their experience in NOC-TIITE (New Orleans Consortium, Technology Integration and Implementation in Teacher Education) project. Findings will provide information about a group of education faculty members' use of technologies, the education faculty members' attitudes and opinions about the integration of technology in education; and the way in which attitudes, use of technology, and the relationship between them change after they experienced this federally funded, technological based project.

4. Procedures for this Research

A simple form to provide demographics will be given you. The form will ask you to provide name, gender, position, which age group you belong to, teaching experience, expertise, technology used before the project and technology currently used. Journals from your first year summer institute will be collected. And you will be requested to provide your course syllabi for the subsequent semesters after the summer institute. Semi structured interviews will be conducted, and each lasts 60-90 minutes. All interviews will be conducted in person and will be audio-taped for transcription purposes. Permission for conducting observation will be requested at the end of interview.

5. Potential Risks of discomforts

It is very unlikely that you will experience any risks in the investigation. Time and effort are the main contribution that you will make. Your participation is voluntary and you may withdraw from the investigation at any time.

6. Potential Benefits to you or others

Findings will be useful to assist the administrators and supervisors of this project in learning more about teachers' perspectives of their experience with technology. Since I will seek instructional designer position in higher education, findings will be helpful for me to shape views of successful technology integration.

7. Alternative procedures

Participation is voluntary and you may withdraw their consent and drop out at any time without consequences.

8. Protection of Confidentiality

The demographics, and other identifying information to be collected will be kept confidential at all times. Taped interviews will be transcribed by myself and kept confidential. This signed consent form, demographics form, audiotapes, syllabus, and observation notes, and other information collected will be maintained in a secure and confidential manner by the investigator in a locked file cabinet in ED 342J.

9. Signatures

I have been informed of all procedures, possible benefits, and potential risks involved in this investigation. By signing this form, I have given my permission to participate in this study.

Signature of Participant

Name of Participant(print)

Date

Signature of Interviewer

Name of Interviewer(print)

Date

Appendix D:**Demographics Information Form**

Name: _____

Gender: _____

Age group: 15-25 _____

26-35 _____

36-45 _____

46-55 _____

56-65 _____

66 and above _____

Position: _____

Teaching experience in higher education:

Teaching experience in other levels:

Expertise:

Technology used before NOC-TIITE:

Technology currently used:

Appendix E:

Interview Questions (Pilot Study)

- 1.** How do you describe your previous experience with technology before you participated in NOC-TIITE?
- 2.** How do you describe your experience in the summer institute?
- 3.** What did you do regarding technology integrating and implementation after the summer institute?
- 4.** What's your current application and integration of technology?
(problems or issues experienced?)
- 5.** How do you believe the impact of technology that has on students?
- 6.** Specifically, what do you see in students engaging in activities with technology?
- 7.** What does or do your Student Teaching Mentors do for you? What benefit do you gain from the FTP-STM relationship?
- 8.** What's your current need regarding technology integration? (technical support? time?)
- 9.** What do you believe that participation of this grant project have changed your belief, practice?
- 10.** What's your future vision / plan regarding technology integration?

Appendix F:

Interview Questions (Dissertation Study)

1. Technology beliefs and practices before the project:
 - What was your previous experience with technology before you participated in NOC-TIITE as a learner? Learning style?
 - What about your beliefs and practices as a teacher back then?
2. Experience during the project:
 - How do you describe your experience in the summer institute?
 - What does or do your Student Teaching Mentors do for you? What benefit do you gain from the FTP-STM relationship?
 - What has the project contributed to the changes to your beliefs, in personal use of technology, the curriculum, and your instruction?
 - What is your general opinion or comments about your participation of this grant project?
3. Current situation and applications of technology beliefs and practices:
 - What's your current application and integration of technology in teaching and research? What's your current need?
 - Any problems such as access, time, technical support and other issues?
 - A. Home use?
 - B. How do you balance the time to learn technology and time to your teaching obligations?
 - C. Other influences from peers or friends
 - How do you incorporate technology into the evaluation?

- How do you address ethical, legal and other issues related to technology use to your students?
 - What impact do you see that technology has on your students?
4. Future plans for technology integration:
- What's your future vision / plan regarding technology integration?
 - What do you suggest to help faculty members integrate technology into classroom effectively and model the use for their students, especially preservice teachers? Personally what barriers you believe this project have helped or you personally have overcome regarding technology integration.

Appendix G

Observation Guidelines

1. Type(s) of technology the instructor using in the classroom
2. The way technology integrated and modeled for the students. Curriculum plans, methods and strategies for applying technology to maximize student learning.
3. Instructor's strategies of dealing with emerging problems with technology in the classroom.
4. Technology used to facilitate a variety of effective assessment and evaluation strategies.
5. Addressing the social, ethical, legal, and human issues surrounding the use of technology. Application of those principles in practice.
6. Type(s) of technology the instructor requires students to use

Artifacts Guidelines

1. Types of technology used to complete the project
2. The content of the project
3. The way incorporated into teaching

Appendix H

Mapping List for Data Organization

1. beliefs and practices with technology prior to the project

Interview

2. experience during the project

Interview, Journals and artifacts

3. current application

Interview, observation data, course syllabi, artifacts

4. their future vision and plan

Interview

Appendix I

Code List

1. Beliefs
2. Practices
3. External factors
 - 1.1 Project experience
 - 1.1.1.1 workshop
 - 1.1.1.2 Self-confidence
 - 1.1.1.3 Mentorship
 - 1.1.1.4 Increasing use and integration
 - 1.1.2 Time needed
 - 1.1.3 Technical problems
 - 1.1.4 support
 - 1.1.4.1 Technical support
 - 1.1.4.1.1 faculty
 - 1.1.4.1.2 technician
 - 1.1.4.1.3 students
 - 1.1.4.2 Administrative support
 - 1.1.5 Technological Leadership
 - 1.1.6 Access to technology
 - 1.1.7 Subject issue
4. Internal factors
 - 2.1 Personal belief
 - 2.2 Personal feelings
 - 2.3 Time
 - 2.4 Learning Style
 - 2.5 Classroom teaching

Vita

Li Wang, born in July 27th 1976, received her associate Bachelor's degree in English Education from Changsha University in the People's Republic of China in the year of 1994. She received her Bachelor's degree in English Education from Hunan Normal University in 1999. In the same year, she was admitted into the doctoral program by the department of curriculum and instruction at the University of New Orleans. In the May of 2002, she received her doctoral degree in curriculum and instruction specialized in Educational Technology.

She had been working as a graduate assistant in the department of curriculum and instruction at UNO from the fall of 1999 to the spring of 2001. She was awarded Chancellor's scholar assistantship in the fall of 2002. But she turned down the offer to work for the NOCTIITE (the New Orleans Consortium in Technology Integration and Implementation in Teacher Education). She had been working for Dr. Richard Speaker since the summer of 2001 on his U.S. department of Education grant. She has been mainly responsible for maintaining and developing web pages, and offering technical assistance to education faculty and preservice teachers. She has been active in research. She presented a paper on synthesizing models of literacy teaching with technology integration in K-12 classrooms with a graduate student and Dr. Richard Speaker, her major professor at the International Reading Association in San Francisco in the May of 2002. With her major professor, she is going to present another paper on investigating how participation of technology-based project has influenced education faculty's beliefs and practices with technology integration at Ed-media in Denver in the June of 2002.