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Teacher Educators' Computer Technology Integration At Utah State University

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TEACHER EDUCATORS' COMPUTER TECHNOLOGY INTEGRATION AT UTAH STATE UNIVERSITY

by

Jiayi Wan

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ABSTRACT

Teacher Educators' Computer Technology Integration at

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Utah State University, 2009

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The purpose of this research is to develop a deep understanding of Utah State University teacher educators' perceptions and lived experience with computer technology integration. Ten methods course instructors in secondary education participated. Data were collected using the phenomenological research method: (1) conducting one-on-one in-depth interviews, (2) classroom observations of the four participants, and (3) examining artifacts, such as syllabi and presentation evaluation forms used by the participants.

The findings of this research show that the subjects regard computer technology as a powerful instructional tool. They also realize it is important to prepare preservice teachers with computer technology for their future careers. The study analyzes the positive and negative aspects of using computer technology in teaching and personal experiences, and how these influence the participants' computer technology integration.

The results indicate four types of computer technology integration among the teacher educators: (1) Advanced Users, (2) Technical Users, (3) Reluctant Users, and (4) Resisters, as well as some advantages and disadvantages of using computer technology in educational settings.

Based on the findings of the research, some strategies are suggested to improve the teacher educators' computer technology integration at Utah State University. These suggestions include aspects such as amending training procedures and building a supportive environment in the teacher educators' professional development. Future research perspectives are also proposed at the end of the dissertation.

(197 pages)

DEDICATION

This dissertation is dedicated to all the teacher educators and students in the teacher education programs at Utah State University.

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LIST OF DEFINITIONS

The following are definitions of terms referred to in this study:

ADDIE Model: An instructional design model that includes five phases: analysis, design, development, implementation, and evaluation, starting with the very basic elements of instructional design. It provides a dynamic and flexible guideline for instructional designers to plan and create training lessons and programs (Wikipedia, n.d.).

Bracketing: A philosophy without presuppositions. It is the researcher's attempt to suspend preconceived notions or assumptions of what other people experience until their experiences are founded on a more certain basis (Creswell, 1998).

Computer technology integration: Combining computer technology and content materials in instructional strategies to achieve instructional goals.

FACT (The Faculty Assistance Center for Teaching): A branch of the Utah State University (USU) office of Information Technology. The FACT is committed to supporting the faculty at Utah State University in terms of technology training and production assistance.

Force Field Analysis: A framework presenting forces that either drive movement toward a goal or block movement toward a goal.

IA (Instructional Architect): A free online computer program designed by a group of researchers in the Department of Instructional Technology at USU. This program is related to the National Science Digital Library (NSDL) and allows users to create educational web pages by using the resources from the NSDL.

InsT 3500: A computer literacy course oriented to the preservice teachers at the Secondary Education Program at USU. The goal for this course is to provide preservice teachers with a working knowledge of instructional technology and the application of technology to the teaching/learning process.

Phenomenon: An observable fact or event.

Phenomenology/phenomenological research: The study of the "lifeworld" as we immediately experience it. "[I]t attempts to gain insightful descriptions of the way we experience the world pre-reflectively, without … abstracting it." (Van Manen, 1990, p. 9)

Preservice teachers: Students at Utah State University who are trained to become middle school (Grades 6-8) or high school (Grades 9-12) teachers.

Teachers: Inservice schoolteachers who work in either elementary, middle, or high schools.
Teacher educators: Faculty members who teach methods courses for secondary education preservice teachers at USU.

Technology: All the instructional tools and designs that help improve teaching and learning process.

YETC (The Adele & Dale Young Education Technology Center): A resource center for the College of Education and Human Services at USU. It includes an open access computer lab as well as a K-12 curriculum materials library. It also provides services such as networking, computer repair and troubleshooting, and web services to the college.

CHAPTER I

INTRODUCTION

General Background for the Study

Since the decade of the 1950s, computer technology has had an increasing influence on education. For current teacher training programs, it is important to prepare tomorrow's teachers for computer technology integration. In order to achieve this goal, teacher training programs must, as much as possible, model appropriate use of technology in teaching, since teachers teach as they were taught (Albion & Ertmer, 2002). To build this kind of modeling behavior, it was first necessary to develop a deep understanding of university teacher educators' perceptions and current practices of computer technology integration. This dissertation focuses on this issue with the teacher educators at Utah State University (USU).

USU's Secondary Education Program

Utah Agricultural College (later Utah State University) was established in 1888, and the College of Education was established in 1927. The Department of Secondary Education emerged as a separate department in the 1960s and was well established by 1968. The department has provided professional education courses for some 27 teaching majors and minors from many departments on campus. Now, USU's secondary education program is a branch of the School of Teacher Education and Leadership (TEAL), a department in the College of Education at USU. Although the program has faculty members who teach classes such as Motivation and Classroom Management, Cognition and Evaluation of Student Learning, and Education of Exceptional Children,

many other faculty members reside in other academic departments, teaching content and methods courses. For example, the teacher of the foreign language methods course is a faculty member in the Department of Languages and Philosophy in the College of Humanities, Arts, and Social Sciences – not the College of Education.

Since about 1968 four academic areas of emphasis have had specialists in the Secondary Education Department: English, mathematics, science, and social studies. In the mid 70s or 80s, the department started requiring the students to take technology classes. Now, all the preservice teachers in the secondary education program are required to take InsT 3500, a computer literacy class offered by the Department of Instructional Technology and Learning Science (ITLS). The Secondary Education program itself also has a class called Reading, Writing, and Technology, which includes computer lab experience for writing. This class is especially useful for teachers who will teach English in public schools. In addition, the department also requires the preservice teachers to work on portfolios with computer technology elements (Knight, personal communication, April 9, 2009).

The PT3 Grant: A Historical Perspective

In 1999, USU's Department of Instructional Technology – now known as the Department of Instructional Technology and Learning Sciences (ITLS) – received a three-year grant from the federal government. The grant was almost a million dollars and was titled *Preparing Tomorrow's Teachers to Use Technology* (PT3). According to the grant project director, Dr. Steve Soulier (personal communication, May 30, 2008), who is now an Emeritus faculty member of the university, the USU PT3 grant was used to

achieve three goals:

1. Expand the College of Education's curriculum library – a collection of textbooks used in K-12 education – into the YETC, a large multimedia facility.

2. Develop a system for allowing preservice teachers to do portfolios totally electronically.

3. Train faculty members to use technology more effectively and provide them with computers.

Besides these goals, the grant was also used to support subject matter specialists who were related to the secondary education program. The specialists could apply for mini grants out of the PT3 grant to enhance the use of computer technology in their classrooms. Thus, the preservice teachers could see computer technology being used in math, art, science, and many other content areas.

The results of the grant project were as follows:

The YETC turned out to be the most effective part of the whole project. The YETC has become a place where the preservice teachers can go and practice with the latest computer technology. In addition, Dr. Soulier used the grant to hire students, including graduate students from the ITLS Department and undergraduate students from other departments, to work at the YETC. These students provided technical support, such as finding appropriate software for instructional design and troubleshooting computer problems, for the YETC users, mostly preservice teachers.

However, the electronic portfolio portion was largely a failure due to two major problems. First, the faculty members were not ready to set up the new system, which was

very different from traditional methods of creating and evaluating non electronic portfolios. Second, the storage capacity was not advanced enough for hundreds of students to store and continuously develop and upgrade their portfolios over time. Even when I started this dissertation study in 2008, which was five years after the completion of the grant project, the goal of making totally electronic portfolios was still not achieved.

Nevertheless, the secondary education program provided technology-oriented principles and specific requirements to guide the students' work on their portfolios. These guidelines included (1) use appropriate electronic media, such as the internet, webpages, email, databases, word processing, and video; and (2) use formats other than written, such as instructional videotapes, CDs, and PowerPoint presentations, on at least one of the artifacts in the portfolio.

As for the faculty training portion, it was hard to evaluate the result at the end of the grant project since it was a long-term process for the faculty members to learn and apply computer technology in their teaching. However, the grant provided some faculty members with laptop computers and purchased many projection systems. Thus, according to Dr. Soulier, the grant planted the seeds for computer technology integration in classrooms at USU. It also took away the excuses from some faculty members who complained that the lack of computers and projection systems prevented them from using computer technology in their teaching.

Statement of the Problem

During the 2007 spring and summer semester, I conducted a pilot study to obtain a preliminary understanding of the role of computer technology in the secondary education program at USU. I interviewed 11 preservice teachers in a computer literacy course (InsT 3500) and eight teacher educators and student teaching supervisors. The interviews were related to computer technology training and integration for USU preservice teachers and faculty members. The results of the study revealed the following problems that need to be dealt with in my dissertation study:

Low Workshop Attendance

Although they all knew about the FACT center, many teacher educators involved in my pilot study admitted that they seldom attend the workshops held by the FACT center. My interview data revealed that two teacher educators had had unpleasant experiences in the workshop training. One teacher educator told me that he once attended a workshop where there were no computers for the learners. Another teacher educator said that the workshop in the FACT center went too fast for her to follow. Thus, she did not survive a single workshop training class. As the interviewer, I concluded that the training environment and training instructions could be improved.

The teacher educators mentioned that it was hard to fit the workshops into their busy schedules. As a result, many of them managed to learn computer skills at home from their children and even from their students at school. Some interviewees working in the education building pointed out that Nathan Smith, the Director of YETC, had given them a lot of technological support.

According to adult learning theory, adults have a psychological need to be self-directing in learning knowledge that can be immediately applied to solve real-life problems. Thus, it could often be more effective for the faculty members to learn by themselves than to attend workshops (Glickman, Gordon, & Ross-Gordon, 2001). However, leaving the faculty members on their own could cause other problems. During my interviews, I noticed that the teacher educators were involved in three different levels of computer technology integration. The most advanced level was *high technology integration level*. The teacher educators on this level were very active in using computer technology in their teaching. They were also eager to learn new computer skills. The next level was *medium computer technology integration level*. The teacher educators on this level realized that computer technology would be a useful tool in their teaching. Although they were trying to integrate the technology, they felt it was hard to learn computer skills. The third level was *low computer technology integration level*. The teacher educators on this level had a negative attitude toward computer technology integration and generally tried to avoid it.

The teacher educators at the advanced level may make extensive progress on their self-directing learning since they are deeply involved in computer technology integration. They would respond actively by asking for help or doing research on their own when they encountered problems in their frequent use of the technology. The teacher educators on the second level could be lost in their self-directing learning since they might encounter too many problems when they use the technology and may not know the starting point for solving these problems. Thus, they may need more help from

workshops or other training resources. As for the teacher educators on the third level, without the stimulus for learning that a workshop provides, they may never get a chance to know and practice any computer skills.

Lack of Communication among the Teacher Educators

In general, according to my pilot study data, the teacher educators at USU did not actively communicate with each other in terms of computer technology issues. Although there were regular department meetings where discussions on the critical issues were sometimes brought up, most communications were limited to things such as getting help from an expert to put a syllabus on the website, or asking the department head for a new computer or projector. My pilot study interview data did not show that the faculty members exchanged their teaching ideas on using computer technology. Again, time could be a significant constraint. Exchanging of teaching ideas could also be happening in very casual occasions, such as at lunchtime.

Another constraint could be teacher educator self-esteem, given the prevailing culture of assumed faculty independence. When I conducted my pilot study, I felt that some teacher educators were embarrassed to admit that they did not know a certain computer skill or were not experts on using computers. As one teacher educator said, "I guess every professor is kind of jealous of his own little turf, and nobody really shares. Faculty don't want to embarrass themselves to say, 'I don't know how to do this.'" It seemed that the teacher educators had, in general, not paid much attention to technology issues. Among the eight faculty member interviewees, only one knew about National

Educational Technology Standards (NETS). Although some content areas, such as English and history, had their own technology standards, the application and enforcement of these standards was not strict.

Misunderstandings on Computer Technology Integration

It seemed to me that some teacher educators had misconceptions about computer technology integration. When asked about this subject, they immediately responded by referring to their use of PowerPoint. For them, computer technology integration seemed to be the synonym for using PowerPoint in teaching. In situations like this, computer technology integration was easily ignored for various reasons, including poorly equipped classrooms and/or (it seemed to me) inappropriate teaching methods.

Preservice Teachers' Lack of Academic Experience

In her dissertation, Dr. Sheri Haderlie (2001) concluded that preservice teachers' academic experience at USU seemed to have little influence on their use of computer technology in their teaching, since they received limited formal computer skill training, and at that time, USU's computer technology was much more advanced than that of many school districts. My 2007 interviews with some secondary education preservice teachers at USU showed a similar pattern. This lack of tangible effects indicated that there were potential problems in our secondary education preservice training.

My interview data from the preservice teachers seemed to support that they did need more computer technology training. Most preservice teachers involved in the

interview admitted that the required computer literacy course (InsT 3500) was the first formal computer course they had taken since they graduated from high school. The preservice teachers also pointed out that many teachers' use of technology in their content areas was limited to PowerPoint presentations.

When asked what they usually did when working on their computers, a typical answer would be, "I wish someone could tell me that. What do I do all these hours? I check email, I read the news online, and mostly use the internet - and also play Solitaire (a game)." Some preservice teacher interviewees took online courses. However, none of them considered that taking online courses helped them develop computer skills. Thus, it might be reasonable to conclude that although the preservice teachers spent a lot of time on computers, few saw that this activity contributed to technology integration for their future careers.

Since most of the preservice teachers I interviewed were in the senior year of their college education, it seemed to me that they might have missed good opportunities to practice computer technology integration during their studies at USU. Thus, I believe that it would be better if the preservice teachers could be introduced to technology integration in the early stages of their coursework. Also, my interview data showed that although some teacher educators required the preservice teachers to use technology in their assignments, the introduction of the technology skills was most often ignored in the course, leaving the preservice teachers to struggle on their own to learn the necessary skills. Thus, it could be helpful if the faculty members could demonstrate the required skills and instruct the students directly in their teaching.

As a result of this pilot study, one of the teacher educators and I planned to collaborate in the Fall 2007 semester. According to our plan, I would go to her classrooms and give lectures on how to use the iMovie application in order to help her students do the course project; she, in turn, would come to my class, telling the preservice teachers how to use iMovie in a specific teaching subject. In this way, we hoped that the preservice teachers would gain a deeper understanding of technology integration. Although this plan was not fully put into effect (I went to her classrooms, but she did not come to mine), we hoped that the idea of collaboration would become prevalent among the teacher educators at USU.

Purpose of the Study

The purpose of this study is to develop a deep understanding of USU teacher educator perceptions and lived experience with computer technology integration. Based on the development of this understanding, I will try to identify the barriers that prevent teacher educators from integrating computer technology into their teaching. I will then try to find solutions to these identified barriers and thus improve the quality of USU's secondary education teacher training program to better prepare tomorrow's teachers for computer technology integration.

Guiding Research Questions

The development of computer technology has made it a powerful tool in education. Future schoolteachers are increasingly required to be competent in the use of

this technology in their teaching. It appears evident that teacher educators should be better prepared to address the technological needs of their students. In order to accomplish this, it would be beneficial for the educational community to understand the teacher educators' understanding of technology integration. The guiding research question in this study is: What are the perceptions that teacher educators at USU attach to their professional development experiences with computer technology? This study attempts to answer this question through the use of phenomenology.

Specific Questions

In my dissertation, I will answer the following research questions:

1. How do the USU teacher educators perceive and experience computer technology integration in their own teaching?
2. What can be used (i.e., strategies or means) to improve the teacher educators' computer technology integration at USU?

Significance of the Study

The significance of the study lies in the following two facts: (1) few studies have explored the same or similar issues through the use of phenomenological research method, and (2) no studies have focused on the teacher educators' professional development on computer technology at USU. Thus, the study possesses potential benefits of contributing new knowledge to educational research and practice.

CHAPTER II

LITERATURE REVIEW

I have completed two literature reviews for my dissertation. The first was on faculty members' computer technology training and integration. This revealed some methods and suggestions introduced in extant literature on how to carry out faculty members' computer technology training. It also suggested the importance of a supportive environment for faculty members' computer technology integration. The second literature review was on educators' beliefs and computer technology integration. In this review, I explored the relationship between educators' constructivist pedagogical beliefs and computer technology integration.

Literature Review I: Faculty Members' Computer Technology Training and Integration

Introduction

A General background of the research studies on the issue. With the increased access to computers and the internet in U.S. schools, concern was raised about the teachers' use of this technology in their teaching (Ertmer, 1999, 2003). Surveys and studies revealed that fewer than half of the new teachers (three or fewer years in the classroom) feel well prepared to use technology in their teaching (Ertmer).

One large-scale effort to change this situation was the PT3 grant program initiated by the Teacher Education Division of the U.S. Department of Education. The PT3 grant program provided $337.5 million to 441 agencies, most of which were colleges of

education, from 1999-2004 (Moore & Duffield, 2006). Many successful individual PT3 projects have been published in special issues of journals such as *Educational Technology Research and Development* (Vol. 51, No. 1, 2003) and *the Journal for Technology in Teacher Education* (Vol. 12, No. 2, 2004), introduced in many conference presentations, and presented in a book titled *Insights from the PT3 Program* (2006). In addition, *TechTrends* also devoted a special issue to provide a macro view of what has been learned through the PT3 program. Nineteen out of thirty-two papers in my literature review were related to the PT3 program. The results of these projects represent the existing trends of research study in this area. Two of the main aspects in these research studies were faculty members' computer technology training and institutional change.

Most of the journal articles included in this literature review were located through electronic databases such as ERIC via EBSCO Host, Education Full Text, and ERIC via the US Department of Education. The keywords used for searching in these databases were faculty and computer technology training. The reference lists of obtained studies were also important sources for identifying more relevant research studies. After reviewing thirty-two research papers, I noticed the repeated patterns and stopped collecting literature.

Faculty Members' Computer Technology Training

One important way of influencing preservice teacher technology integration in classroom teaching practices was to increase faculty members' participation in technology integration initiatives in the methods and content courses.

Workshops. Workshops were a common form of faculty training in many research studies (Davidson-Shivers, Salazar, & Hamilton, 2005; Graves & Kelly, 2002; Murphy, Richards, Lewis, & Carman, 2005; Strudler, Archambault, Bendixen, Anderson, & Weiss, 2003). Hall, Fisher, Musanti, and Halquist (2006) reviewed 34 PT3 grant projects and reported that 14 of these projects used a technology workshop in faculty professional development.

Workshops provided training on PowerPoint, Webpage development, Blackboard, iMovie, Inspiration, digital video, WebCT, and concept mapping applications. They focused on enhancing curriculum with faculty members' learning particular applications. Some workshops took a project-based learning approach to address specific learning goals and outcomes related to technology standards (Graves & Kelly, 2002). Others used the ADDIE model to carefully guide the design of the workshops (Davidson-Shivers et al., 2005). Still others asked the faculty to participate in a preservice technology course (Popham & Rocque, 2004). Most workshops were offered more than once to fit the faculty members' busy schedules (Murphy et al., 2005; Strudler et al., 2003).

These research studies showed that faculty members who went through the workshops reported a more positive attitude toward technology training and an effective result when the workshop participants shared a common academic area, taught similar courses, and had an excellent group leader (Graves & Kelly, 2002).

However, Davidson-Shivers et al. (2005) noted that some research studies reported that workshops often had misdirected goals, which was caused by not utilizing instructional design models, resulting in the workshops' being ineffective. Thus, the

researchers argued that the identification of faculty members' needs was critical for workshop success.

Student Wizard Assisting Teachers (SWAT). Murphy et al. (2005) argued that it was necessary to assist faculty members individually on their technology skills since the technology workshops would not cover the wide range of technology needs. This perspective of mentoring was supported by Howland and Wedman (2004), Leh (2005), and Wedman and Howland (2003).

However, it was not easy to recruit mentors. Murphy et al. (2005) reported that only the graduate students from the Instructional Technology (IT) Department who were in the middle of their course work were willing to serve as mentors. The researchers' contact with a couple of K-12 teachers and IT graduate students in the final stage of their course work did not generate fruitful results. Leh (2005) also reported that the graduate students in the IT program served as mentors in her study. Howland and Wedman (2004) as well as Wedman and Howland (2003) called this kind of mentoring team a "SWAT" (Student Wizard Assisting Teachers) team.

A typical mentoring procedure involved each faculty member meeting with a SWAT team member in the faculty's office once a week for 2-3 hours. The SWAT team member taught the faculty members computer skills and helped identify possible opportunities for technology integration on the basis of their syllabi. The research study showed that SWAT turned out to be one of the necessary elements for successful professional faculty development (Howland & Wedman, 2004). My literature review also showed that the faculty members greatly appreciated the flexibility of the training.

Some faculty members regarded this one-on-one mentoring to be the best computer training they had ever received (Denton, Davis, Strader, Clark, & Jolly, 2003; Leh, 2005).

Institutional Change

The researchers argued that institutions would need an organizational change, during which the administrators would play crucial roles, to align their classes with technology training (Mewborn et al., 2002). This perspective was supported by Wizer and McPherson (2005), who also regarded the change of organizational structures as one of the administrative support forms that were necessary to promote the use of technology.

Duffield and Moore (2006) analyzed the strategies that were most prevalent and successful in PT3 projects. One of these strategies was to provide incentives for faculty members who participated in professional development. The incentives took the form of a course release or summer pay and mini grants, since technology trainings were time-consuming activities.

University faculty members are busy people. However, most faculty members reported that they would be willing to use technology if they had more time and a small amount of funding (Finley & Hartman, 2004). Finley and Hartman's study revealed that their interviewees spent a great deal of time collaborating with other faculty members on the technology skills and integration. These collaborations even included casual discussion of an idea while standing in a colleague's office doorway.

Strudler et al. (2003) documented that during 2000, 13 faculty members from the College of Education at the University of Nevada in Las Vegas received 10 mini grants. The next year, the mini grant funding was expanded to include seven departments and

four colleges. As a result, all recipients revised their syllabi to meet the NETS technology standards and adopt new technology-based learning activities.

Leh (2005) argued that the administrators at higher education institutions should support, value, and nurture the sustained collaboration of the faculty, helping them from a variety of disciplines see teacher education as a university-wide enterprise. Finley and Hartman (2004) even suggested in their study that it was important to create an institutional culture that possesses a positive common vision regarding the use of technology.

Mewborn et al. (2002) suggested that teacher education should be approached from an interdisciplinary perspective. This study reported on the Deans' forum at the University of Georgia, which provided a group of about 30 faculty members with time and space to discuss and share their experiences on teacher education across their disciplines. The faculty members participating in the forum were reported to be well benefited in terms of professional development.

Brantley-Dias, Calandra, Harmon, and Shoffner (2006) examined 21 PT3 projects over the last several years that aimed at increasing collaboration among education, art, and science faculty. One of the common approaches identified by the researchers in these 21 grants was an attempt to increase collaboration with entities outside the university, such as local community college and Professional Development Schools (PDS). These collaborations usually resulted in technology-equipped field placement for the preservice teachers as well as the faculty member. Brantley-Dias et al. reported that several universities among the PT3 projects they reviewed recognized that

the already-established positive relationships with colleagues in the college of arts & sciences and collaboration with area schools were the strength of their teacher education program.

Barriers

My literature review showed that there were two main categories of barriers that restrained teacher education programs in terms of the technology issue.

The first type of barriers referred to the lack of necessary resources such as equipment, time, training, and support (Ertmer, 1999). According to the literature, the lack of resources is primarily due to bureaucratic and organizational reasons (Graves & Kelly, 2002). Wedman and Diggs (2001) pointed out that department heads played an important role in offering rewards and incentives, including access to funds for faculties' technology use.

The second type of barriers referred to faculty members' underlying beliefs about teaching and learning. These barriers were subtle and might not be realized by the faculty members themselves (Ertmer, 1999). Faculty members were not motivated to integrate technology until they had a vision for how it would improve teaching and learning. For example, Albion and Ertmer (2002) had found clear evidence that faculty members with more constructivist philosophical beliefs use computers more frequently, in more challenging ways, and have greater technical expertise. According to Ertmer (1999) and Barnett (2003), one of the most important steps in achieving meaningful technology use was the development of a vision of how to use technology to achieve

important educational goals, although the personal philosophical beliefs of teachers were not easy to change (Albion & Ertmer).

Summary

This literature review showed that faculty members' computer technology integration was not an isolated issue. Computer skill training, the university's policies, and even the technological atmosphere of the university were factors that could have influence on faculty members' computer technology integration. Moreover, it was also important to build up appropriate personal philosophical beliefs that would support faculty members' computer technology integration.

Literature Review II: Educators' Beliefs and Computer Technology Integration

Introduction

One factor that emerged as a central feature in understanding computer technology integration was educators' beliefs. Many researchers regarded educators' beliefs as a major barrier that prevented educators from using technology in their classrooms (Ertmer, Addison, Lane, Ross, & Woods, 1999; Harwood, Hansen, & Lotter, 2006). This view was based on the assumption that educators' beliefs were the best indicators of their perceptions about computer technology, which, in turn, affected their decisions on technology integration (Pajares, 1992).

This literature review examined the meaning researchers give to educators' beliefs and various research study findings about the relationship between educators' beliefs and

computer technology integration. The literature review indicated that although educators' beliefs were a broad concept, researchers usually focused on only one aspect: educators' beliefs on teaching and learning. More specifically, the comparison between educators' beliefs on teacher-centered and student-centered teaching and learning usually becomes the major concern of the debates on this topic.

The literature review also showed that, although there were different research findings on whether or not the change of the educators' beliefs were the first important step leading toward the change of their computer technology integration, it was probably acceptable to conclude that the change of educators' beliefs was the most fundamental aspect that led the change of computer technology integration. In addition, the literature review revealed that the use of computers was probably not functioning as a catalyst in educators' beliefs change process.

This literature review attempted to answer the following two questions:

1. What aspects of educators' beliefs did the research studies focus on?
2. What has been found in the research studies about the relationship between educators' beliefs and computer technology integration?

Most of the journal articles included in this literature review were located through electronic databases such as ERIC via EBSCO Host, Education Full Text, and ERIC via the US Department of Education. The keywords used for searching in these databases were teaching philosophy, computer use, and educators' beliefs. The reference lists of obtained studies were also important sources for identifying more relevant research studies. Some studies (mostly unpublished) were identified but were not obtained. The

inclusion criteria were set up according to how the journal articles could help answer the three questions of this literature review. Studies published before 1990 were not included in this review, since the development of computer technology and software has brought big changes in the research environment on this issue. Twenty-nine research papers were reviewed.

What Did "Educators' Beliefs" Mean in the Literature?

When discussing the issue of educators' beliefs, different researchers used different terms. For example, some researchers used "teachers' views of computers" (Dexter, Anderson, & Becker, 1999), others used "teachers' beliefs about schooling" (Dwyer, Ringstaff, & Sandholtz, 1991), still others used "teachers' pedagogical beliefs" (Ertmer, 2005) or "teachers' beliefs about the role of technology" (Ertmer et al., 1999).

No matter what terms they used, the researchers described educators' beliefs as tacit, often unconsciously held assumptions about teaching and learning. More specifically, most research studies I reviewed tended to explore how computer technology integration in classrooms was related to two educators' beliefs about teaching and learning: a transmission view and a constructivist view. The former vision was based on a theory that learning occurred in a highly prescribed manner, where facts, concepts, and understandings were presented by the teacher's explanations and were absorbed by learner's repetitive practice of each skill in sequence. The latter one, on the other hand, was based on a theory that learning was achieved only through learner's exploration of

new ideas and seeking explanations to the learner's own prior beliefs to build the structures of new beliefs (Ertmer, 2005).

The Relationship Between Educators' Beliefs and Technology Integration

Did educators' beliefs cause the change of technology integration? Research studies had shown that educators' beliefs had an influence on educators' use of computers in classrooms. For example, after analyzing the data collected in the Teaching, Learning, and Computing (TLC) survey, a national survey of more than 4,000 teachers from grades 4-12 in Spring 1998, Becker (2001) argued that educators with the most constructivist teaching philosophy were stronger users of computers. Educators with more constructivist philosophical beliefs used computers not only more frequently, but also in more challenging ways and had greater technical expertise (Becker; Becker & Ravitz, 2001).

In addition, research studies (Ertmer et al., 1999) also found that even in situations when the access to the computers was constrained, educators with different educational beliefs would probably respond in different ways as follows:

In their qualitative study, Ertmer et al. (1999) examined the relationship between the first- and second-order barriers that the teachers encountered in their teaching environment. The first-order barriers were referred to as being extrinsic to the educators. These barriers included factors such as lack of access to computers, insufficient time, and inadequate administrative support. Barriers that interfered with or impeded educators' fundamental beliefs about teaching and learning were referred to as second-order barriers.

Seven primary school teachers (Grades K-2) participated in this study. The researchers carried out a survey among the teachers, observed each teacher's classrooms during a period of six weeks, and conducted semi structured interviews with each teacher. The findings of this study showed that the teachers' beliefs shaped their instructional goals as well as their perceptions of the first-order barriers to technology use. For example, a first-order barrier, the lack of time, was a common concern of the teachers in this study. However, if a teacher used the computer only as a presentation tool or as a reward in his/her classroom, he/she usually did not consider the "lack of time to use computers" as a serious problem. On the contrary, if a teacher regarded technology as an essential element added to the curriculum, he/she perceived the barrier as a much more significant issue. The researcher summarized that educators' beliefs interacted with the first-order barriers to facilitate or limit educators' technology use (Ertmer et al., 1999).

The above conclusion was consistent with the findings of an earlier study conducted by Honey and Moeller (1990) on how and why teachers did or did not use information technologies in their classrooms. The researchers interviewed 20 teachers in elementary, middle, and high schools of two districts. In their paper, the researchers reported that although there were teachers who held student-centered educational beliefs, not all of them turned out to be technology-oriented teachers. The researchers found out that some of those teachers had personal fears and inhibitions toward the use of computers, while others were already fully occupied to fulfill various city-mandated requirements.

However, Honey and Moeller (1990) also pointed out that teachers' appropriate choices of computer software and educators' use of technology in their classrooms were primarily determined by two negating factors: (a) educators' personal ambivalence about computers and (b) educators' lack of computer using experiences. Only in the absence of these two factors could educators' beliefs play an important role in technology integration. This conclusion probably reflected the problems in the late 1980s when personal computers were not widely used in schools. In fact, some research studies conducted at the same time, such as Dwyer and colleagues' 1991 study, had already pointed out that although teachers who had regular access to computer technology in their classrooms over several years seemed to have significant changes in their instruction, such changes did not occur till they had confronted deeply held beliefs about schooling.

Did the use of the computers stimulate the change of the beliefs? Although educators' beliefs appeared to be relatively stable and resistant to change (Albion & Ertmer, 2002; Kagan, 1992), some research studies found that continuous use of computers could be a factor that stimulated the change of the educators' beliefs. In Dwyer and colleagues' 1991 study, for example, the researchers argued that regular accesses to computer technology over several years had significantly changed the educators' instruction, shifting it more to the constructivist way.

Dwyer et al. (1999) reached the above conclusion based on the Apple Classrooms of Tomorrow project (ACOT), which aimed at exploring, developing, and demonstrating powerful uses of technology in teaching and learning. The researchers in this study provided their participants, including 32 teachers and 650 students of five schools, with

immediate access to specially designed classrooms equipped with interactive technologies that could best support learning goals across the curriculum. After analyzing a rich longitudinal, multiperspective body of data accumulated since 1985, the researchers postulated a five-stage theory to illustrate the process of educators' technology integration. These five stages were entry, adoption, adaptation, appropriation, and invention, ranging from educators' uncomfortable feeling toward computers to their competence in using computer technology to create different learning environments in their classrooms.

However, Dwyer and colleagues' findings were not entirely supported by other researchers' studies. Windschitl and Sahl (2002), for example, contended that the condition of ubiquitous technology did not initiate educators' movement toward constructivist instruction, although the researchers had observed two of three of their participants' significant shifts toward constructivist instruction during this two-year case study. The study was conducted in a school that had initiated a laptop program. Each student in the program was required to purchase a portable computer and each teacher was supplied with a portable computer. The researchers reported that one of their participants, who preferred externally mandated curricula, had remained in teacher-centered instructional approaches during most time of the study. Although this participant had ten years of teaching experience, she still believed that only more experienced teachers could implement project-based teaching strategies.

Was the use of the computers the only factor that stimulated the change of the educators' beliefs? Dexter and colleagues' 1999 study might have provided an answer.

In this study, which included 47 teachers from 20 K-12 schools across three states, the researchers studied the teachers' perceptions of the impact of computers on their classroom practice. These teachers all completed a questionnaire survey, took part in three semi structured interviews, and participated in three classroom observations. The researchers found out that the teachers felt that computers helped them change toward more constructivist teaching practices over time. However, they did not regard computers as the catalyst for that change. For these teachers, experiences and classes taken during inservice training also contributed to their changes. In addition, it was worthwhile to notice that six out of ten of the participants in this study were those "with the strongest constructivist orientations … as the most influential factor on recent major changes in their instructional practice" (p. 235). The authors concluded that for educators to implement the use of educational technology in a constructivist manner, they must have opportunities to construct pedagogical knowledge in a supportive climate (Dexter et al.).

Summary

This literature review identified the major concerns and findings of the research work that was related to educators' beliefs and technology integration issue. The literature review found that the researchers in this area were interested in studying educators' pedagogical beliefs and its relationship with computer technology integration. It was generally acknowledged that educators' beliefs have an influence on technology integration, just as Albion and Ertmer (2002) suggested that the change of beliefs was the

first step to changing educators' computer technology integration. However, it was not easy to change educators' beliefs. According to Everett Rogers' *Diffusion of Innovations* theory (1995), an individual's decision about an innovation is a process that includes five stages: knowledge, persuasion, decision, implementation, and confirmation. The change of educators' beliefs may occur during each of these stages. The literature review showed that the change of educators' beliefs relied not only on the increased computer-using experiences, but also, more importantly, on the change of curriculum and even school culture over a long period of time.

CHAPTER III

RESEARCH METHODOLOGY

Theoretical Framework

Modeling

The design of my dissertation is partially based on social learning theory, which was proposed by Albert Bandura in 1969. This theory is concerned with learning by modeling. According to Bandura, one of the influences that modeling can produce is observational learning effect, where learners can acquire new patterns of behavior by watching the performance of models (Bandura, 1971). In my dissertation, the preservice teachers at USU can learn new patterns of teaching behavior by watching the teacher educators' use of computer technology integration. Thus, it is important to make sure that the teacher educators at USU are competent to integrate computer technology into their own teaching.

It has become commonly recognized that teachers teach as they were taught. However, I have also learned from my teaching experience that the modeling of computer technology integration could be a task that requires meticulous care. For example, when I first taught Instructional Architect, I only showed the functions of the computer application to the preservice teachers. I assumed that they would use these functions to create some interesting learning objects. When I asked the preservice teachers to create their IA projects for their teaching, I noticed that many of them simply listed some websites in their projects. Then I realized that it was my mistake for not showing the

specific examples of how to use the IA software in teaching. I was not modeling. Thus, one of the goals in my dissertation study is to distinguish between modeling and knowing a certain computer application. Although some teacher educators are very good at using computer programs, it does not necessarily mean that they are doing a good job on modeling.

The other concern in my dissertation study will be why the teacher educators use computer technology in a certain situation when other different instructional strategies are also available. For example, when using IA in their teaching, some preservice teachers simply listed some websites in their IA projects without indicating in their projects how to acquire the specific learning materials in these websites. Since some websites are designed using numerous links and layers, a learner could be easily lost without specific instructions. In situations like this, the preservice teachers could choose to either include these specific instructions in their IA projects, or simply give oral instructions in their classrooms. The purpose of using IA is not to show some "cool" technological skills, but to achieve the instructional goals. Before I started writing my dissertation proposal, Dr. Haderlie, one of my committee members, and I had a conversation on whether or not we should assume that computer technology is extremely important in education. We agreed that simply knowing and using computer technology is not an essential element of making a good teacher. Only when computer technology serves the instructional goals, can we consider it as a useful instructional tool. Thus, I believe it is necessary to clarify this thought in my dissertation.

Adult Learning Theory

The design of my dissertation study is also based on the framework of adult learning theory, which is built on the theory of andragogy proposed by Malcolm Knowles in the 1980s. In his theory, Knowles suggested five assumptions of adult learning. These assumptions are listed below:

1. Adults have a psychological need to be self-directing.
2. Adults bring an expansive reservoir of experience that can and should be tapped in the learning situation.
3. Adults' readiness to learn is influenced by a need to solve real-life problems often related to adult developmental tasks.
4. Adults are performance centered in their orientation to learning – wanting to make immediate application of knowledge.
5. Adult learning is primarily intrinsically motivated. (Glickman, Gordon, & Ross-Gordon, 2007, p. 53)

Brookfield's six principles, which were presented in 1986, on the effective practice of adult learning is another important theory that provides useful guidance for my dissertation study. These principles are as follows:

1. Participation in learning is voluntary; intimidation or coercion has no place in motivating adult participation.
2. Effective practice is characterized by respect among participants for each other's self-worth.
3. Facilitation is collaborative, with learner and facilitators sharing responsibility for setting objectives and evaluating learning.

4. Praxis is at the heart of effective facilitation, with learners and facilitators involved in a continual cycle of collaborative activity and reflection on activity.

5. Facilitation aims to foster a spirit of critical reflection in adults. Educational encounters should assist adults to question many aspects of their personal, occupational, and political lives.

6. The aim of facilitation is the nurturing of self-directed, empowered adults who will function as proactive individuals. (Glickman et al., 2001, p. 61).

One important aspect of my dissertation study will deal with the teacher educators' perspectives on learning computer skills. Adult learning theory will offer theoretical guidance on my understanding of the phenomenon revealed in my study. The use of adult learning theory to explain some of the problems revealed in my pilot study will most likely demonstrate the significance of its use in my dissertation study. For example, some participants in my pilot study showed their unwillingness to attend workshops to learn computer skills. Rather, they learned computer skills on many other informal occasions. According to adult learning theory, on one hand, I may conclude that these teacher educators would probably prefer a more self-directing way of learning computer skills. On the other hand, I may explore the solutions of making the workshops carry some self-directing features. Although the sample included in my pilot study was not large enough to draw a convincing conclusion of the issue, my dissertation study of a larger scale would probably bring more exciting results under the guidance of adult learning theory.

Rationale for Using Phenomenology

I used phenomenology to conduct my dissertation study. A phenomenological study is a qualitative research study. It describes "the meaning of the lived experiences for several individuals about a concept or the phenomenon" (Creswell, 1998).

An interesting phenomenon revealed in my pilot study was that the teacher educators' computer technology integration varied largely with individuals. One of my interviewees, for example, put all his lectures on the internet by using Breeze as well as Podcasting. His approach was a gradual evolution, which could be dated back to 24 years ago when he started to teach at USU. At that time, his mentors suggested that he record each of his lectures and put them on reserve in the library. He used to be equipped with tape recorders and projection slides. The equipment was later replaced by computer technology. Another teacher educator used the internet as a primary resource since the websites provided her with lots of information that she could use in her teaching. Still another teacher educator used computer technology as a tool to motivate the students' learning. The students in her class were required to create video projects on learning subjects.

In fact, different teacher educators took different computer technology integration approaches according to not only their different needs and teaching background, but also their philosophical beliefs on teaching and computer technology. My literature review showed that educators' beliefs have influences on their use of computers in classrooms (Becker, 2001; Becker & Ravitz, 2001). Even in situations where the access to the computers was constrained, teachers holding positive beliefs would probably respond in positive ways (Ertmer et al., 1999). The philosophical belief issue was also revealed in

my pilot study. One of my interviewees told me that he seldom used computer technology in his teaching because he regarded the development of computer technology as simply a change of symbolic representation, not a brand new thing compared to traditional symbolic systems such as Chinese ideographs and alphabets.

Thus, in my dissertation study, it is necessary to deeply explore the teacher educators' insights on discovering and understanding different teacher educators' perspectives on computer technology integration. The use of phenomenology seemed like an effective tool for achieving this goal. This research approach may also be different from the approaches used in many other research studies on the same or similar issues. My literature review indicated that most research studies were conducted in specifically designed environments where the participants acquired experience in professional development on technology. None of the studies I have reviewed explored teacher educators' lived experience on computer technology integration. Since a phenomenology study is "based on the premise that human experience makes sense to those who live it, and that human experience is an inherent structural property of the experience itself, not constructed by an outside observer" (Creswell, 1998), I hope my study will reveal new discoveries that may have been ignored in those published research studies. The Institutional Review Board for the protection of human participants at USU has approved this research study (see Appendix A).

Bracketing

In order to conduct this phenomenological study successfully, it is important for me to bracket my own preconceived ideas about the phenomenon. For example, in my aforementioned experience of collaborating with other teacher educators, I finally gave two lectures in one teacher educator's class, but the teacher educator did not come to my classroom. Although I was disappointed with this result, it is not wise to carry a negative impression regarding teacher educators' incorporation when I carry out my dissertation study. My impression of this event was at most my own preconceived ideas about the phenomenon, since I never communicated with them to try to understand their side of the story. Thus, I needed to remember that "phenomenology's approach is to suspend all judgments about what is real – the 'natural attitude' – until they are founded on a more certain basis" (Creswell, 1998, p. 54). Thus, it was important for me, the primary data collection instrument of this qualitative research study, to bracket my own preconceived ideas about the phenomenon.

In order to identify my preconceived values and biases, I participated in a bracketing interview prior to my data collection with Gulfidan Can, a doctoral student in my department. First, I audio-recorded our interview conversations about my personal background related to computer technology and my research topic. After transcribing the interview data, I showed the draft to Dr. Haderlie, one of my committee members, to further clarify my thoughts and expressions. In addition, I added Dr. Eastmond's suggestions to the final version of this interview protocol (see Appendix C).

My bracketing interview alerted me to the fact that I needed to make a strong attempt in temporarily suspending my personal beliefs and biases when conducting the

interviews and describing the interviewees' experiences. These personal beliefs and biases were as follows:

First, I believed that computer technology was useful in education, especially when it helped stimulate learners' independent thinking and build up their own knowledge. However, as to teaching and learning rudimentary knowledge and skills, such as solving quadratic equations in algebra, I felt that a piece of paper and a pencil would be more efficient in both academic and economic aspects.

Second, I believed that teacher educators should take advantage of all educational tools, including computer technology, to facilitate teaching and learning. More importantly, since teacher educators were modeling teaching for preservice teachers, who would in turn affect many children's lives, it was no longer the teacher educators' personal decisions on whether to use computer technology or not in their teaching. Rather, I believed that it should become one of the obligations of their professional development. Thus, I don't think teacher educators should try to avoid computer technology for various excuses, such as the lack of equipment and time.

Third, I believed that computer technology integration was closely related to each faculty member's unique personal background. Thus, I would not only expect a variety of discovery in my research study, but also regard a respect for each individual's attitude and practice on computer technology integration as important and valuable.

I entered my data collection phase with the warning about these preconceived ideas in my mind. I understood that the reality of the shared life experience was within the actual participant and it might differ from my point of view. Thus, when my

participants' view of value was in conflict with my beliefs, I attempted not to become emotionally involved.

And I also tried to avoid biased analysis in my data analysis, but I believe it still found its way to my interpretation of the data. I believe it is beneficial for my readers to keep in mind my biases and help them understand the data better. We still need to recognize that personal understandings and biases in phenomenological investigations would influence the interpretation of events (Gallenstein, 1995).

Selection of the Participants

In order to select my participants, I first obtained a list of all methods course teacher educators in secondary education at USU. One of the staff assistants from the Department of Secondary Education provided me with a list of 15 methods course teacher educators in different departments on campus. I visited each department to double check the accuracy of the list and added six more names. Thus, I ended up having a list of 21 methods course teacher educators. Dr. Richard Rhees, the coordinator of the Teacher Education Accreditation at USU, reviewed the final version of the list and verified that it was a comprehensive one.

Based on this comprehensive list, I randomly selected 10 people, one at a time, by using a table of random numbers. I used one of the following three ways to approach each potential participant: sent out an email, made a phone call, or visited the person's office. I informed the participants that the participation in my study was entirely voluntary. The participants might refuse to participate or withdraw at any time (even

partway through or after the interview) without consequence. All information collected would be kept confidentially.

I contacted the selected people one by one. In each instance where I realized that a person would not be able to participate in my study, I randomly selected another person from the list to replace him/her. Among the potential participants I attempted to contact, four of them did not participate in the study for various reasons: one was recently retired, one had to leave town for a family emergency, and two never replied to my emails.

According to my dissertation proposal, I planned to interview 10 to 15 teacher educators first. If the data collected from these 10 to 15 people did not reach the saturation point, more interviewees would be randomly selected to add to the cohort until no more new data could be found. Toward the end of my interviews, I realized that the interview data became saturated enough to answer my research questions. Thus, I ended up interviewing 10 teacher educators.

Among these participants, three of them had been working as teacher educators for more than 20 years; four of them between 10 and 20 years; and three of them for less than 10 years. Two of them had long time teaching experiences as schoolteachers before entering the higher education system. Table 1 shows the detailed teaching years for each participant. It was worth noticing that the participants who had relatively short teaching experiences in higher education were not necessarily young faculty members. In fact, their teaching careers often spanned the time periods from the non-computer age to computer age.

Table 1

Number of Years for Each Participant Teaching in Higher Education

Participants	Years in higher ed.	Other teaching experiences
1	33	
2	18	Including 4 years as TA in a doctoral program
3	7	
4	40	
5	7	Previous 28 years of teaching in public high schools
6	20	Previous 10 years of teaching in high schools
7	10	
8	3	
9	18	
10	19	

These 10 teacher educators taught in different content areas: Physical Education, Agricultural Systems Technology & Education, Social Studies, English, Music, Engineering & Technology Education, and Family & Consumer Sciences Education.

By the time I interviewed the teacher educators, all of them had been involved in method course teaching in their content areas.

Data Collection

In my dissertation study, the data collection process included the following

aspects:

In-depth Interviews

A phenomenological study primarily involves in-depth interviews to collect information (Creswell, 1998). I conducted nine face-to-face interviews. Eight of them were one-on-one interviews and one of them involved two interviewees at the same time. Most of these interviews lasted about 40 minutes to one hour. When I conducted the interviews, I asked questions and remembered to be a good listener. The interviews went like informal conversations with the participant doing most of the talking – just like what Leedy and Ormrod (2005) suggested. I used a digital device to record all interviews except one, where the participant did not want his voice to be recorded. Following the interviews, I transcribed the audio files.

Design of the Interview Procedures and Interview Questions

In my pilot study, some teacher educators that I first contacted did not want to participate in my study. One teacher educator replied to my interview request email by saying "I don't think I would be very helpful." When I sent out interview request emails for my dissertation study, I clarified that no matter how much the teacher educators are involved in computer technology integration, their contributions to the study would be highly valued.

My interview procedures were designed as follows:

Before I started interviewing each teacher educator, I established rapport by having a short, casual conversation with the interviewee to help build a stronger trust

between the interviewee and me. I then asked the teacher educators three short answer questions:

1. How many years have you been working as a teacher educator?
2. What is/are the content area(s) that you are teaching/have taught?
3. Do you receive incentives for doing computer technology integration?

My formal interview questions were:

1. What is your definition of computer technology integration?
2. Could you give me some examples on how you integrate computer technology into your teaching? Have you experienced a desire/preference to integrate computer technology, but you actually used some other instructional methods? Have you experienced that when sometimes you had options of either to integrate computer technology or not to do so, you chose not to do so?
3. Why did/didn't you choose computer technology in these situations? Did you have any other options available when you developed your instructional design ideas?
4. How do you feel that computer technology has changed or is changing your pedagogical beliefs since you began teaching?
5. Do you think your demonstration of integrating computer technology with your content area(s) would benefit your students? How?
6. How do you feel about the NETS (National Educational Technology Standards) in terms of integrating technology into your teaching? Are you aware of them? To what extent are you aware of them? Are they helpful? Do they need modification for your situation?

7. How do you feel about your students' competency in using technology in their teaching? Are they able to do the necessary things? Will they be ready for future changes?

8. How often do you attend computer-training workshops? What are some reasons why you do or why you don't?

9. How do you usually communicate with other faculty members, including your colleagues in the Secondary Education and other departments, the department head, and the dean, to discuss the computer technology issues in your teaching? How did you feel when you saw other faculty members increasingly integrating computer technology?

10. Do you have any additional concerns to add at this time?

Observations and Artifacts

After I collected the interview data, I observed four teacher educators' classrooms. These four teacher educators were in three content areas: Agricultural Systems Technology & Education, English, and Engineering & Technology Education. My interview data showed that these teacher educators had different computer technology integration styles. For each teacher educator, I observed two classroom sessions: one was a teaching session, and one was a student presentation session. I also collected the teacher educators' requirements for their students' presentations. These classroom observations helped me compare the following:

1. The classroom-learning atmosphere with and without computer technology.
2. Students' use of computer technology in different instructors' classes.

Data Analysis

During the data analysis phase, I first generally reviewed all the transcribed data in order to form a holistic view of the information. Later, I reduced the data, sorting the text into different categories, which were presented in the next chapter. The digital device provided high quality vocal records, which helped reduce the amount of incorrect transcription (Creswell, 1998).

Delimitations of the Study

Since this qualitative study was conducted at USU, the findings applied only to this specific university. It is the responsibility of each reader and user of this research study to determine the applicability of the findings in their own situation. Thus, one of the limitations of this study was its generalizability.

Another delimitation of the study would be my presence as the investigator. Simply knowing that I was a doctoral student at the Instructional Technology Department might have made the participants in my study assume that I was computer savvy and enthusiastic about computer technology. This preconceived idea might have affected the participants' descriptions of the actual phenomenon. For example, some of them may have exaggerated their use of computer technology, while others might have felt too ashamed to admit that they used little of it.

Moreover, since I could only include those teacher educators who were willing to participate in this study, the information on those who were not willing to participate was definitely lost. This lost information, which would surely have been valuable to the

research, would form one of the limitations of the study.

Summary

This dissertation study was based on the theoretical framework of modeling and adult learning theory. In order to get the meaning of the lived experiences of the teacher educators, I used phenomenology to conduct this study. My bracketing interview alerted me that I needed to make a strong attempt in temporarily suspending my personal beliefs and biases when conducting the interview and describing the interviewees' experiences.

I randomly selected 10 participants in seven content areas. The data were collected by using in-depth interviews, classroom observations, and artifacts. I recorded the interviews on a digital device and transcribed the data after the interviews. During the data analysis phase, I sorted the data into different categories. These categories became the sub-titles of the next chapter.

CHAPTER IV

FINDINGS

In this chapter, I will present the findings from my research data. I will review the following topics: teacher educators' attitudes toward computer technology integration; factors affecting teacher educators' computer technology integration; teacher educators' personal experiences and its influence on their computer technology integration; positive and negative aspects of using computer technology in teaching; formal computer skill training; specific computer programs in use; and a summary of my classroom observations.

Attitudes Toward Computer Technology Integration

Teacher Educators' Definition of Computer Technology Integration

During my pilot study, I noticed that whenever I mentioned computer technology integration, many of the interviewees promptly brought up their experiences with giving PowerPoint presentations. Their reactions made me wonder if the teacher educators regarded computer technology integration as simply using PowerPoint because this was simply the most easily observable. During this dissertation study, I asked each participant what his/her definition of computer technology integration was. Their answers made me reject my previous assumption, since none of them equated computer technology integration with PowerPoint. Rather, they revealed their insights into the concept.

At least half of the participants pointed out in their definitions that computer technology was a tool in a teacher's toolbox. "Just like one of the many tools," one of the teacher educators said, "just like lecture is a tool, computer is a tool." Nevertheless, the teacher educators also put forward the following criteria for using computer technology effectively as a teaching tool:

1. Improving teaching and learning materials. As one of the participants said, "The first thing comes into my mind [when talking about computer technology integration] is how I can improve my audiovisuals. … [H]ow I can bring the classroom more alive [by] using the computer."

2. Helping master teaching objectives. Like one teacher educator pointed out, "[I]f [computer] can help [us] master an objective, we should use it. If it does not help us [as a class] to master an objective, we should not use it."

3. Enhancing the learning process by serving as a backup. As one participant mentioned when teaching his distance education classes, he used PowerPoint slides to help his students follow along when the vocal communication system was broken down. Thus, computer technology showed advantages over other teaching tools to enhance the learning process in this case.

In fact, all the above criteria reflected a general principle of using computer technology as an educational tool: to be selective. My interview data showed that although some participants preferred currently developed computer software, others accepted a broader spectrum of the technology. The teacher educators' attitudes toward being selective of using computer technology were astonishingly consistent. As a matter of fact, some participants also guided their students, the preservice teachers, to use

computer technology in a selective way. As one teacher educator said,

> I try to encourage my students when they can use PowerPoint or a computer. If they can have [their] students working on the computer, that is fine. However, if an old paper and pencil does a better job, or if an overhead projector, or writing in the dirt, does a better job mastering the objective, that is what they should use. And so I try to encourage them to step back what would help them best master the objective. And that to me is what computer technology integration is. They need to prepare to do that.

The Influences of Computer Technology on the Pedagogical Beliefs

When asked whether or not computer technology had changed or was changing their pedagogical beliefs, the participants provided the following viewpoints:

An alternative way to attain educational objectives. Many participants felt that the use of computer technology had more or less changed their ways of teaching, making it easier and more efficient to attain their educational objectives. For example, one participant said that instead of having the students use the calculator in a methods measurement and evaluation course, he asked his students to input their data in the Statistical Package for the Social Sciences (SPSS) program, a computer program that would do all the calculating for them. "It's just make it so much easier, less time consuming," he said. However, if the course objective had been to perform statistical calculations with a calculator or by hand, the use of the computer would have missed the mark.

In distance education, the use of computers might have brought about even more pedagogically significant changes. One of my participants, who had a lifelong experience in teaching distance courses, regarded computer technology as something

"terrific" in the sense that it had made it easier to enable more people to benefit from college education. For this teacher educator, the extension of educational system through computer technology was the biggest advantage for him, since it had showed that many more people were capable of absorbing the college education and graduate school than he previously thought.

The change in the instructional contents and methods. The premise conditions of successfully using the SPSS in classrooms and delivering online courses were having sufficient knowledge and the ability to use relevant computer programs. Thus, the advantages of using computer technology in teaching would challenge teacher educators to renew their instructional methods. As one of the participants said, "We'd better be updated with it (computer technology)." This change of the knowledge and skill structure would inevitably result in the change of the instructional contents and methods. For example, one of my participants who taught music added some computer literacy content, such as how to use Excel, into his curriculum. This additional instructional content was related to the teacher educators' considerations of computer technology integration.

The core remained the same. My interview data also showed that although computer technology had influences on the teacher educators' instructional methods, they believed that their core pedagogical beliefs remained unchanged. Many participants in my study pointed out that computer technology was at most a tool, which enabled them to communicate to their students in a better way. Some of the examples included using PowerPoint to present learning contents bigger and clearer, using video clips to

demonstrate events that could not be viewed live, and using Adobe Connect to provide a flexible way of test reviews. Yet, all these utilizations of computer technology served one educational purpose: helping the students learn and be successful. This purpose was referred to by the participants as not only one of the aspects of the core pedagogical beliefs in the educational system, but also a major factor that kept the educators forging ahead now as it had during the entire history of their educational experiences. As one participant who was in the agriculture area said,

> I don't think things have been [significantly] changed since 1917 when agricultural education became -- receiving federal funding -- to be part of the schools. Those teachers in 1917 were using the newest and the best technology to help their students. … I still think those teachers in 1917 had the same philosophy that most of us have today in agricultural education. And that is that we are trying to find the best way to help our students to be successful in their lives, to be successful in their careers, [and] to be successful in whatever they do. And so I think good teachers will use the best technology available to them to help their students to be successful. And so, the root pedagogy, I don't think it has changed.

According to my interview data, another major aspect of the core pedagogical beliefs that remained unchanged was the constructivist point of view, which assumed that the students needed to be involved in active learning processes to build their own knowledge through their classroom and life experiences. For example, one participant indicated that computer technology had not changed her pedagogical beliefs. She said,

> I am pretty fixed on that constructivist point of view that kids need to have experiences that when they discover, they make meaning out of what their experience in life and classroom. So, I don't think that (computer technology) would change that.

Since the term "constructivism" was not even coined or popular in education in the 1980s, it was not clear whether computer technology helped the participant form constructivist pedagogical beliefs. In many participants' teaching experiences, the

constructivist methods of instruction took forms of psychomotor hands-on laboratory work and group work. Although computer technology, such as computer simulation technique, might sometimes make their constructivist instructional methods more effective, none of the participants regarded it as a main aspect in their teaching methods. Many of them were even concerned that if computer technology were not used effectively, it would damage the instructional strategies that they were trying to use.

In a word, computer technology had some influences on the teacher educators' teaching style. As one participant said, "[It] definitely changes the way you talk about technology in your classes, so as far as the content that you teach." Also, computer technology helped the teacher educators update their pedagogical information easily. Just like another participant pointed out, "If you just Google things, and it is there." Nevertheless, according to my interview data, computer technology still played a minor role in the teacher educators' instructions. On the one hand, it could be because of the fact that all the participants were instructors of methods courses, which were delivered in face-to-face instructional environments. And their use of computer technology was largely limited to a handful of software packages, such as Microsoft Office, the internet, and some features of Blackboard. On the other hand, the teacher educators were not lost in the halo of computer technology. Rather, they held firmly to the fundamental beliefs of education regarding computer technology as a tool to help them achieve their educational goals.

Realizing the Importance of Computer Technology

According to my interview data, all the participants regarded computer technology integration as an important part in their teaching, especially considering the benefits it would bring for their students, the preservice teachers, when they demonstrated the use of computer technology in their classrooms. When asked if it was important for their students to know how to use computer technology in their future teaching, all the participants gave quite positive answers such as "Sure!" and "Absolutely!"

During one of my interviews, two participants pointed out that since today's children were very much digitally engaged, they would not be satisfied just to sit and look at the pictures. As one participant said, "[I]n order to keep their attention, you have to use various [digital] graphics, …[since] it is their life now." Thus, the participants thought it was very important for their students to know how to use computer technology for their future teaching.

A participant in another interview approached the issue from the educators' point of view. The participant was a Physical Education major. He said,

> Everything we do now [in education] is related somewhere and other to computer technology even if is a device -- like we have baseballs that have device in than [that] can tell how fast the baseball is thrown. So, that is computer technology. We don't have to have the radar gun anymore to tell us how fast it is thrown. It is actually in the ball. So, those kinds of things out there are available for physical activities.

This example showed that as long as the development of computer technology became mature, it would permeate into the educational system, changing the ways of teaching and learning. In these situations, it was significant for the preservice teachers to know the existence of these advanced educational tools. In addition, the preservice teachers' computer technology preparation at USU would also increase their

opportunities of finding jobs and "they will continue to grow and continue to use [computer technology]," as a participant said.

Factors Affecting Computer Technology Integration

My interview data revealed that many factors had influences on the participants' computer technology integration. Some of these factors promoted the integration, while others hindered it.

Factors Promoting Computer Technology Integration

Advantages of using computer technology in classrooms. My interview data showed that one of the important factors that motivated the participants to use computer technology in their teaching was that they perceived the advantages of using it. For example, many participants used word processing programs in their teaching, since they experienced the benefits of switching from a typewriter to a computer application, which was much easier to use to accomplish the same tasks. As one participant said,

> I just saw the advantages of it (computer technology). For example, why did we go from a typewriter, which was where I started, to word processing program? Well, it takes a lot of time to change the errors when you make errors on a typewriter. With the word processor, so easy! I saw that point.

When asked if it was hard to make those changes, he responded, "Yes. It is hard to make those changes, because you are changing a routine, [and] you are changing your habits." However, the advantages of making these changes still stimulated him to go through the transition.

One of the participants gave me another example. He mentioned that the night before our interview he had used Adobe Connect, a web conferencing program, for the first time to do a test review with his students. He said, "I was sitting at my home in my kitchen, from 9:30[pm] until midnight, with a camera on me, and a microphone. My students could log in, from wherever they were at and join this test review session." Compared to a traditional test review, where an instructor and his/her students gathered in a specific room, the computer technology had undoubtedly helped break down the restraints of the activity, bringing the instructor and the students more freedom in terms of location and time. In fact, the use of computer technology in this case had not only largely increased the convenience of teaching and learning, but also helped attain the expected instructional objectives. As the participant continued,

> [The students] could ask questions; I could answer their questions; I could show them PowerPoint slides and images; I could put up questions – little quiz questions – as examples of what they might see the next day. [For] two and half hours, I had a third of my class engaged.

As he was talking, I observed that he was excited about using the program. He stressed on certain words, such as "my kitchen" and "midnight." And his voice showed a great delight when introducing what he had done during that test review. Although the participant did not tell me whether or not he would use the program again in his next test review, it was not hard for me to find the answer in his tones and facial expressions.

Still yet another example came from a participant who taught mostly long distance courses. He told me that he used to take airplanes to teach at the distance sites. The flights were not easy, especially when there was a storm. With computer technology, he did not need to take risks in those storms anymore. The technology also

saved him a considerable amount of time on going to different sites. "So I got very used to using technology … and [have] become very good now," he told me cheerfully.

Observing the advantages of computer technology even stimulated the participants who were not quite involved in utilizing computer programs in their teaching. For instance, one of my participants described herself as "technology handicapped" and did not feel like she wanted to embrace computer technology. Yet, when I interviewed her, she said that she would start to use some functions of Blackboard in her methods course even though it was not required and she had never used it before. As she said,

> [W]ith this methods class, I can see where I want my students to [use the Blackboard]. For example, like [making] posts or be able to access each other's [posts], and talking to each other about these group kind of projects. So that is more appealing to me now. I go, "Ok, I see how that would be useful."

A supportive environment. My interview data showed that a supportive environment usually promoted the teacher educators' computer technology integration. In fact, all my participants admitted that they had more or less gotten help from other people and/or their departments in terms of learning computer skills, setting up software and hardware systems, and updating information on computer technology integration. The participants usually got help from the following sources:

1. Family members. One participant told me that his wife was a "technology junkie" who developed websites. She taught him computer skills and provided him with troubleshooting suggestions. A couple of other participants consulted their children on computer techniques.

2. Experts. Almost all participants mentioned that the FACT center had assigned experts to their departments to help them maintain their online course computer systems. Besides this, many of them said that they got a lot of help from the "tech guy," a professional adviser who was hired by their department. One participant even hired an undergraduate student, who possessed the knowledge of a newly upgraded computer program, to help him accomplish a specific task.

3. Friends and colleagues. Many participants told me that they sometimes got useful information from their friends and colleagues on how to use new computer techniques in their teaching. For example, one participant learned how to use iClicker from a friend in a different department. He then introduced the technique to his colleagues in his department.

Friends and colleagues sometimes also played a role of helping the teacher educators out when they faced computer problems. However, my interview data showed that the teacher educators usually turned more to their family members and the experts than to their friends and colleagues for troubleshooting problems. It was possibly because that the teacher educators were unwilling to take other people's time for free. Like one participant said, "I don't like to bother these guys (his colleagues), because they are working, too." It may also be due to a culture of independence and an image of self-reliance to maintain.

4. Departments. The support from departments also played an important role in the teacher educators' use of computer technology in their teaching. One participant mentioned that his department had research groups that applied for grants all the time.

These efforts helped them buy new equipment, including new computer devices. The results turned out to be very helpful in their teaching. Other participants told me that they got new computers from their department every four or five years. Still other participants got financial support from their departments for conferences and computer trainings.

5. Professional conferences. During my interviews, many participants referred to professional conferences as a good resource for them to obtain new knowledge on computer techniques for educational purposes. Thus, the supportive environment was not limited to on campus; it was also related to the atmosphere in the whole academic circle in each content area.

Job obligations. According to my interview data, job obligation was an important and powerful factor that encouraged the teacher educators to promote their computer technology integration. For example, two of my participants were faculty members in the Department of Engineering and Technology Education. Their technical area expertise was related to computer software and programs. For example, they needed to know how to use computers to control the manufactory machines and manufacturing processes, or they needed to know how to use the Computer-aided Design (CAD) to work on industrial design and interior design. Since computer technology was an indispensible part of their curriculum, it became a "must thing" for them to learn new computer skills and update their computer knowledge. These faculty members went to special software trainings and managed to be "pretty good at CAD and Computer-Aided Manufacturing (CAM)," as one participant said. My interview data showed that their training processes were pretty intensive. Like one of the participants said,

> I attend workshops on the national level, because it is the content I needed to learn. … [In order] to teach a course, you have to go to a two-week workshop. And the last two summers I had gone to two of those, where I learned the new software. ... [T]hat is the opportunity when you are away at another university. You are stuck in a dorm, pretty much 10-12 hours a day. You just learn that software, that curriculum, and how … to teach them. You are learning a year-long course … in two weeks. One person said it is like trying to get a drink out of a fire hydrant.

When asked if he felt tired while working those long hours, he answered, "No, that is my job!"

If the job obligation of using computers was removed, it was simply the teacher educators' personal decision on whether or not, as well as how much, they would like to be involved in computer technology integration. In fact, for most teacher educators participating in this study, they were not required to use a certain amount of computer technology in their teaching. Thus, their priority of developing computer skills depended largely on many other factors, such as their time schedule, classroom facilities, and their other job obligations. One of the participants, for example, became an administrator and got less involved in teaching. He admitted that he spent less time on updating his computer skills, and could not use them as quickly as he did before. "It was kind of sad to see you left behind [as the computer technology used in the field progressed]," he said.

Factors Hindering Computer Technology Integration

Course evaluations. My interview data showed that USU's course evaluation system seemed to be a hindrance to the teacher educators' use of computer technology in their teaching. On the one hand, the course evaluation system did not include items related to computer technology integration. Thus, a teacher educator could be highly

evaluated in his/her course evaluation even if he/she ignored the use of computer technology in his/her classrooms. For example, a couple of my participants were not actively involved in exploring new computer software and using them in their teaching, partially because they had already been highly evaluated in their course evaluations.

On the other hand, when attempting to use computer technology brought negative influences on their course evaluation, the teacher educators might choose to stop using the technology rather than finding ways to solve the problem. For example, one of my participants told me that two years ago he tried to use more computer technology in one of his courses. However, his course evaluation dropped dramatically from an average of 5.8 to about 5.1. Later, he realized that it was because in order to do a lot of computer presentations, he had to turn the lights off in a big classroom, causing a weak interaction between him and his students. He said, "I could not use my personality and my facial expressions. We will have brighter light bulbs (in the projectors) so we can keep the lights on. But we cannot [do that] for this room right now." After he switched back to the overhead projectors, his course evaluation went back up to the ordinary level.

Another example came from a different participant. When she heard that some professors spent 20 minutes trying to get their computers to work in the classroom, she hesitated to use computers in her own class. She said,

> That is a waste of the class time and I am not doing that to the students. So, in that sense, I have things pretty much set. It goes well. The students seem to be learning. That means I can get good evaluation. So, I am like, I am good.

Time issue. According to my interview data, the issue of the lack of time to become familiar with computer technology was one of the major factors that hindered the

teacher educators to use computer technology in their classrooms. As one participant said during the interview, the lack of time was the main concern for her to learn new computer skills. “We have the FACT center, which is very helpful for the faculty (members). But sometimes, I don’t have time to go over and get help that I need.”

In addition, learning a computer program was usually a time consuming task. When asked if it took him a lot of time to learn a new computer program, one participant answered,

> Yes. It took me a long time to switch (from WebCT to Blackboard). It took me a long time going to WebCT. I got pretty good at it. And then we switched to Blackboard. It took me a while. In fact, I am still learning things on Blackboard that I used to do on WebCT. Yes, the new technology does take me longer (time to learn).

For some teacher educators involved in my study, they had to learn and practice to use certain computer software for several semesters before they were ready to teach the software. In situations where using the software was not required in teaching, such a long period of time could wear away the teacher educators’ original ambitions. Sometimes, even a short-term task, such as getting materials ready and uploaded for an online course, could be a very time consuming one. As one of the participants pointed out, “If you are gonna teach an online course, you have to spend a lot of time, getting ready for all online distance delivery. That is quite time consuming.”

Unreliability of computer technology. During the interviews, many teacher educators mentioned that the computer technology was sometimes not very reliable. This unreliability could further cause frustrations among the users. For example, using computer technology in a classroom might require the teacher educators to troubleshoot

unexpected technical problems. For the teacher educators who were not familiar with the computer programs or lacked the confidence to troubleshoot, they would quite likely not to use the computer in their classes. As one participant said, "I know that I cannot troubleshoot. So… I will just be dying there. And that is a waste of time. I am not doing that to the students. That is very frustrating."

Even for the teacher educators who had confidence to solve technical problems on their own, their frustrations on the unreliability of computer technology remained the same. When talking about this issue during one of my interviews, the participant, who showed high enthusiasm and confidence of using computer technology, said,

> [T]hose are very frustrating things. … [I]f it is a high pressure thing, or something new that I am trying out, I usually try to have a back-up in place. Sometimes, I try to use video clips, and I feel it worked on my computer. And then, I go to whatever classroom I teach in, and that computer does not have the right software to support the video clip. So we have to switch plans and go on to something else, and then try to trouble shoot that and come back the next day. Or convert [the clip] to a flash video, from a Quick Time video or something, and then show it that way.

Similarly, many other participants mentioned that they had to prepare a back-up plan, usually overhead transparencies and projectors, for their classes.

Lack of advanced computer tools. Computer technology was not advanced enough to allow the teacher educators use it in their classroom extensively, or at least for some purposes. For example, as a participant in Physical Education pointed out,

> You cannot practice shooting a jump shot on a computer. It is just no way. And most of our skills are [learned] in that way. You cannot get into the cardiovascular shape by playing on a computer, you have to actually run.

Lack of computers in school districts. Many participants mentioned that some school districts usually did not have certain computer technology elements available, or

at least they did not have elements as good as what was available at the university. When asked if sometimes he wanted to use computer technology but for some reason could not, a participant answered,

> Sure. I do a lot of work with school districts, where I go out help them prepare their lesson plans, get their test together, and I cannot always count on being able to hook into the Internet in the presentation, and I cannot always count on having a projector there, and a projector that works, so I always have overhead transparency backups, and I carry my own overhead transparency projector, and I would say 1/3 of the time that is a good thing. So that I do that, always prepared, so usually when I am on the road, is when I try to back it up, I don't completely count on projectors. You've got to have that backup, and because as long as you have a lesson plan printed out, you can always just write on a chalk board, of course you don't see chalk boards anymore (laugh), with a lesson plan in my hand, I don't need anything else, I can just write on a board, somehow, and that is of course we all used to teach years ago.
>
> So, in many cases the backup of choice is the technology most recently replaced.

Personal Experiences and Computer Technology Integration

My interview data revealed different life/teaching experiences of the participants. When asked if their life/teaching experiences have influences on their decisions of using or not using computer technology in teaching, all the participants gave positive answers. I classified their life/teaching experiences and computer technology integration status into four categories.

Category I (Advanced Users)

In general, the participants in this group were active in the integration of computer technology. They used a lot of computer programs in their classrooms. Their

life/teaching experiences were very different: some of them had 30 or 40 years of teaching experience, while others had a few years of teaching experiences; some of them taught themselves how to deliver online courses, while others had online course learning experiences before starting teaching; some of them were in departments that were supportive of computer technology, while others had to struggle through all the difficulties on their own. However, these differences did not change the fact that they were curious about the computer technology, amazed by the power of computer technology, and were not afraid to try new computer technology. In a sense, it was the interweaving influences from life/teaching experiences and personalities. The common characteristics of their experiences and personalities were listed as follows:

Curiosity toward new things. The participants in this group showed some common characteristics without exception: They were curious about new things. As a result of this curiosity, the teacher educators usually took initiatives to start their computer exploration without any other requirements from their departments. Some of them even invested their own money and time, without been reimbursed, before the university and schools would provide computers for them. For example, when asked if it was hard for him to go from a non-computer age to a computer age, one participant answered,

> Oh, not too [hard]. I have never had any classes in it (computer technology). So, I just kind of discover on my own. And then I had … bought a Mac, back about 1988 or 89. This one was a little Mac, [with] little tiny screen. And I brought that to school, because they wouldn't provide for us yet. So I brought that to school in a case for three or four years.

Amazed by the power of computer technology. Many participants in this category were amazed by the power of computer technology. One of them told me:

> [I]t was just fascinating. I started off doing all my lesson plans and units and handouts on the computer. And I love the fact that you could then quickly fix them, because in the old days … what you did was extremely difficult to change. … So I love that part about it. So you can constantly revise and update.

Of course, the power of computer technology went far beyond just revising and updating. It also helped the students to be more engaged in study. As one participant said,

> I like the ability that [computer] gives me to engage my students. So, if I can pull in a video clip, or if I can take an image, work with it in Photoshop, and … [it] is usable for my students, that would allow them to visually *see* what I am trying to teach them, either through the video or still image. I love the power that this (computer) gives me to do that. … I love the color, the [image] size ….

Not afraid to try something new. One of the participants pointed out that it could be a personality thing that he was not afraid to try something new. He told me that in his department, they have talked for years about early adopters and the lag group. For the early adopters, they would try out the software as long as they thought the software would be useful in their teaching. "I like playing with the stuff, it is kind of fun," he said.

Another participant told me that when he first started using the computer, he used the Mac system and got quite familiar with the system. Although he got used to Macintosh computers, he switched quickly to the Windows system on observing the fact that many sites he taught at did not use the Mac system. "I just started to use PCs (Windows machine) entirely," he said.

Time was not a bother. When I interviewed these participants, I wondered if it was hard for them to find time to do all these explorations on computer technology. When asked if time was an issue, the participants answered:

"Oh, yeah! It is a huge issue, but it's worth it."

"We all think that. But we do have time. If you want to learn how to use the technology, you will find time to use it."

"(I did not sacrifice a lot of sleeping time). But I spent a lot of evenings. You know, just messing around, because I was curious."

Motivated by the advantages. Compared with the participants in other categories, the participants in this group were more motivated by the advantages of using computer technology in their teaching. As one participant, who had gone through the non-computer age with 34 years of teaching experience, said, "When I first started teaching, the computer was not used at all as it relates to the educational process. We see the advantages to use a computer, so we integrate computers."

Another participant, who had 40 years of teaching experience, added,

> I tell you … [a] big motivation for me [to use computer]. … I have always been very interested in serving the students out in the remote sites, you know. So, in order to do that, it was not that realistic to drive out there all the time, or to fly. So, the best way to do it was to use the technology. So, it was kind of a means to the end: Serving the students out in the distance site.

Besides the above common features, it was worth mentioning one participant's computer skill learning experience here. In the early 90's, when he was a preservice teacher, he took a class on basic Lotus 123. Later, before going out to student teach, he had an instructional technology course. He described the class this way:

> All I remember doing there was [that the class was] the first time I have ever used the scanner. And it was an old (one). It was one of the first scanners that they had there. This would be in the early 90s. It was slow. And we made overhead transparencies -- that overlaid, … the flip, multiple stacking, -- I guess. We did do a video, like an in-camera-edit, with the old VHS. This was old stuff. And then, we did a little program. They had just got a program called Hyper Studio. It was like a PowerPoint. But it was years ago. It was an Apple version of

> PowerPoint. I remembered learning that. But that was one of those examples of learning a program that I never used again.

However, these basic skills had exerted a subtle influence on his future computer skill development. As he later pointed out,

> [T]he skills that I learned, by learning that program (Hyper Studio), helped me learn PowerPoint, helped me learn some of these others. … When I started teaching high school in 1994, I had never heard PowerPoint. … [T]here were still so many program that I have never used. But I have given the skills in my undergraduate program to the point that I was not afraid to just jump in and pull the menus down and try to figure the programs out.

He continued, "I have learned how to do web design completely on my own. Dreamweaver, I have learned on my own; Photoshop, I have learned on my own. I have never taken a formal class with those."

Category II (Technical Users)

The second category included the participants whose content areas were very computer technology oriented. For example, the participant needed to master CAD software and G&M Codes in order to teach construction and manufacturing control courses. It was their job to achieve a high level of professional competency of using these computer programs.

The participants in this group were teacher educators with long-time teaching experiences. The computer technology they taught was very different from the computer technology they learned as students. As one participant said, "All the stuff I teach … was not part of my undergraduate curriculum." In order to stay on the top of their professional level, they went to conferences, attended workshops, and taught themselves, picking up the new technology and skills in their professional careers.

Although these teacher educators were deeply involved in using their professional software for teaching, they admitted that the evolving nature of the software was a big challenge for them. When asked if he felt comfortable when experiencing the changes of the technology development, a participant replied, "No, never!" He continued,

> Last summer I had to learn a new CAD program. And I knew what a CAD program can do, because I used to teach it 10 years ago. But I don't know where to find [a certain] command. And there are so many levels of menus. It takes hours [to figure it out] sometimes. I know the software can do it, but I don't know how it does.

However, he had never given up on mastering new software, since he regarded learning new professional software as his responsibility for being a teacher educator in his field.

My interview data showed that the nature of this professional skills updating requirement gave the teacher educators a stronger ability to handle computer technology difficulties and made it easier for them to adapt into new technology environment. As one of the participants indicated, he used to only use the professional software in his classroom, without integrating other computer software and programs, such as PowerPoint, to assist his teaching. A couple of years ago, when he began to teach in some newly-built classrooms equipped with computer and internet access, he started to catch up with all computer technology skills he had ignored before. He did not feel overwhelmed by learning these new computer programs and skills. It was reasonable to infer that a person who got used to dealing with the constant changes of computer technology in his own content area would probably regard web-searching skills and using PowerPoint as much easier tasks.

Category III (Reluctant Users)

The participants in this category took different approaches to using computer technology in their teaching. Like one participant said,

> I use very few PowerPoint presentations. So, what I do is I use PowerPoint to make an overhead transparency. And I will use a transparency machine, in some cases; I use a board, in some cases. But I still use the computer to prepare for my audio-visuals in somewhere or another.

This participant used Word for a lesson plan, used Excel and Blackboard to keep grades, and also contacted each one of his students once a week through email. However, he regarded himself as "not a heavy computer user." "I would say that I chose not to use the computer technology more than other [teaching tools]," he said.

My interview data showed that although these teacher educators realized the importance of computer technology integration, their life experiences probably prevented them from adapting to today's computer age. When asked if life experiences had an influence on her computer technology integration, one of the participants said,

> Absolutely. Like I am older, I was not raised with computer. So when I think of finding information, my first thought was not the computer. Whereas younger kids, like my children would say, "Mom, just go to the web." And I was like, "Oh, yeah!"

Another participant's life experience showed how he got lost in the rapid development of computer technology. He was once a teacher who did not use any computer technology at all before he went to graduate school 20 years ago. Yet, he became very computer savvy during his study in a doctoral program, since he not only minored in Instructional Technology, taking computer technology classes, but also taught a computer technology class as a teaching assistant. He used IBM computers, wrote many computer programs in BASIC Language, and even helped his parents with their

computer needs. He used the same computer knowledge and skills for two years of teaching in a college after getting his Ph.D. However, when he changed his job to a different university, where using Macintosh computers were required, things changed. "All of a sudden, I was far behind again." He said. It seemed that the sudden change of the environment had cast a dark shadow on his continuing explorations in the new computer world. Like he said, "I don't think I have really caught up." According to my interview data, he does not use too much computer technology in his teaching.

Category IV (Resisters)

One of my participants considered herself as a person who was very limited on using computer technology and was not anxious to embrace computer technology. She said,

> I am so technology handicapped myself.… I don't feel like I want to embrace that. … I am not savvy with it.… I am not comfortable with it.… It is not appealing to me.…It is too scary.…It does not work for me, it is too hard. I am like, "Oh! I don't know!" As far as integrating stuff, I am very limited. I mean I think it is wonderful stuff, but I am like, "I feel old." I feel like I don't want to learn that new stuff.

However, during the interview, she told me that she was planning to use the threaded discussion feature of Blackboard in her methods course. In order to achieve this goal, she would need an expert from the FACT to set up the computer systems in her office. She was not required to use Blackboard. She used it only because she saw some of the features could be helpful in her teaching. Besides using Blackboard, she had also collected a lot of useful websites for her students.

As our conversation went deeper, I realized that she actually would like to use computer technology in many other situations, as long as the technical part of the work could be taken care of. For example, she told me that one of her friends, who was also a teacher educator, took all the students' written work and, by the end of a semester, burnt it on a CD for each student. "I don't know what that is. I don't know what that means. I don't know what she is talking about. But if somebody would do that for me, and I can give it (the CD) to the students, great!"

My interview data further showed that her family life could have influences on her attitudes and reactions toward computer technology. Her husband is a professor, her son is a doctoral student, and she has a son-in-law who is an electrical engineer. "My son is very savvy and my husband is very savvy," she said. "And he (the son-in-law) knows everything. They all know about the computers. So, I feel like, I just raise my hand and somebody comes and fixes them for me." Her life experience probably explained why she did not want to explore computer technology on her own. As she said,

> [S]pending time, like trouble shooting, figuring it out…I don't find that is appealing. No, I want it be done. I want to have everything ready, everything organized. And I want to feel confident and comfortable. But I will find other ways rather than spend my time doing that.

When asked if she believed that the more she used computer technology, the more she would be confident in using it, she replied, "Oh, I am sure [I would]! It is true!" However, since she was facing the point of retiring, she chose to maintain her teaching styles, instead of doing some explorations.

A Brief Discussion

Although I categorized the participants into four groups, it was not appropriate to evaluate their teaching according to which category they were in. In fact, all the participants showed their enthusiasm for teaching regardless of their computer technology status. Even the participant in category IV said, "I feel very confident that I am doing the right thing, doing a good job. And so I am happy. I love my job here." I also observed their enthusiasm during my classroom observations. I noticed that all the classrooms I observed had a strong learning atmosphere, whether the instructor used computer technology or not. Moreover, the following patterns also emerged from my research data:

Gradual evolution. My interview data showed that the participants who were very interested in trying out different and new computer technology in their teaching were those people who never stopped exploring new computer software and skills during a long period of time, usually decades.

This phenomenon seemed to suggest that computer technology integration should be a long-term process that required the teacher educators to follow all the way the development of computer technology. In fact, many of these participants admitted that without their long-time involvement with computer technology, it would be overwhelming for them to make the transition in a short period of time.

Advising the students. My research data showed that the teacher educators who did not use computer technology in classroom could also provide good advising for the students on how to use computer technology. For example, during one of my classroom observations, a participant in category III did not use computer technology in his own

teaching. However, he taught his students the appropriate ways of using computer technology, such as using the "bullets" function to reveal the learning materials one by one on the screen. His teaching also went into detail on how to set up the computer system. For example, during his students' presentations, he set up the computer to face the presenter. In this way, the student presenter did not need to look back at the text on the projection screen. They could face their audience all the time. All these strategies helped his students improve their teaching skills. This example seemed to suggest that teacher educators' computer training could probably switch from learning and mastering computer skills to knowing the teaching effects of these technology tools.

Different emphases. My interview data showed that all the participants share similar assumptions toward computer technology integration. These assumptions were:

1. Computer technology was a useful and a powerful teaching tool
2. Computer technology was one of the tools in a teaching toolbox
3. School districts were not well equipped with computer technology

It seemed that the teacher educators in Category I (advanced users) and II (technical users) emphasized the first assumption more, while the teacher educators in Category III (reluctant users) and IV (resisters) emphasized the second and third assumption more, respectively. For example, when asked if a piece of paper and pen was more useful in teaching, the participant in category IV replied,

> Oh, no! Ideally, if everybody has laptop, where they could automatically save, publish, and print hardcopy, (it) would make a lot more sense than paper and pencil. But the school needs to (have computers). We could be sure that (if) every kid could have access to that, that would be great. But you know the way it is now. There are just a few people, who have [access] at home, or have it to bring to class. Even (in) my college classes, I don't see every student walk around with

> a computer, with a lap top. So, you get to rely on what you have available, which is paper and pencil, still.

My interview data suggested that the teacher educators who held the first assumption were more motivated to have computer technology integration than the teacher educators who held the second and third assumptions.

Positive and Negative Aspects of Using Computer Technology

Positive Aspects of Using Computer Technology

According to my interview data, there were some positive aspects of using computer technology in the teacher educators' classrooms.

Providing advantages in teaching. Many participants pointed out that computer technology had brought advantages to their teaching. As one participant said,

> [That is] absolutely! Just the fact that … when we have type writers, you have to go back and retype the whole page. Just the ability to use Word processing and fix things and the way of storage, the way you can store things on computer, just those basic things.

Another teacher educator added that she could use PowerPoint to project actual images, making some teaching materials become tangible. And that was very helpful in teaching. Also, by projecting teaching materials, she could deal effectively with a larger class size.

Improving productivity. The use of computer technology also improved the teacher educators' productivity, saving their time and making their working process easier. As one participant said, "[T]he first component of computer use would be [on]

lesson plans. Being done on the computer, we have a consistent ability to change lesson plans already established." Many other participants had similar experiences on working on lesson plans and grades. Just like another participant said,

> I also am in love with the computers, because back when I learned to be a teacher, I did all my lesson plans on paper, pencil, and old legal pads. And now I have all my lesson plans on the computer. I can put those in, pull them out, and I can print them out. It just saved me a ton of time by having my lesson plans in Word. I have being using Excel for [recording] grades. I thought that was a big step for me. Coming from the old days, we had a calculator and grade book. But now that the Blackboard comes along, I don't use Excel anymore, because Blackboard can do all my grades [and perform computations automatically]. And the students can see their grades [in the class, as you go along]. So, I am using Blackboard on and off a lot to do that.

Computer technology also improved their students' working effectiveness. As one participant said, "students can access information on a computer a lot faster than going to the library and looking up a hard copy of a particular article. So we spent less time doing that." Later, he mentioned that computer technology could even save the students' money. "They don't have to have a paper copy; they can have the information right in front of them on the screen, instead of having a hard copy. So we save money for the students using the computer technology," he said.

Offering easy accesses. One participant mentioned that since there were so many computer labs on campus, it made the computer labs more accessible than the library was. He regarded this as an advantage for using computers for the students. USU has 10 computer labs (Old Main computer lab, Taggart Student Center computer lab, AG Science computer lab, library computer lab, Family Life computer lab, business building computer lab, EE/CE computer lab, YETC computer lab, ITE computer lab, and UR Graphics computer lab) dispersed all over the campus. These computer labs were under

the direction of Network & Computing Services and the Computer Fee Committee. The computers in these labs were equipped with the most advanced software as well as qualified consultants trained to answer general technical questions.

Engaging the students and enhancing teaching. Compared with passing around a magazine and showing students an image, computer technology provided large colorful text and graphics that the teacher educators could easily choose to project and could change according to their instructional needs. My interview data showed that most of the teacher educators loved the power of computer technology, especially when sometimes they could pull in a video clip and/or manipulate images in Photoshop to allow the students to envision the lesson content. It would largely help the teacher educators engage the students in the learning process. One participant told me that he once showed in the classroom a video clip of an actual cell dividing into two parts. "When I started teaching 15 years ago, I could not have done that. And so, that is the incentive (for using computer technology)," he said,

> I had a football player back in the classroom, who had not been engaged with me at all in the first three weeks of the class. When I showed the video of that cell dividing, he said, "Can we see that again?" So, that is the power -- seeing my students' eyes light up and said, "Oh, I get it! Now I can actually see it!"

In some content areas, it would be a critical element in instructions to allow the students to actually *see* some particular processes. For example, in the content area of agriculture, it was very important for the students to see how to slaughter animals and how to vaccinate animals. As one teacher educator said, "[W]e can tell them (the students) [about the processes]. We can have them practice. But they need to see. It is absolutely important for all of us (both the students and the teachers)…It is a *must.*" In

the past, teacher educators used VHS tapes and video projectors to show the students the processes. When it had first become possible, the use of VHS tapes was regarded by some participants as a revolutionary change. However, as one teacher educator mentioned, it used to take six weeks for them to get the film strips, coming from companies out of town. And now, with computer technology, the teacher educators could not only obtain the videos on DVD or on the internet, but also could prepare the teaching materials right before the class. "Simply go to the website, pull it out, and make sure it works," one teacher educator said. As he continued,

> And it is *amazing* that we could show the students in simulations, in modeling. And of course, the next step is that we could get them to the laboratory and let them practice it. And at some point, hopefully, [we need to] get out to the community and actually learn by doing and do by learning.

Presenting most of updated teaching resources. Computer technology had also provided the teacher educators with most of updated teaching resources. One participant in Physical Education major told me about a time he taught a lesson on flexibility. "As one of the things we do in physical education, we would pull up sites on the internet that deal specifically with flexibility and show the students how other people teach flexibility and measure flexibility," he said.

My interview data showed that many of the teacher educators used the Internet to get current teaching information from research, lesson plans, and teaching units. The teacher educators also asked their students to look up current research information related to the topic areas on the internet. One participant described the internet resource as *huge, great,* and *fast.*

Enabling distance education. One of the most obvious advantages of using computer technology in educational purposes was to enable the long distance teaching and learning. As one participant said,

> I think one of the things [that] is shown pretty clearly is that you don't have to be right here in Logan to get a good education. The technology is good enough now that you being in Mexican Hat (a community in southern Utah) [will still allow you] to get a good education.

Negative Aspects of Using Computer Technology

Relying too heavily on computers. One of the negative aspects that most participants mentioned was that some faculty members relied too heavily on using computer technology in their teaching. Many participants were concerned that if teacher educators emphasized too much on computer technology, it might cause the preservice teachers to lose their abilities in using other teaching tools. In situations when computer technology was not available, these preservice teachers might panic and be less effective as a teacher because of the inconvenient environment. Like one participant said,

> I think a lot of new teachers, they are so busy putting a lesson plan together, and put a PowerPoint presentation together. And when they finally get to the classroom, they simply go through the PowerPoint slides. And that would be very boring in a high school classroom.

Inappropriate use/over use of computer. My interview data showed that PowerPoint was probably the most abused computer program in classrooms, since it was easy for a person to simply go through PowerPoint slides without considering his/her instructional objectives and sometimes never using pictorial material (Tufte, 2003). One participant described some faculty members' classrooms as dark places with only the

instructors' PowerPoint slideshows going on for the whole class sessions. Everything that the students wrote down was coming from the PowerPoint slides. "And I believe that is an overuse of a computer. And it simply is all what they are doing, depending on the PowerPoint presentation," he said.

Not Using Computer Technology Even When It Was Available

Although computer technology was a powerful teaching tool, my interview data showed that sometimes the teacher educators chose not to use computer technology even if it was available. This usually happened in the following situations:

Teaching in a more efficient way. Sometimes, the teacher educators recognized other teaching tools as more effective ways than using computer technology. My interview data showed the following specific examples given by the participants from their teaching experiences.

Example 1: If an instructor tried to illustrate or map out the teaching materials, it was easier to write them down than to use computer technology. In this way, the instructor could draw out the students' thoughts as well as add a little bit of human touch, which the students liked to see, to the teaching.

Example 2: Sometimes, when demonstrating a process, the teacher educator would choose to do a real demonstration by either going to the site on a field trip and using actual objects or staying in the classroom, instead of showing the students a video clip. The major difference of using these two teaching methods was that the students could ask the instructor questions when seeing a real demonstration. They could not do

the same thing to the human on a video clip. So, there were more opportunities for the students to get immediate explanations in real demonstrations.

For instance, it was considered to be easier for an instructor in Physical Education to teach the students how to shoot a basketball without a computer than with a computer. Although there were computer programs that would offer teaching materials on the topic, in actual teaching situations, the instructor's hands-on demonstrations working with the students was seen as being more beneficial to the students. In a situation like this, it was also reported to be easier for the instructor to give the students immediate feedback when watching them practice. After practicing the skills, the instructor would direct the students toward the computer technology for computer-based demonstrations and help them continue the learning process.

Example 3: In some content areas, such as Physical Education, there were times when observation of activities worked better than using computer technology. The students in the Physical Education major, for example, needed to develop a good sense of observational skills. Although the students could use computer technology to enhance the skills, it was better for them to actually be in a classroom and observe real people's activities.

Example 4: Sometimes when an instructor needed to show the students a real object, such as a cutting torch, it was more effective to bring in the real torch to the classroom than to use a PowerPoint diagram, as long as a real torch was available.

Example 5: Sometimes, face-to-face discussions would be essential for the students to develop critical thinking and analytical skills. Although computer technology

had a considerable asset in presenting information in classrooms, it would probably be less useful than class discussions. The use of computer technology on thread discussions requires the students to use outside class time.

Using different teaching tools. Many participants pointed out that in order to allow their students, the preservice teachers, to learn different teaching strategies, they used a variety of teaching tools, such as overhead projectors, computer technology, real demonstrations, and classroom discussions. Thus, computer technology, although it was an important teaching tool, became only a part of their teaching techniques, especially in those content areas where hands-on practices and experiences were critical in teaching and learning. As one participant said, "We try to teach in different ways. Our classes are hands-on, so we cannot do everything on a computer. I only use computer once or twice during [the full semester of] class. And the rest I deliberately use different (teaching tools)."

Using existing equipment to achieve the same goal. Sometimes, when the teacher educators had ready-made teaching materials, they would not bother using computer technology. For example, when they had video tapes or DVD disks available, they would just used a regular VCR or a DVD player, instead of setting things up on a computer and watching them there. Sometimes, when the teacher educators had their teaching materials on transparencies, many of them would not transfer these materials into PowerPoint slides, since it took a lot of time to transfer all of them. In a situation like this, the use or disuse of computer technology would achieve the same instructional goals for the teacher educators. As one participant said,

> Whether it is (on) PowerPoint or it is (on) transparencies, they (the students) will get the same information. And we will talk about it (the teaching materials). And it is all good. I don't see my going through and spending time to do (transfer) that is worth it.

Another participant added, "[Even if] you are using a computer, you are doing the same thing. But you can do it without a computer."

Undermining teaching styles. Some participants did not choose to use computer technology, because of undesired effects in its use. They might explain that they needed to exert their own teaching style, which they thought would be beneficial for their students. One participant said that when he needed to write concepts and run through examples on the whiteboard, he would choose to use an overhead projector rather than a computer in order to have a bright classroom and a good interaction with his students. "I would definitely not want to use the PowerPoint or to turn the lights off. I would not use computer technology in that case," he said.

Other teacher educators already used computer technology. My interview data showed that sometimes a couple of participants chose not to use computer technology because they believed that the students had already been exposed to a lot of computer technology in other classes. As one participant said, "I don't even use PowerPoint too much because they get that so much in other classes." Thus, it seemed to be unnecessary for the teacher educators to show the students the teaching techniques that they had already known.

Formal Computer Skill Training

The FACT

The FACT center at USU is in charge of much of the computer technology training for all the faculty members of the university. (Other entities that train are IT Services, especially their HELP desk; College of Education technical employees, including the YETC; and the technical people working in each department.) My interview data revealed that the FACT has two major ways of providing training opportunities for the teacher educators: workshops and assigning representatives to each department to help the faculty members when they had technical difficulties. FACT usually holds workshops on various topics, such as Photoshop, PowerPoint, Blackboard Vista, and so forth. All the faculty members could register for these workshops free of monetary costs, but with a significant outlay of time requested.

The Teacher Educators' Perspectives on FACT Service

According to my interview data, all these teacher educators were more or less involved in the computer skill training provided by the FACT. Some participants went to the FACT training workshop once or twice a year, while others attended the workshops once every couple of years. In general, the participants did not go to the workshops very often. As for the representatives who were assigned to each department, my interview data revealed that most teacher educators regarded their representative as a valuable resource. These representatives usually had the following responsibilities: providing training schedule to the teacher educators in each department, setting up computer system for online course teaching, and help solve some other technical problems for the teacher educators.

The teacher educators held positive as well as negative opinions about the FACT services.

Positive Aspects

According to my interview data, the teacher educators had the following positive attitudes toward the workshops and the representatives of the FACT:

Helping develop computer skills. When asked if the workshops from the FACT were helpful in developing their computer skills, many participants gave positive answers. As one participant, who attended three workshops, including the advanced PowerPoint, WebCT, and Blackboard, said, "Absolutely! In all those cases, they helped. I would say they taught 100 concepts there. I came back and used 20 of them. [Even though all were not usable, the workshop] still helped immensely."

Sometimes, even in situations when there were no workshops on some particular computer programs, the teacher educators could still get help from the FACT. For example, a participant once got a one-hour training with a FACT consultant to learn how to use Adobe Connect, which was not a regular workshop topic. Another participant also pointed out that he went to the FACT asking some specific questions, rather than attending workshops. "I went there sometimes for coaching on different things," he said.

Helping set up online course systems. Many participants pointed out that when the whole university was switching from using WebCT to Blackboard, the representatives from the FACT were very helpful. As one participant said,

> I think they are doing a pretty good job, providing things that we need. [T]he change … was painful. … [B]lackboard did not work half of the time, and we all

> had our stuff on WebCT. [T]he FACT center was doing a really good job try to get us all over there, get us up to speed, … and keep us up to date.

Thus, it seemed to be an effective way for the representatives to help the faculty members individually on setting up online course systems.

Gathering training information effectively. One participant mentioned that the FACT got information from faculty members on their particular needs for learning computer skills. FACT center people then, according to the results of these surveys, set up workshop schedules and informed the faculty members about the time and location of the workshops. The participant indicated that the system worked out very well.

Negative Aspects

According to my interview data, the teacher educators had the following negative attitudes toward the workshops:

Time conflicting. One participant said that it was hard for her to attend FACT workshops and even go to the FACT center to ask questions during the work hours. When she finished her work at 5:00pm, FACT was also closed. In fact, the workshop time issue also showed up in my pilot study, where a faculty member suggested having evening workshops instead of day time workshops. When asked if she would be tired after a whole day's work, she said that she could be. "But you are learning!" her eyes lit up.

Overwhelming amount of information. Another issue that many participants pointed out was that each FACT workshop delivered too much information for the faculty members to learn and use. Although some participants were happy to accept the fact that they could use only 20% of the information from each workshop, other

participants felt overwhelmed and finally lost their interest to learn. As one participant pointed out, "I remember going to the WebCT training. And it was like, 'Woo!' … Just too much information to me … It was very hard for me."

Poorly organized instructions. A couple of the participants complained that the instructions at FACT workshops were not very well organized. As one teacher educator said, "They don't put the materials out there in a way that is well suited for [the audience to learn]."

When asked about his perspectives of attending FACT workshop, another participant used the word "horrible" to describe his feelings. He gave me a specific example on his first time attending the WebCT training. The instructor of the workshop gave the learners a manual for their future reference. However, his teaching was based on a different set of learning materials, rather than the manual. He said,

> But to me, it would be nice if I would be taught out of the manual that I was going to use as a reference to figure things out, because when you are taught something that is *that* different with that new (information), you know you will only absorb maybe 25% of it.

A week later, when he was foundering his way to pick up the learning materials in the workshop, he realized that the manual was out of date. "That was why they didn't want to teach out of it." He said. His other workshop training experience also made him feel that the instruction wasn't worth his effort and time.

My interview data also showed that none of the participants remembered receiving any handouts from the FACT workshops. Although it was hard to generalize this conclusion to all the FACT training workshops, it seemed to be that, at least from the point of view of these participants, the FACT lacked some follow-up strategies to

increase the efficiency of their workshop instructions.

Specific Computer Programs in Use

During my interviews, I asked the participants the specific computer programs they used in their teaching. Their answers provided me with two categories of computer programs. The first category included computer programs that were used only by the participants in particular majors, while the second category included computer programs that were used by all participants (see Appendix E for the definitions of computer programs and devices).

Category I (Professional Software)

The teacher educators in different content areas had their special computer software used for special purposes. For example, the curriculums in the Department of Engineering and Technology Education included communications, construction, manufacturing, and transportation. Thus, the teacher educators in that department were required to master computer languages and programs such as G&M Codes, CAD (Computer-Aided Design), and CAM (Computer-Aided Manufacturing).

The teacher educators' use of such computer software had positive influences on improving their computer skills and building their confidence of mastering other computer programs for their teaching. According to my interview data, I noticed that teacher educators from the departments with heavier computer technology components showed more self-assurance of their computer knowledge and skill levels. For example, a participant from the Department of Engineering and Technology Education mentioned

that they did not have any major problems in terms of using computer technology. "We tend to be the type of the department that can solve our [computer technology] problems on our own," he said.

However, the teacher educators' use of the first category computer software was not the focus of my dissertation. The reasons were as follows:

First, for many teacher educators, the first category computer software was considered as a *must* instructional content. The software was not a tool to *assist* their teaching of other instructional materials.

Second, in order to master the first category computer software, many teacher educators needed to attend professional off-campus workshops. As my interview data revealed, it was not feasible for the FACT to hold this kind of workshop, since, as one participant mentioned, "there are not enough professors on campus that need that training. So, it won't work."

Third, the computer software formed the foundation of specific courses, without which, the course itself wouldn't exist. It was not the kind of situation where the teacher educators could choose either to use the software or not to use the software to teach. Thus, my dissertation study focused on the second category computer software.

Category II (General Software)

The computer programs in the second category were not considered a necessity for some specific content areas. Rather, these programs were used by most of the participants in various departments. According to my interview data, my participants used the following computer programs to assist their teaching:

PowerPoint. Some teacher educators involved in my study used PowerPoint to give lectures. Some participants used *Keynote*, which is Apple's version of PowerPoint.

Web Browsers. Most teacher educators involved in my study used web browsers such as Internet Explorer, Safari, and Firefox in their teaching. The major usage of the internet mentioned in my interview data included the following aspects:

1. Finding simulations on the internet to help teach content materials
2. Showing the students examples on the internet of what other people were doing
3. Looking up sources of information related to topic areas
4. Having students look up articles on current research

One specific online resource that was mentioned in my interview data was YouTube. The YouTube clips were very beneficial, according to some participants' perspectives.

Word Processors. Many teacher educators involved in my study used word processing programs to create and edit lesson plans.

Excel. Three participants used Excel spreadsheet for record keeping.

Blackboard. Many participants used Blackboard to deliver online courses and keep grades. Some of them used it as a supplemental resource for face-to-face class room discussions.

Web design. Two teacher educators in my study used web design programs. One teacher educator used some HTML coding for web designing, while the other teacher educator used iWeb.

iMovie. Not many participants used iMovie. However, when asked if iMovie was useful in their teaching, all the participants who used iMovie gave very positive answers. The students enjoyed making their own video projects and liked to see their friends' images – sometimes their own images – on their own movie.

Photoshop. My interview data showed that only one teacher educator held a positive attitude toward Photoshop and wished his students could have done more with the program. He would like to see his students enhance their presentation skills by taking graphics, making changes to them, and bringing them to their presentation slides. In this way, the students also did not need to rely totally on the internet to get graphics. However, some other participants held a neutral attitude toward the use of this program. Although they admitted the power of the program, they seemed to be not clear about its specific usages.

One participant also mentioned Document Camera, which, according to the participant, was useful for projecting maps with color and high definition.

Summary of Classroom Observations

From October 13 to December 5, 2008, I observed four participants' classrooms. For each participant, I observed one of his/her teaching sessions as well as one of his/her student presentation sessions. I compared the four faculty members' classroom observations in Table 2 (see Appendix B for details).

Table 2

Comparison of the Classroom Observation Results

Comparison aspects	Instructor A	Instructor B	Instructor C	Instructor D
Content area	Agriculture	Agriculture	English	Engineering
Used computer technology?	No	Yes	No	No
Methods course?	Yes	No	Yes	No
Computer applications	N/A	PowerPoint	N/A	N/A
Effective instruction?	Yes	Yes	Yes	Yes
Students used computer?	Most of them	Some of them	No	All of them
Students' use of applications	PowerPoint	PowerPoint	N/A	Professional software
Students skillful?	Yes	Yes	N/A	Yes
Students' presentation effective?	Yes	Yes	Yes	Yes

Table 2 showed that the use of computer technology was not directly related to the effectiveness of instructions as measured by the learning atmosphere observed during the class sessions. Also, students' use of computer technology seemed not to be directly related to their teacher educators' demonstrations of how to use computer technology. The students could have learned the computer skills on their own or in other classes, which I did not observe. However, since the students only showed their skills on using PowerPoint, which was a commonly used form of software package, it was not clear if

they were competent in using other more complicated software, such as Photoshop and video editing software.

Summary

In this chapter, I first reviewed the teacher educators' attitudes toward computer technology integration. My research data showed that all the participants regarded computer technology as an important aspect in their teaching. They also considered computer technology as a powerful instructional tool. However, it needed to be selectively used. Although computer technology had influences on the teacher educators' teaching, it did not change their core pedagogical beliefs.

In the second part of this chapter, I reviewed the factors that affected the teacher educators' computer technology integration. According to my interview data, I identified three factors that promoted computer technology integration: advantages of using computer technology in classrooms, a supportive environment, and job obligations. The factors that hindered the teacher educators' computer technology integration included course evaluations, time issue, unreliability of computer technology, lack of advanced computer tools, and lack of computers in school districts. I will further discuss these factors in the next chapter.

Next, I reviewed the teacher educators' personal experiences and its influence on their computer technology integration. According to my interview data, I categorized the participants into four categories in terms of their ways and attitudes toward computer technology integration. In the Statement of Problems section of this dissertation, I

concluded from my pilot study that the teacher educators were involved in high, medium, and low levels of computer technology integration. Although the teacher educators involved in my pilot study were different from the teacher educators involved in my dissertation study, the classifications had similarities. In this chapter, Category I (advanced users) and Category II (technical users) were similar to the high level of computer technology integration mentioned in the Statement of Problems. Category III (reluctant users) was like the medium level; Category IV(resisters) was similar to the low level. Compared to the classifications in the Statement of Problems, the classifications in this chapter were based on a deeper analysis. A major difference between the two classifications was that the teacher educators on the low computer technology integration level generally demonstrated a negative attitude toward computer technology integration. While in this dissertation study, the teacher educator in Category IV(resisters) still held the belief that computer technology was important and powerful in education.

In the fourth section of this chapter, I identified, according to my research data, the positive and negative aspects of using computer technology. The positive aspects included providing advantages in teaching, improving productivity, offering easy access, engaging the students and enhancing teaching, presenting a variety of updated teaching resources, and enabling distance education. The negative aspects included relying too heavily on computers and the inappropriate use (over use) of computer technology. I will further discuss these aspects in the next chapter. During my interviews and classroom observations, I have also noticed that in some situations, the teacher educators chose not to use computer technology even if it was available. I identified the reasons, according to

my research data, and presented them in this section. In general, the teacher educators' decisions on whether or not to use computer technology were based on their attitudes toward effective ways of teaching.

In the fifth section of this chapter, I identified the positive and negative aspects of the FACT services according to my interview data. The positive aspects included helping develop computer skills, helping set up online course systems, and gathering training information effectively. The negative aspects included time conflicting, overwhelming amount of information, and not well-organized instructions. I will further discuss these aspects in the next chapter.

In the sixth section of this chapter, I listed the specific computer programs – a variety of popular computer applications – mentioned by the teacher educators in our interviews.

In the last section of this chapter, I summarized the findings of my classroom observations. The results of these observations suggested that computer technology was not directly related to the effectiveness of instructions. Also, students' use of computer technology seemed not to be directly related to their teacher educators' demonstrations of using computers.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

In this chapter, I will discuss the following topics: the major driving force of computer technology integration; teacher educators' modeling on using computer technology; computer technology training at FACT; a supportive environment; and students' competency in using computer technology.

The Major Driving Force of Computer Technology Integration

The findings of the last chapter suggested that observing the advantages of using computer technology in education firsthand seemed to be the first step in changing the teacher educators' orientation toward computer technology integration. This conclusion seemed to be supported by the result of a small survey I conducted after my data analysis phase, where I identified the positive and negative factors affecting computer technology integration (see Appendix D). This survey was used as a check on the estimations that I had made previously.

I asked five USU faculty members, including four teacher educators and a non-teacher educator, to give a weight to each factor on a 1-10 value scale. The averaged estimation of the outsiders showed that the *advantages of using computer technology in classrooms* had the highest weight (9/10) among all the factors (see Figure 2). This conclusion would probably conflict with my literature review result that the change of pedagogical beliefs was the first step in changing educators' computer technology

integration. I think the use of advantages of using computer technology in classrooms as a variable would bring more advantages than the use of the change of pedagogical beliefs as a variable in conducting research studies. First, it is easy to measure the advantages of using computer technology, while it is harder to measure the change of pedagogical beliefs. Second, compared to the change of pedagogical beliefs, the perceptions of the advantages of using computer technology are more related to Rogers' five stages (knowledge, persuasion, decision, implementation, and confirmation) of individuals' innovation decision making processes, since "individuals will seldom expose themselves to messages about an innovation unless they first feel a need for the innovation" (Rogers, 1995, p. 164). Based on my findings, I would suggest that an examination of the advantages of using computer technology in classrooms could become a future research topic.

The Comparison of Figure 1 and 2

The force field analysis model in Figure 1 was based on my estimations of the weight of positive and negative factors affecting computer technology integration. The force field analysis model in Figure 2 was based on four faculty members' estimations. Figure 1 and Figure 2 showed the following similar patterns:

1. *Advantage of using computer technology in classrooms* received the highest weight in both figures.
2. *Advantage of using computer technology in classrooms* and *Job obligations* received higher weight than *A supportive environment* in both figures.

These similarities probably suggested that in order to enhance computer

technology integration, it might be important to increase the opportunities for the teacher educators to realize the existence of some specific computer programs and observe the examples of using these computer programs in educational settings. In addition, setting up job obligations was probably another effective way to improve computer technology integration.

However, it was observed in Figure 2 that although the faculty members regarded job obligations as a major driving force, they seemed not to have a strong desire to add items of computer technology integration into the course evaluation form. Was this an evidence of cognitive dissonance, since the teacher educators' desire of using computer technology was dissonant with their activity of doing something that would help promote the use of computer technology? The answer could be positive. However, further research most likely needs to be conducted to analyze the teacher educators' beliefs and attitudes that were related to this cognitive dissonance.

In addition, it seemed that my estimated weight of *Unreliability of computer technology* was much lower than the faculty members' estimations. My estimation was based on my interview data as well as my experience in four years teaching of the compute skill for preservice teachers class, which revealed that although the unreliability of computer technology had caused frustrations to some teacher educators, its reliability had being largely increased. I might have overestimated this improvement.

Figure 1 and Figure 2 also suggested that the driving forces and the restraining forces were almost balanced. This indicated that it was hard for the teacher educators to move toward the desired state to integrate more computer technology in their teaching.

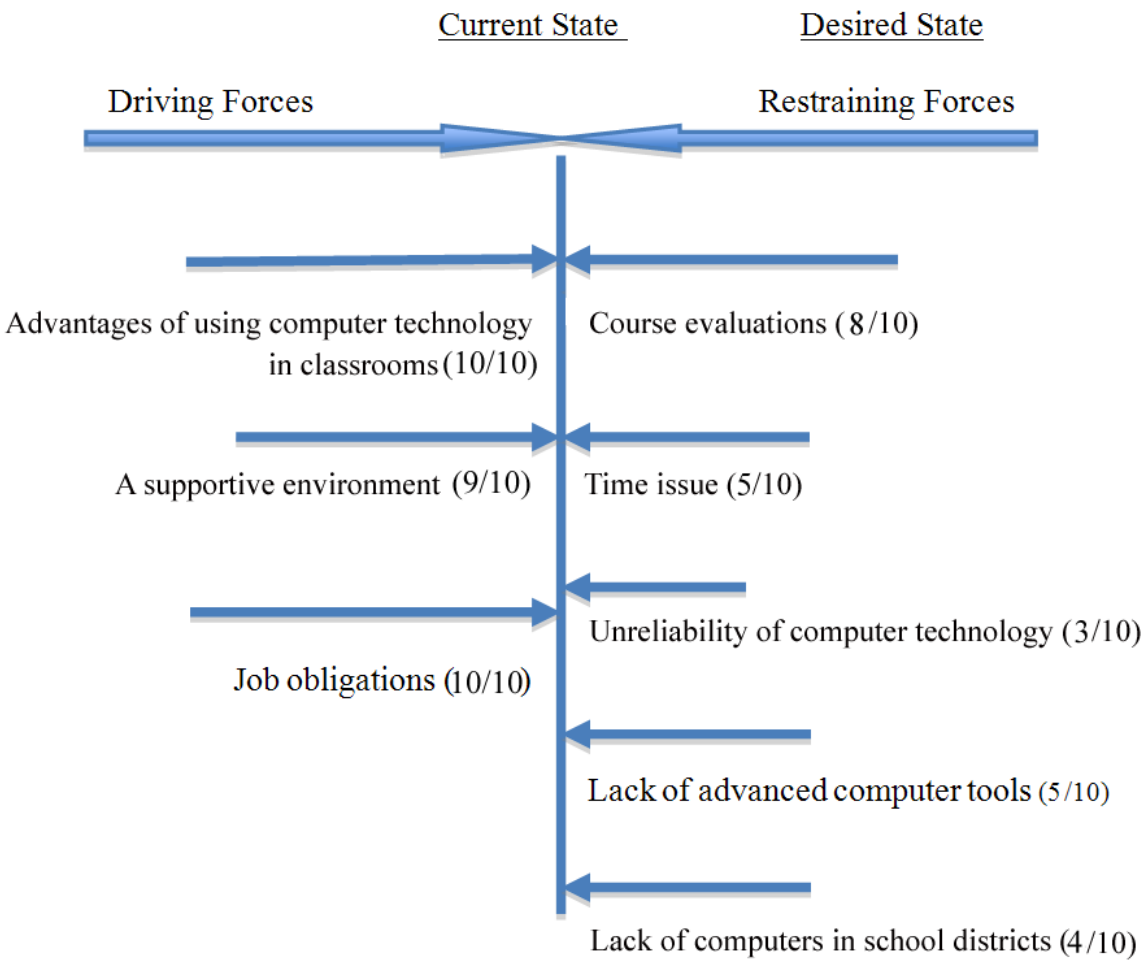

Figure 1. My force field analysis model on positive and negative factors affecting computer technology integration (weight based upon my estimation).

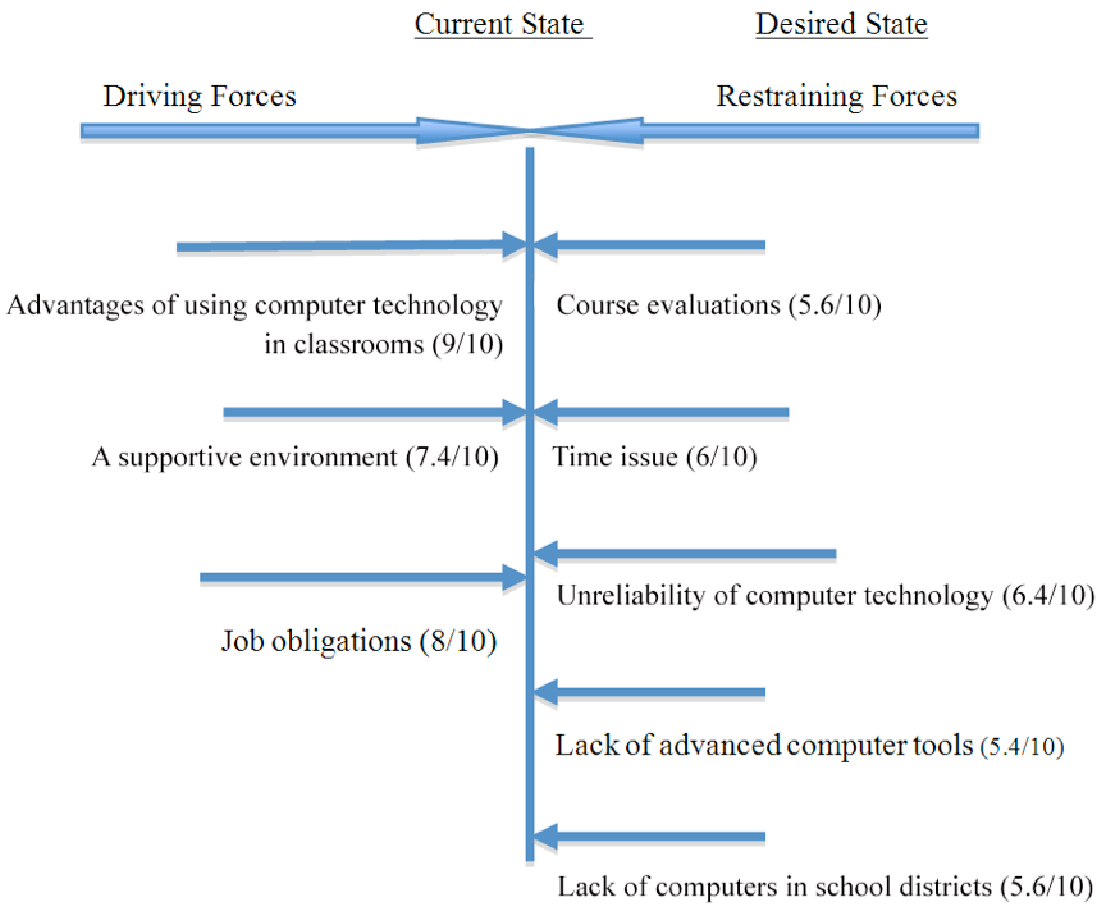

Figure 2. Outsiders' force field analysis model on positive and negative factors affecting computer technology integration (weight based upon outsiders' averaged estimation).

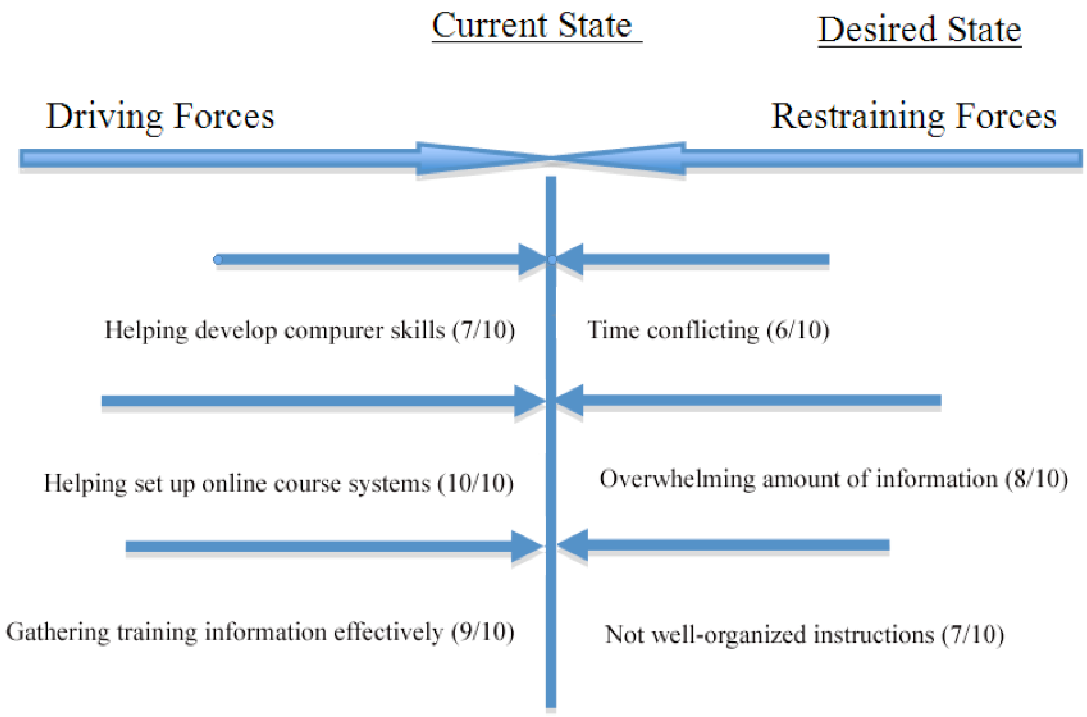

Figure 3. My force field analysis model on the positive and negative aspects of FACT service (weight based upon my estimation).

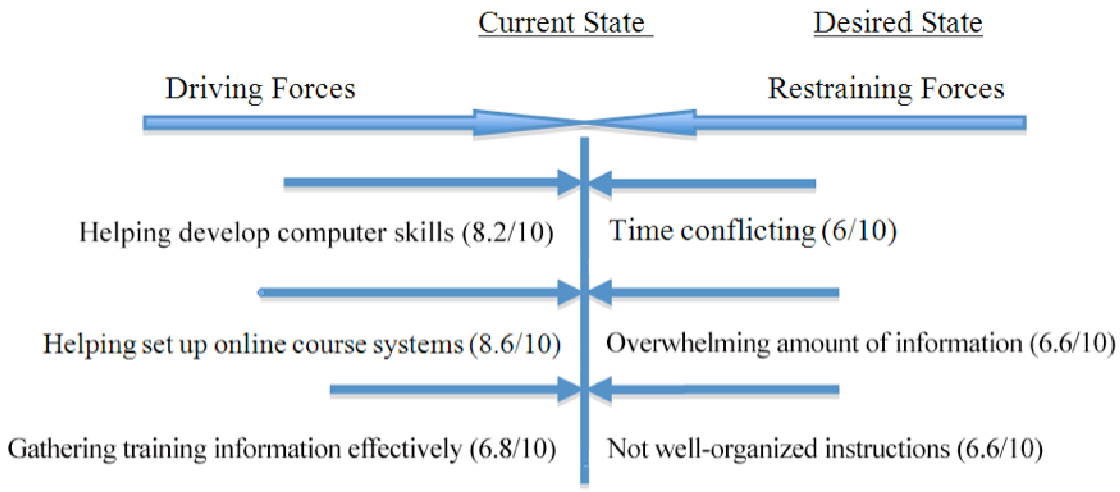

Figure 4. Outsiders' Force field analysis model on the positive and negative aspects of FACT service (weight based on the outsider's averaged estimation).

Comparison of Figure 3 and 4

The force field analysis model in Figure 3 was based on my estimations of the weight of positive and negative factors about formal computer skill training at USU. The force field analysis model in Figure 4 was based on four faculty members' estimations.

Helping set up online course systems was the highest estimated driving force in both figures. This result indicated that 1) setting up online course systems was the most effective service from FACT, and 2) one-on-one computer training was an efficient training format.

The comparison of Figure 3 and 4 also showed the different weights on *Overwhelming amount of information*. I have noticed that one of the faculty members involved in this weight survey circled "2" on this item, while others circled "6," "7," "8,"

and "10." Thus, I might conclude that *overwhelming amount of information* was a strong restraining force according to both estimations.

Figure 3 and Figure 4 also suggested that the driving forces and the restraining forces were almost balanced. This indicated that the current FACT training probably was not helpful enough in the teacher educators' computer technology integration.

Comparison of Figure 5 and 6

In the last chapter, I reviewed the advantages and disadvantages of using computer technology in education. Figure 5 and 6 showed the results of the weights survey on these positive and negative effects. Figure 5 was based on my estimations while Figure 6 was based on the four faculty members' averaged estimations. Both figures revealed that the advantages of computer technology integration obviously outweighed the disadvantages. Thus, there seemed to be no reasons for the teacher educators avoid the use of computer
technology in their teaching, unless a more effective instructional tool can be used.

Teacher Educators' Modeling on Using Computer Technology

The findings revealed in the last chapter confirmed that the teacher educators perceived computer technology integration as an important and indispensible instructional tool. However, not all the participants were actively involved in modeling the use of computer technology in their teaching, including some of the teacher educators who held strong constructivist pedagogical beliefs. This phenomenon seemed to conflict

with the findings of my literature review: Educators who held a constructivist view would be more involved in computer technology integration. Two major factors most likely contributed to this inconsistency: (1) many content areas needed to use hands-on exercises to enhance

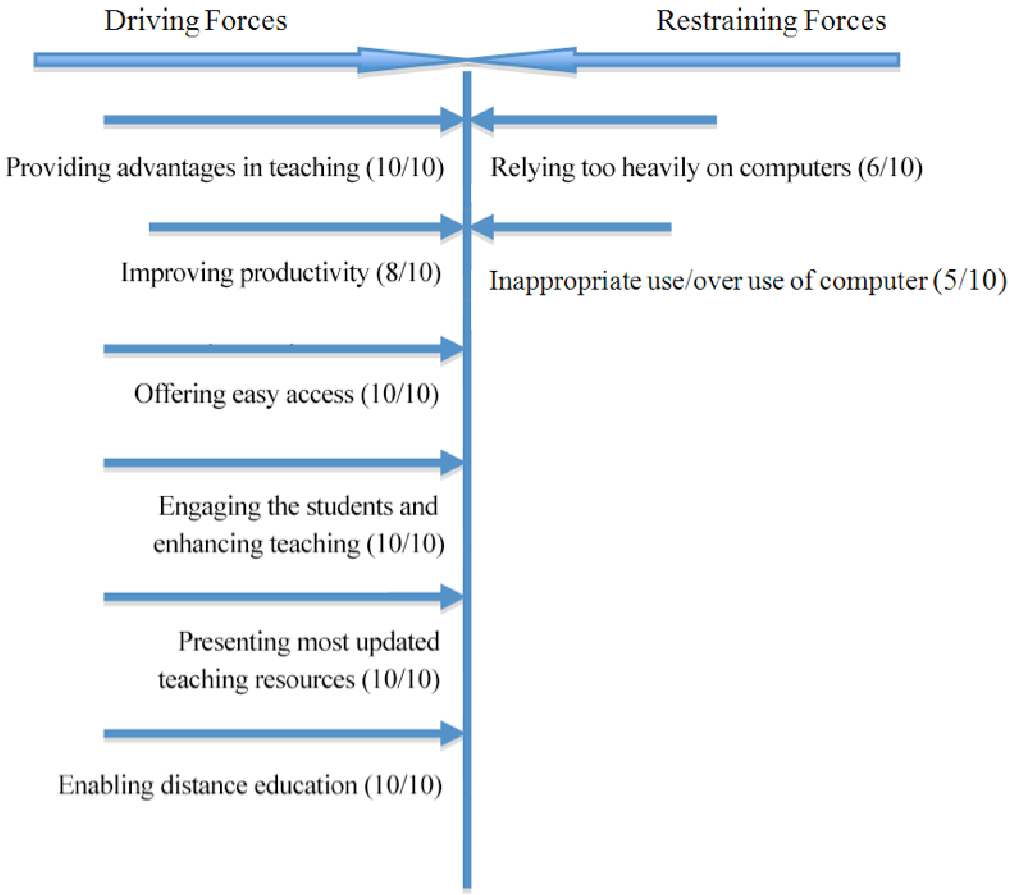

Figure 5. My force field analysis model on the positive and negative factors of using computer technology (weight based upon my estimation).

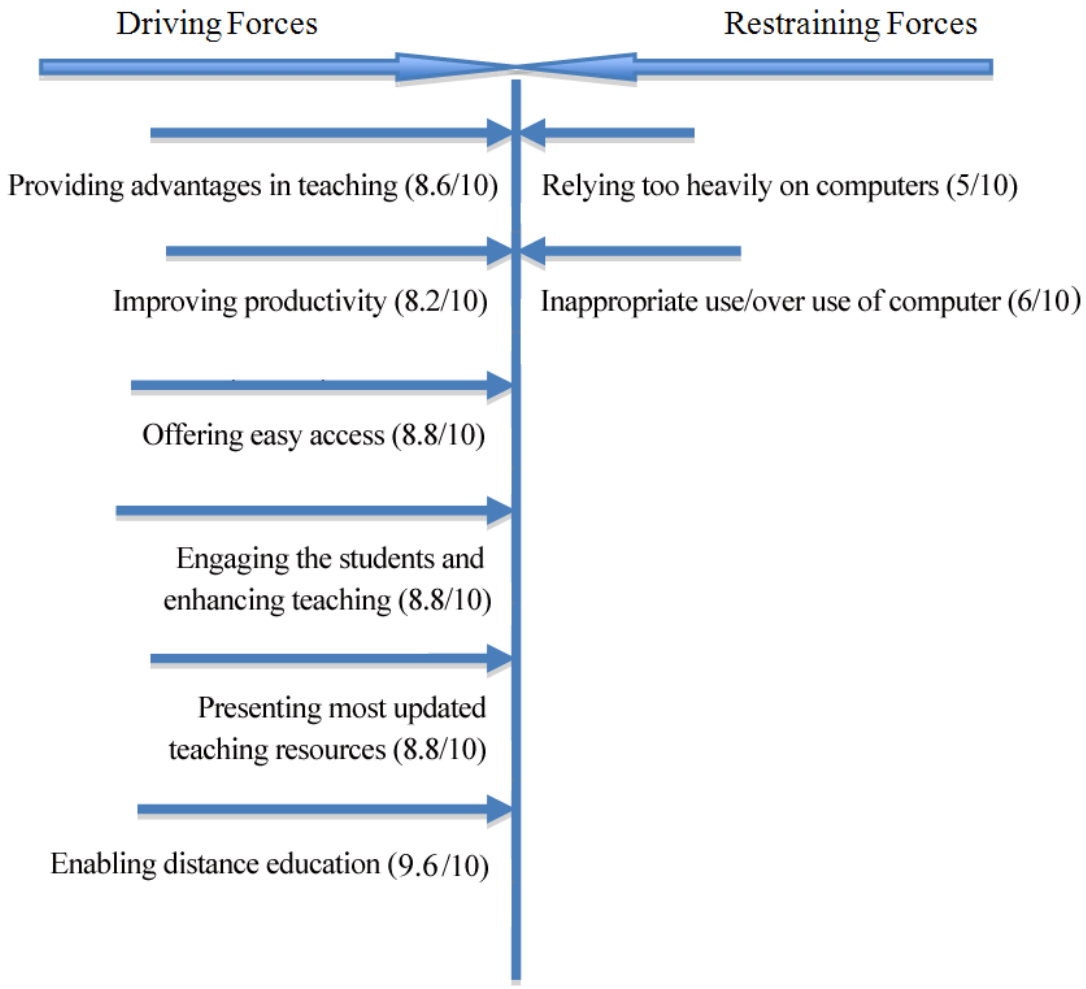

Figure 6. Outsiders' force field analysis model on the positive and negative factors of using computer technology (weight based upon the outsiders' averaged estimation).

constructivist instructions, and (2) the nature of methods courses required the teacher educators to demonstrate the use of different instructional tools.

In order to further explore this issue, I compared the instructional methods in different content areas, since my interview data revealed that content area could be a factor that influenced the teacher educators' decisions on using or not using computer technology to achieve their instructional objectives and goals. All the participants involved in my study were methods course instructors. Many methods courses included a diversity of curriculum that dealt with everything from classroom management to discipline to content. To be specific, I listed below the methods of teaching in different content areas according to the descriptions of the participants.

In the Agricultural Systems Technology and Education major, the methods of teaching included demonstration and a great deal of laboratory-based learning, which gave the students the opportunities to learn by doing. Problem-based learning was another major method in agricultural education. In problem-based learning, the teacher educators worked with their students, the preservice teachers, in presenting a real problem, developing solutions to the problem, and leaving the solutions open ended enough for the students to get engaged in the learning process. Although sometimes the teacher educators needed to prepare and give lectures, lecturing was not the major method in this area.

In the Engineering and Technology Education major, the methods course covered different methodologies for teaching, such as constructivist approaches, cooperative learning approaches, and traditional lectures. Since there were many design exercises,

problem solving, and hands-on laboratory experiences involved in this major, the methods course also needed to deal with teaching strategies in psychomotor domain, such as how to hold a beaker and how to pour, as well as safety issues in laboratory settings. In addition, writing lesson plans was another important topic in the methods course as it often is in such classes. Mostly, the methods course was a lecture class.

In the English major, the methods course covered topics such as how to teach reading, how to teach writing, and how to assess students' work. To be specific, the course emphasized inquiry instruction, which taught the preservice teachers how to engage their students to discover and construct meaning for themselves out of literature. According to the participant, the best way to teach the methods course in English was to model the real classrooms, where the preservice teachers could experience the teaching methods, or to go out to the schools, where the preservice teachers could work with school students. The course had a lot of activities, such as cooperative learning activities and some micro-teaching with role playing, where the students could experience and evaluate each other's teaching methods. Pedagogy was an important content in this course. The instructor took a very constructivist point of view and guided the students to construct knowledge and make the meaning from their own experiences that they brought to the learning environment.

In the Family and Consumer Sciences Education major, the methods course covered different teaching strategies and resources, such as problem-based learning, cooperative learning, and practical reasoning. The teacher educators mainly used group activities and hands-on activities in their classrooms, since the preservice teachers needed

to teach in a laboratory setting when they got a job. The teacher educators in this content area used very few lectures.

In the Music major, the methods course was mainly about classroom management. The course also covered the topic of budgeting, where the teacher educator taught the students how to use Excel to manage accounts. Of course, music major students needed to spend a considerable amount of time on practicing musical skills.

In the Physical Education major, the ways of teaching included demonstration (the teacher educator demonstrated particular skills), observation (the students observed the teacher educator's performances), feedback (the teacher educator watched the students' performances), and evaluation (the teacher educator evaluated the students' performances).

In the Social Studies major, the methods course covered writing methods on lesson plans and teaching units as well as multi-expository teaching methods, such as lectures, directed reading lessons, directed reviewing lessons, advanced organizers, graphic organizers, and cognitive maps. The course also covered special methods for different content areas in social studies, such as anthropology, psychology, sociology, government & political science, history, economics, and geography. Moreover, the course covered general topics, such as adolescent development, and teaching models, such as inquiry methods of concept detainment and case studies. All these contents prepared the students for their student teaching.

Table 3 lists the major teaching methods in different content areas. The analysis in this table shows that many majors made considerable use of hands-on exercises. When in

laboratory settings, the focal point of teaching was on psychomotor skills. Computer technology could be less useful than instructors' face-to-face instructions unless particular computer programs were developed to assist the laboratory work in a particular content area.

Table 3

Major Teaching Methods in Different Content Areas

Content areas	Major teaching methods
Agriculture	Demonstration; learn by doing; problem-based learning
Engineering	Lectures; design exercises; hands-on laboratory exercises
English	Inquiry instruction; model real classrooms; cooperative learning
Family Consumer	Problem-based learning; cooperative learning; hands-on activities
Music	Class management; learn by doing
Physical Education	Demonstration; observation; feedback; evaluation
Social Studies	Lectures; reading; reviewing lessons; inquiry instruction; case studies

For example, in the agriculture area, the students could use computers to track the growth of the poinsettia plants in green houses. From the time they planted the flower, the student could set a target market date and tracked the height of the plant, the bugs they observed, the amount of water the plant received, and the PH value of the soil. Since an unacceptable potted flowering crop size could cause higher shipping charges, downgrading of the product, and lost sales, growers of potted flowering crops usually

face challenges of controlling the crops' height under conditions that are changing each year. These conditions include weather condition, cultivar, plant vigor, shipping date, and pot-size. The computer program is a grower-management tool that can plot plant height onto a graphic once or twice each week and make height-control decisions after comparing actual plant height with desired plant height over time. Thus, compared to recording data on notebooks, the program helps save the users a large amount of time. These specific computer programs would enhance teaching in a specific content area but could not be used in other content areas.

In addition, since these were methods courses, the teacher educators tried to introduce different teaching tools, including computer technology, into their classrooms. The nature of these courses required the teacher educators to analyze the advantages and disadvantages of using different teaching tools. One participant said that by the end of each class, he wanted to make sure that the students understood how to use specific tools in specific situations. For example, if he modeled using a whiteboard in a class, he would give the students the guidelines for using whiteboards. For other tools, such as overhead projectors and PowerPoint presentations, he used similar methods to guide the students' use of these tools.

Moreover, in some situations, computer technology could not replace other teaching tools. For example, one participant mentioned that her classes were usually full of 15-minute long activities. Many of these activities did not involve computer technology. My classroom observations also showed that the well-designed classroom activities usually brought about an active learning atmosphere, even if the instructors and

the student presenters did not use computer technology at all.

Thus, computer technology was not involved in every aspect of the methods courses' instruction, since the computer technology was not advanced enough to replace other instructional tools. However, it was probably not necessary only to use computer technology in every teaching aspect and get rid of other instructional tools. Since many teacher educators would likely teach in at least some situations without computers, the instructors probably felt that dealing only with computer options would have been a mistake, as it would not adequately prepare the new teachers.

Computer Technology Training at FACT

The Characteristics of Computer Technology Integration

My interview data revealed that the teacher educators' computer technology integration carried the following three characteristics:

First, the teacher educators did not need to become computer experts in order to implement computer technology integration. During one of my interviews, a teacher educator told me that he needed to master the professional computer programs such as CAD. As for computer programs such as PowerPoint that assisted his teaching, an average level of mastery was enough. My interviews with other teacher educators and my classroom observations also supported this conclusion.

Second, all the teacher educators involved in my study were concerned more about how computer programs could be useful in their teaching, rather than their computer skills. Although there were some participants who tried very hard to improve

their computer skills, their ultimate goals were to use these skills to facilitate their teaching. Even for that teacher educator who did not want to embrace computer technology, she was still attracted by certain functions in Blackboard and wanted to try them in her teaching, regardless of her "limited" skills. Thus, the real motivation for computer technology integration seemed to lie in the application aspects, rather than the skill aspects.

Third, with the fast development of computer technology, it was very difficult and time consuming for the teacher educators to follow every development of the computer programs and try to stay updated. Sometimes, even the change of the interface of a certain computer program could cause a big trouble for the teacher educators who were once very familiar with the old versions of the same program. For example, one participant mentioned that he was bogged down for hours trying to figure out how to use InDesign. He had been very familiar with desktop publishing software in the late 1990s. Now, there was no way that he could use his old knowledge since the electronic size and quality of graphics and cameras has changed so much with the advent and growth of digital photography.

Based on the above analysis and the analyses in the previous sections of this chapter, I recommend the following methods to improve the FACT center workshop training and other services:

Changing Workshops

The characteristics of computer technology integration implied that the computer technology training in FACT could switch from emphasizing computer skills training to

extensive introductions into the educational applications of computer technology. For example, some of the workshops at FACT could change into lectures or discussions on different ways of using well-accepted computer programs such as PowerPoint in different teaching environments, while other workshops could contribute to the applications of new educational computer programs such as Instructional Architect.

This change of training style might help solve the following problems:

Encouraging the learning of computer skills. For the teacher educators who do not like to learn computer skills, the new training style would stimulate their willingness to integrate computer technology into their teaching. As long as they realize that they can use certain features of some computer programs, they would take the initiative to learn the skills or to find help to solve the skill problems. For example, one of the participants in this study did not like to learn computer skills. However, after she realized that the Blackboard's threaded discussion feature would be useful in her teaching, she took initiative to ask for help to learn how to use Blackboard.

Simplifying computer technology integration process. The new training style would probably change the computer technology integration procedure, making it easier for the teacher educators to accomplish computer technology integration process. It seemed to me that many participants thought computer technology integration was based on the skillful use of various computer applications and software. Thus, only after they got quite familiar with the applications and software could they skillfully integrate computer technology into their teaching.

The new training style takes an opposite approach. In fact, knowing a couple of useful features of a computer application would be quite enough for the teacher educators to start practicing their computer technology integration. They don't need to be quite familiar with the overall features of the application. For example, when I teach Photoshop, I pick out some features that would be useful for my students in their teaching. One of these features is how to highlight a spot on a graphic. In order to use this feature, my students only need to follow these steps:

1. Open Photoshop
2. Select the object/area – use those selection tools
3. Choose Select > Inverse
4. Choose Image > Adjustments > Curves
    a. Make sure that the Preview option is selected.
    b. Change the value in the Output option to about 120 ~ 150. (Try other values till you are satisfied with the results.)
5. Save the changed image.

In order to use this feature, the students only need to know how to use the selection tool in Photoshop. This is the only computer skill they need to develop. For the rest of the work, they only need to follow the above steps and click corresponding commands in the command menu.

Thus, if our computer training starts with showing the learners useful features for instruction and regards computer skills as simply tools to achieve the use of these features, it would largely eliminate the teacher educators' fear of difficulty, since they

only need to focus on one or two specific computer skills in order to apply certain features of computer applications in their teaching. In this way, the new training style would probably not only save the teacher educators a lot of time to develop computer skills, but also simply their computer technology integration process.

Catching faculty members' attention. My interview data showed that many teacher educators were concerned about how to use software properly. For example, many of them mentioned the abusive use of PowerPoint. In fact, FACT center had website information providing methods on how to use PowerPoint to increase student interest and motivation. However, it seemed that none of the teacher educators had noticed the existence of the website. Thus, lectures and workshops on the proper use of computer programs would help bring the information to the front.

One-on-One Training

My interview data showed that many teacher educators preferred one-on-one training to workshop type training when learning computer skills. As one participant said, "I just learn much better one-on-one." Since one-on-one training met individual teacher educator's particular needs, the teacher educator could immediately apply the training content to his/her teaching. However, as some participants pointed out, the typical workshop training on computer skills did not have such advantages. Thus, my interview data showed that one-on-one training was much more preferred and was probably more effective than the workshop training. This conclusion was also aligned with the adult learning theory: Adults desired the immediate application of knowledge.

Although one-on-one training seems to be more expensive to provide, it is a good supplemental for the workshop training style.

Supportive Environment

My research data and my literature review showed that a supportive environment was very helpful for the teacher educators' professional development on computer technology. Although many participants involved in this study had self-teaching experiences on learning computer skills, none of them was absolutely isolated from their environment. Many of them got help from their family members, friends, students, colleagues, and departments.

The technology training offered by the FACT center was a part of the supportive environment. In addition to the FACT service, there were many other formal and informal ways that could be considered as an indispensible part of the supportive environment. This indispensible part included the following aspects:

Workshops

My interview data showed that all the participants with offices located in or close by the Education Building mentioned the YETC computer lab and its director Nathan Smith as being helpful to their learning. The YETC computer lab provided the faculty and students with a useful resource of teaching and learning. My interview data showed that Mr. Smith first compiled information from different faculty members about their needs of learning some specific computer programs. Then he would arrange workshops

on this particular component of technology and email the faculty members about the time and location of the workshops asking them to sign up ahead of time.

I attended several workshops held by Mr. Smith on Photoshop and Audio technology. The workshops usually had no more than 10 learners for each session, allowing the instructor to pay enough attention to each learner. Many of these workshops were held in the evenings, which may fit better into some teacher educators' time schedule than that of the workshops held at FACT center.

Besides YETC's training workshops, some of the participants got a lot of personal help on computer technology from Mr. Smith. Whenever the teacher educators encountered difficulties on their use of computer technology, they often turned to Mr. Smith to get immediate help, going directly to his office and asking their specific questions.

However, it seemed that many other teacher educators involved in my study did not use YETC as one of their resources. This was probably because that they either did not know of the existence of the YETC, or their physical locations made it inconvenient for them to ask for help at YETC. Since the YETC had set a good example of giving the teacher educators instant and efficient help on computer technology, it would be helpful if other computer labs in other parts of campus could offer similar service. USU has 10 computer labs scattered all over the campus. Such service offered by each computer lab would be a tremendous help for the teacher educators located nearby. This change also requires that the lab directors should have the expertise to answer questions on computer technology.

Learning from the Students

A healthy attitude. Many participants pointed out that they had learned a lot from their students, since students were actually very good resources in terms of computer technology. As one participant said,

> It is hard to find help, especially in the middle of a project, in the middle of a classroom. But the good thing is [that] many of my students know the answers to those problems. [The students] helped me fix [the problems] and get through that. So I learn so much from the students. And I think that is a good thing.

However, some participants also pointed out that asking for help from the students in the middle of a class session would bring some negative effects for their teaching. As one participant said, "Last year we had a student who was a computer whiz. She could teach me anything about the computer. But in the classroom I don't think it is probably a good idea to say, 'help me do this'." For other teacher educators, it would also "hurt their ego a little bit," as a participant said.

My interview data showed that some teacher educators were reluctant to use computer technology in their classrooms, since they did not want to show their students that they were not competent to use computers. The ideology that teacher educators should be very knowledgeable about computer technology and set up a perfect teaching model for their students should be changed. It was important for the teacher educators to show a healthy attitude toward the use of computer technology in their teaching, perhaps candidly admitting that with all the changes in computer technology that occur, they did not possess all the knowledge about computer technology. Thus, when the preservice

teachers face the same issue in their future careers, they will be brave enough to explore new teaching methods for the benefit of their students.

Students' learning ability and resources. My interview data showed that sometimes it was good for the teacher educators to give the students some responsibilities of working with the computer technology. For example, one participant told me that she asked the students to do web-searching and find video clips related to the teaching content. In this way, the teacher educator gave an opportunity for the students to practice their computer skills in their content area. In the meantime, the students saved a considerable amount of time for the teacher educator.

Colleagues' Exchanging Teaching Ideas

Many of the teacher educators involved in my study mentioned that they got new teaching information on computer technology from their colleagues. For example, during one of my interviews, I asked the participant how she handled the issue of finding time to identify useful video clips for her students. She replied, "I got them from colleagues." Thus, at least in some cases, the communication among the teacher educators on computer technology information was very helpful for them to obtain new teaching ideas.

When asked if they felt stressed when seeing their colleagues use more computer technology, most of the participants showed their excitement. They replied as follows:

> "In most cases, [When] I see someone else use a computer, many times I am thinking … that might be a better way to do that."
>
> "When I see somebody using technology that I feel can help me, I would be motivated to learn how to use the technology."

> " Yee, good job! I like to learn. [If I] know someone is using something that I have not used before, I will be like, 'Show me how to do that! What are we doing here?'"

Sometimes, they were not just motivated. Some of them would turn to the technology specialist in their departments or the FACT and ask for a workshop training on that particular computer program. As one participant said,

> When I first saw a PowerPoint presentation eight or nine years ago, I went to our computer person here [in our department] and said, 'You know, it [would] be great to have a workshop on how to use PowerPoint.' And we had one. It was well attended.

My interview data showed that many teacher educators communicated to their colleagues and exchanged teaching ideas on how to use new computer technology in their teaching. As one participant said,

> We were talking about the smart board, so we got one. We spend a lot of time talking about the technology. So it is a positive atmosphere. We learn from each other, and we can choose to use it or not. I think it is very open, I think it is very good.

Some of the teacher educators were co-teaching classes. The co-teaching provided a good opportunity for the teacher educators to learn from each other and help each other, especially when the teaching partner had a different computer knowledge background.

It was also easier for the teacher educators who teach the same content area to communicate more on computer technology. As one participant said,

> I [communicate] with the colleagues who do the same thing I do, but not generally with everybody. So, if I learned how to do something on a computer, that is going to help the two or three other of my colleagues to do methods in pedagogy, then we share that. But I don't necessary share that with other colleagues or with other people in the university.

However, in some other departments, the colleagues were not communicating very well about computer technology integration. My interview data showed that two factors prevented the teacher educators from communicating: lack of support from the department and lack of a united spirit among the colleagues.

Lack of support from the department. A few teacher educators involved in my study complained that they had hardly got any support from their departments. Some departments only provided very old computer hardware and software and never updated the equipment. Hiring a computer technology specialist to help the teacher educators solve technical problems seemed to be out of the question. Computer technology integration seemed to be ignored in these departments. One of the teacher educators involved in this study had to struggle almost 20 years on his own to update software as well as hardware in order to use them in his teaching. He had also to struggle on his own to solve technical problems. Usually, when the department was not decisive on supporting its faculty members in using computer technology, many faculty members would choose not to use the technology. Thus, in these cases, it was hard to form an active atmosphere among the colleagues to communicate and share information on computer technology.

Lack of a united spirit among the colleagues. My interview data also showed that sometimes even with the support from the department, the communication atmosphere was still weak among the colleagues. One of my participants was a lecturer who had no Ph.D. degree. She felt discrimination and elitism from her colleagues. “I don’t feel like I have anybody to talk to,” she said. Fortunately, she got help from her family members

and, particularly, from her department head. “My department head is great! Anytime you have issues or questions, you are supported. So I feel good about that,” she said.

Thus, in order to improve the communications among the colleagues, it was important to increase the support from the department and enhance the united spirit among the colleagues. The following measures could be considered to improve the support from the department:

The department head. The department head needs to show concern for the faculty members, spend time talking to them, ask about their needs, and help solve their problems. In addition, as my literature review indicated, department heads need to offer rewards and incentives to faculty members for their use of computer technology.

Getting grants. My interview data showed that getting grants was a feasible way to financially support the teacher educators’ computer technology integration. In many cases, the receiving of grants helped improve the computer technology environment for the teacher educators. For example, one of the participants was involved in Dr. Soulier’s PT3 Grant. It turned out that the grant helped pay for an assistant for his teaching. “And that was helpful,” he said. Another participant in Physical Education mentioned that his department received grants to buy new equipment to input cardiovascular endurance data into computers, which enhanced computer technology integration. Still another participant mentioned that they bought many digital cameras by using a grant. These cameras helped their students work on their video projects. These grants could result from a department head, an associate dean, or the faculty member’s own effort.

Hiring computer technology specialists. My interview data showed that some

departments had hired computer technology specialists to help their faculty members solve computer technology problems. These specialists usually responded immediately to the faculty members' concerns. This assistance seemed to be very helpful. As one participant said,

> I still rely heavily on my tech guy, here in the department. [If] something goes wrong, I really had to call … the tech guy … [to set] up an email account. I don't think I can do that.

Having a technology savvy backup person can make a big difference.

Changing Policies

My interview data suggested that changing some of the policies on the institutional level would be helpful to enhance teacher educators' computer technology integration. The solutions can be as follows:

Commitment statements by faculty. A couple of participants indicated that it would be useful if the teacher educators would vow to learn a new software package every year. In this way, the teacher educators would be self-motivated to keep on exploring computer technology, since my interview data showed that, when the teacher educators were close to retirement, some of them tended to lose their motivation to learn new computer software.

Faculty meeting and professional conferences. The university could provide some faculty meetings on computer technology integration, showing the latest development and applications of computer technology in educational area. The university could also hold professional conferences on computer technology integration, or encourage the teacher educators to attend professional conferences outside of the

university, since many participants mentioned that they learned a lot about technology at professional conferences.

Revising the student course evaluation form according to NETS. My interview data showed that none of the teacher educators involved in my study used the NETS to guide their use of computer technology in teaching. Some of them had never heard about the standard, while others had their own professional standard to follow. It could be useful if the university integrated the NETS into the course evaluation form.

Students' Competency in Using Computer Technology

Students' Competency

When asked about their students' competency in using computer technology, many participants gave positive answers. For example, one participant responded as,

> Yeah! They are about as competent as [I think] they need to be. They know how to do web searches, [how to use] PowerPoint, [and how to use] document cameras. And a lot of them know how to use the internet, too.

However, some participants pointed out that it was important to treat the students case by case. As one participant said,

> We generally analyze them (the students) as a population, that they all have the experiences in technology…[But] I have been surprised that some of the students who don't know how to use certain technology, [such as] when you requests something to be submitted online, [or] … in Word.

As an instructor of the computer literacy class for the Secondary Education Program, I also noticed that there was a big variety in the students' computer technology backgrounds. Some of the students had already known how to use certain computer applications before they took the course, while others had never heard about these

applications. In addition, some students showed great confidence in using computer technology, while others were intimidated.

A couple of participants in my study viewed the issue in a different way. They pointed out that even if a student was competent in using certain computer applications, it did not mean that he/she could use it effectively in his/her teaching. Thus, it was important for the students to develop their computer skills as well as the effectiveness of using these skills in their teaching.

Students' Computer Technology Experience

My interview data showed that the students' formal computer technology experience at USU came from the following three sources:

Preparation for the CIL test. USU requires each student to take the *Computer* and Information Literacy (CIL) test during his/her study at the university. Although there is no specific time limit on taking the test, the students are strongly recommended to pass the test in their first year of school. During my interviews, many teacher educators mentioned that their students had already passed the test. The university website provides online tutorials that contain information about all skills and concepts necessary to pass the CIL. This information includes: information law and ethics, computer systems, document processing, information resources, spreadsheets, and electronic presentations. By studying from these tutorials, the students should know how to use Word, Spreadsheet, PowerPoint, and the internet.

The computer literacy course. The computer literacy course (InsT3500) is a one-credit course entitled Principles and Tools of Technology for Teachers. I am the

instructor of this course. The goal of the course is to introduce some computer applications and computer skills that are useful for teaching. Most of the students in this course were in their senior year of college study. The students could take this course at any time – either before, during, or after they took their methods courses. During my interviews, I asked the participants if it would be helpful for the students to take the course earlier to get more practice in the secondary education program. Many participants agreed that taking the computer literacy course in their senior year did not give the student much time to learn and practice. However, one participant pointed out that it might be a good time to refresh their mind. She said, "Everything changes so rapidly on the computer programs. They got the basic skills but not the new upcoming things. [Thus,] the closer to the student teaching [that they take the course, the more of] an advantage [it is]."

Teacher educators' modeling. The teacher educators involved in my study had two attitudes toward computer technology modeling in their classrooms. On the one hand, some teacher educators regarded that it was necessary for them to show the students how to use computer technology, since the students would learn and use the technology in their own teaching someday. These teacher educators were usually active computer technology users themselves. Also, in some content areas, such as Physical Education and Music, where some special computer applications were used in teaching, it was more likely that the teacher educators would hold this point of view.

On the other hand, some teacher educators thought their demonstrations of using computer technology would not make a big difference for the students, since the students

had had similar demonstrations in other courses already. Although the teacher educators who held this perspective were not active computer technology users, their point of view was supported by my classroom observations. Regardless of the amount of computer technology their teacher used, the student presenters in my classroom observations showed similar computer skills. However, it was worth pointing out that these observations were limited to the content areas where no special computer applications were required.

However, I think it is necessary to use technology in different classes. Since different courses had different goals and different teaching and learning methods, the teacher educators' use of computer technology in different courses would give the students more opportunities to observe how to use computer technology effectively in different teaching and learning environments. When such technology was used, the students did appreciate their teachers' efforts. This appreciation was confirmed in my interview data. One participant mentioned that when he used Adobe Connection to do his test review, he received a very positive feedback from the students. "They really appreciated me taking the time to do that," he said.

Preparing Students

My interview data showed that all the participants agreed on the importance of preparing their students to know how to use computer technology before they started teaching. However, it was hard to set up a standard to decide how much the students need to know. First, computer technology is developing quickly. What the students learned in the classroom could become out of date a few years after leaving the

university. Second, since the university had more advanced computer technology available than that of some school districts, it was possible that the students would not use their computer skills when going to teach in these school districts.

Thus, it seemed to be more important to prepare the students on how to adapt themselves in their new teaching environment in terms of using computer technology, rather than only prepare them with specific computer skills. As one participant point out,

> The idea is for us, as teacher educators, to get our students to use technology and be familiar enough with that technology. They will use it when they get out into the school. But for me, the kind of the driving force behind anything is not to teach students a specific technology. …[T]he technology is going to change. … [T]his is a challenge for me as a teacher educator… to help my students develop the skills to learn the new technology, not be afraid of the new technology, and [where advantages] to adopt the new technology.

However, in order to achieve this goal, the teacher education program needs to expose the students to various updated computer technologies, since using computer technology would definitely help the students build confidence and make it easier for them to adapt to their new environments. It is the teacher educators' responsibility to skillfully design the elements of computer technology into their curricula. Some teacher educators in my interviews mentioned that they encouraged the students to make video products for their assignments, since they found out that the students liked to see themselves in their short video clips. In addition, introducing interesting computer applications such as Photo Booth to the students would be another way to approach the goal. When students explored Photo Booth, they reportedly had fun and showed a great deal of interest in using Mac computers. Moreover, introducing online free teaching programs such as Instructional Architect would also be beneficial.

While preparing the students' confidence on using computer technology, it is also important to teach them to use a variety of instructional tools. As one participant said,

> I try to teach this philosophy to my students: use all your tools in the toolbox, even if it did not include any technology. … [Use] whatever tool available to help the student best master the objective before them, that is what they should use. And that is very difficult for a brand new teacher (preservice teachers) [to use].

Computer technology can provide a powerful teaching tool. However, it is also important to guide the preservice teachers in how not to abuse it. As one teacher educator said,

> It (computer technology) has made teaching better. [B]ut I think in some ways it has also … messed up some of the process, because we are not being effective in using it. We are using it just to use it. And it takes quality time away from our students.

In a word, all the teacher educators intended their students to become good teachers, not just in the sense of using computer technology, but in the sense of being good teachers. As one participant said, "I would rather the students be excellent teachers, [whether] they can use a computer [or not]. … I think we'd better teach them that."

Perspectives for Future Research

The results of this dissertation reflect the features of this current technological age. Most participants in my study started their teaching careers without any computer technology – not even email. Nevertheless, "[Now] you could not live without it (email). It is part of your daily activity – a big part of your day. So, things have just slowly changed. … [C]omputer integration has been part of everything we do," as another participant pointed out. These teacher educators not only witnessed the transformation of

the computer technology in education, but also experienced the excitement and sometimes the disappointments of the change.

With the rapid development of computer technology, the following three aspects of this dissertation will likely change in the future.

The Change of Teacher Educators' Life Experience

In the future, with the retirement of the generation of teacher educators who experienced the transformation, research studies will focus more on the teacher educators who grew up with computer technology. The change of the participants' life experience will eliminate some of the issues discussed in this dissertation.

For example, in this study, many participants used overhead transparency as a major presentation tool before the computer presentation tool was available. For some of these participants, they switched successfully to the computer tool, while others still kept the old habit for various reasons. Obviously, in the future it is not necessary to discuss issues of using overhead transparency versus computer technology, since teacher educators at USU probably have used computer presentation tools throughout their careers. As one participant in my study pointed out when he was talking about the young faculty members, "I don't know if they … even know how to use transparency. They [probably] don't need it." My classroom observations also showed that the student presenters only used overhead transparency when a school district had no computer available.

This change of teacher educators' life experience will probably change the proportion of computer technology in their curriculums and affect their design of

computer-based courses. As a young participant said,

> I have taken online courses. So [when] I teach online courses, I would take my experiences from being a student in those classes to how I am going to organize it, because I know what is effective and what is not.

Thus, with the change of the teacher educators' life experience, future research studies would focus more on their computer-based instructional experiences, rather than their transmissions from the non-computer age to a computer age.

More Reliable Computer Technology

Many teacher educators involved in my study had to use a back-up plan when they used computer technology due to its unreliability. Although this unreliability was a major factor that prevented some participants from using the technology, my interview data also revealed that computer technology has become more and more reliable in recent years. As a teacher educator said, "Computer technology can get in your way, sure. But for the most part, it becomes fairly reliable."

I believe that in the future, the reliability of computer technology will not be a major hindrance to the teacher educators' computer technology integration. This change will likely affect some teacher educators' attitude toward using computer technology and even their teaching styles.

More Advanced Computer Technology Available

My interview data showed that in some situations, the computer technology was not advanced enough to allow the teacher educators to use it. For example, it was very hard to use computer technology in the Physical Education major to improve the

students' motor skills. However, the situation has been changing and one participant said,

> Now, [with] the new technology associated with the Wii, people can actually practice on a computer-enhanced screen. For example, they can do the actions of bowling, by holding that device in their hands and making motions. That practice actually works on your cardiovascular endurance.

Right now, USU does not have these programs. But the hope of having the programs in the future is promising. The participant continued,

> We don't have that program yet. But I know within the valley, we have a couple of our senior centers that have this technology [as well as some] individuals [who own it privately]. But we have not integrated that yet into our educational program, here or in the schools. But it has been talked about … there have been articles written on the advantages of that technology.

In fact, the idea of using the advanced technology had already permeated into classrooms. The participant specifically mentioned that in his methods class, the Wii computer technology can be integrated into their dance programs. "So the students can watch a screen and… dance. It would be an alternative way of just going out running around a track," he said.

During my interviews, a couple of teacher educators mentioned Smart Boards. The use of the smart boards was not discussed in this dissertation, since only a few classrooms had this new technology available, and most participants had never used it (see Appendix E for a description of its use). However, some teacher educators showed their interests of integrating the technology into their teaching. As one participant said,

> With the smart board we can [have] the overhead projector on, be able to … write on the smart board – and we've got some (smart boards) here. I have not used it, but I can see the smart board can solve [many] problems.

Thus, future research will probably focus more on how to use advanced computer

technology, such as Wii products and Smart Boards, in educational settings. There could be more innovations in sight. A teacher educator looked forward to future classrooms by saying

> But five years from now, it will be different. Five years from now, who knows what the students' desks will look like. Everything we write on the board will show up on the desk, and the students [will be able to] edit (and) print right from their desk.

With the rapid development of computer technology, such a vision is not ridiculous. We have reasons to believe that the computer technology will change dramatically in the future and will permeate deeper into classrooms. Although a teacher educator in my study mentioned that a lot of faculty members did not use computer technology in their teaching, this issue will become less prominent in future studies.

However, some of the issues discussed in this dissertation are still worth exploring in the future.

Computer Skill Training

The participants involved in future studies will probably have a more similar background in using computer technology than the participants involved in this study. With the change of the audience, computer skill training methods will also need to be changed. Can we have more intensive workshops, since the teacher educators will probably be able to follow the instructors more easily? Can we have higher requirements, such as having tests for the teacher educators who participate the workshops, since the average computer skill level of the teacher educators will probably be high enough to take and complete such tasks? Can we spend more time discussing

different ways of using specific computer applications in different content areas and classroom settings? Future research studies will likely provide the answers to these questions.

Design New Evaluation Forms According to NETS

My interview data showed that it was primarily the teacher educators' personal decisions on what kind of computer technology and how much computer technology they wanted to integrate into their teaching. So far, there has been no evaluation based on NETS, and most of the teacher educators were not even aware of the existence of such a standard. In June 2008, ISTE released the next generation of NETS for teachers. Since Utah has adopted the ISTE standards for public school teachers, it is important to incorporate NETS into the teacher education program. A standards-based course evaluation form would be helpful in providing a guideline for the teacher educators during their computer technology integration. Whether this form is adopted for all classes by the university or not, this kind of form should be standard practice for all teacher educators.

Summary

In the beginning of this chapter, I analyzed findings results from the last chapter. The discussions in this section helped draw the following conclusions:

1. Realizing the advantages of using computer technology in classrooms was a strong factor motivated the teacher educators to use computer technology in their teaching.

2. Helping to set up online course systems, which was a one-on-one training process, was the highest-rated services at the FACT.

3. There seemed to be no reason for the teacher educators to avoid the use of computer technology in their teaching, unless a more effective instructional tool can be used.

In the second section, I discussed teacher educators' modeling on using computer technology. Although all the participants perceived computer technology as an important and indispensible instructional tool, not all of them were actively involved in modeling the use of computer technology in their teaching. My discussions suggested that computer technology was not advanced enough to replace other instructional tools, since many content areas needed to use hands-on exercises to enhance teaching. In addition, since the participants were all methods course instructors, the nature of methods courses required the teacher educators to demonstrate the use of different instructional tools. Thus, the modeling of computer technology was not shown on every aspect of the participants' teaching.

In the third section, I suggested the computer technology training in FACT switch from emphasizing computer skills training to extensive introductions into the educational applications of computer technology.

In the fourth section of this chapter, I suggested several ways to build a supportive environment for computer technology integration. These aspects included improving workshops outside of the FACT services, learning from the students, colleagues' exchanging teaching ideas, and changing policies.

Next, I discussed the preservice teachers' competency in using computer technology. My discussions suggested that it seemed to be more important to prepare the preservice teachers on how to adapt themselves in their new teaching environment in terms of using computer technology, rather than only prepare them with specific computer skills.

In the last section of this chapter, I proposed two research topics for future studies: computer skill training and designing new evaluation forms according to NETS.

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APPENDICES

Appendix A

IRB Forms

Utah State University
Department of Instructional Technology
2830 Old Main Hill
Logan UT 84322-2830
Telephone: (435) 797-2642

Date Created: 5/8/2008
USU IRB Approved: 5/8/2008
Approval terminates: 5/7/2009
Protocol Number: 2083
IRB Password Protected per IRB Administrator

INFORMED CONSENT
Teacher Educators' computer Technology Integration at Utah State University

Introduction/Purpose: Professor Nick Eastmond and graduate student Jiayi Wan in the Department of Instructional Technology at Utah State University are conducting a research study to find out more about teacher educators' perceptions and practices of computer technology integration. You have been asked to take part in this study because you are currently a teacher educator. There will be approximately 10 total participants in this research.

Procedures: If you agree to be in this research study, the following will happen to you.
1. You will be asked to fill out a short questionnaire.
2. You will be involved in an interview. The interview may last an hour. It is about your perceptions on computer technology integration. The interview will be audiotaped.
3. At a later time we may ask for your permission to observe your classroom.

Risks: There is minimal risk in participating in this study.

Benefits: Although this study will provide no direct benefit to you, the results of this study may help build a better understanding of university teacher educators' perceptions and current practices of computer technology integration. The results of the study may be helpful in improving Utah State University's current teacher training programs.

Explanation & offer to answer questions: If you have any questions about this study you may contact Jiayi Wan, by email at jiayi.wan@aggiemail.usu.edu or phone (797-2694). You may also contact Dr. Eastmond by email at neast@cc.usu.edu or phone (797-2642).

Voluntary nature of participation and right to withdraw without consequence: Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without consequence.

Confidentiality: All information collected will be kept confidential consistent with state and federal laws. Your name will not be shared with anyone and responses will not be linked to names in any reports of this research. The records will be stored at USU in a locked cabinet in a locked room (Room 213). Only the researchers will have the access to the stored data and no one else will have access to this information. The audio tapes and all other identifying information will be destroyed one year after the dissertation defense.

IRB Approval Statement: The Institutional Review Board for the protection of human participants at USU has approved this research study. If you have any questions or concerns about your rights, you may contact the IRB at (435) 797-1821

Utah State
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Protocol Number: 2083
IRB Password Protected per IRB Administrator

INFORMED CONSENT
Teacher Educators' computer Technology Integration at Utah State University

Copy of consent: You have been given two copies of this Informed Consent. Please sign both copies and retain one copy for your files.

Investigator Statement: "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature and purpose, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

Signature of PI & student researcher

Nick Eastmond, Ph.D. Principal Investigator *(435-797-2642)*	Jiayi Wan Student Researcher *(435-797-2694)*

Signature of Participant: By signing below, I agree to participate

Participant`s signature	Date

Appendix B

Classroom Observations

From October 13 to December 5, 2008, I observed four participants' classrooms. For each participant, I observed one of his/her teaching sessions as well as one of his/her student presentation sessions.

Observing Instructor A's Classroom

I observed Instructor A's classroom on October 13, 2008. The class was an afternoon session of ASTE 4150 (Methods of Teaching Agriculture). The course was held on Mondays and Wednesdays from 3:00 to 4:15pm. I was about three minutes late for the class. As soon as I entered the classroom, the instructor gave me a warm welcome and introduced me to his students, telling them that I was observing the instructor's use of computer technology for my dissertation study.

There were three students in the classroom. The fourth student showed up during the middle of the class session. (Later, I learned that there was another student who missed the class on that day.) It was a small classroom, with a long white board and a projection screen in the front. The classroom was also equipped with two overhead projectors, a computer, and a computer projector. There were a lot of ceiling lights. I noticed that the instructor was using an overhead projector and had only half of the ceiling lights on. The light in the classroom was not dim. Rather, it was soft and made me feel very comfortable. I could clearly see the projected text on the screen. The seating for the students was arranged in a U-shape, with 14 chairs available. Each student was able to use enough table space for his/her handouts and notebooks.

The topic of that unit was *The Approved Agricultural Education Program*. The instructor gave each student a handout with all the objectives listed for this specific

session. For each objective, the professor printed the learning content on a transparency. He used the overhead projector in a progressive disclosure way: gradually revealing the learning materials on the transparency, while leaving the rest of the learning content hidden under a piece of paper. The instructor used four transparencies during this session. Each of these transparencies stayed on the overhead projector for 20-, 5-, 25-, and 10-minutes respectively, providing the students with enough time to take notes.

It was not long before I noticed the active and friendly learning atmosphere in the classroom. The instructor showed his tremendous enthusiasm for teaching with his rich facial expressions and gestures. He did not stay in the front of the classroom all the time. Rather, he changed his standing spots and, for many times, even bounced into the deep U-shaped seating area. With his eye contact, close physical distance with the audience, and, occasionally, friendly teasing of a specific student, I felt that he was taking care of each student. In addition, the instructor's profound knowledge on the topic largely helped him handle his teaching with ease. Every time before he disclosed new learning materials on the transparency, he would ask questions to either arouse the students' previously learned knowledge or to stimulate their critical thinking. I noticed that all the students were deeply involved in the learning process. They responded to their teacher's questions, took notes, and asked questions all the time. Moreover, the teacher and the students' sense of humor added "spice" to the learning environment. From time to time, they would make jokes related to the content topic. The classroom was filled with laughter and joy.

I observed instructor A's student presentations on October 15, 2008 from 3:00 to 4:30pm. I arrived ten minutes before the beginning of the class. One student was setting up her PowerPoint slides on the computer. Another student was standing next to her and talking with her. It seemed that he was giving her some advice. A few minutes later, I got the presentation evaluation criteria from the instructor. According to these evaluation criteria, each student was required to present a 15-minute long unit of teaching. The presentations were scored based on the following items:

Appropriate dress

Objectives used and followed

Presentation (voice, innovative, presentation technique)

Effect (Were the objectives completed?)

Audiovisual item(s) used

It seemed to me that the instructor did not list the use of computer technology in the criteria. I started a brief conversation with one of the students, asking her why she chose to use PowerPoint to present even if it was not required. The student told me that since she had got used to PowerPoint presentations and used PowerPoint all the time, it was easy for her to create a PowerPoint document. "Also, " she continued, pointing to the "presentation technique" listed in the criteria, "it [her use of PowerPoint] fits this [presentation technique]." It seemed that the student considered the use of the computer technology as a major technique in her presentation. As it turned out, four students used PowerPoint to present. Another student used overhead transparencies, since her school did not have computer projectors.

During the presentations, I noticed that the students were skillful in using PowerPoint features in their teaching. Their use of PowerPoint functions were listed in Table 4.

Table 4

Students' Use of PowerPoint Features

Students	Student #1	Student #2	Student #3	Student #4
Topics	Writing check	Digestive systems	Welding safety and first aid	Beef breeds
Animations	√	√	√	√
Audio	√			
Bullets	√	√	√	√
Graphics	√	√	√	√
Video Clips	√		√	
URL Links			√	
Templates	√	√	√	

Table 2 revealed that the students all employed the basic functions of PowerPoint in their teaching. The students' presentations also showed some other aspects related to the computer technology integration issue:

1. The students' presentations showed that they were not only skillful in using a variety of features of PowerPoint, but also were able to use these features properly in their teaching. For example, when teaching how to write a check, a student used "$" sign and "¢" sign as the title and subtitle bullets, respectively. In another case, a student used a *text zooming* animation to emphasize the important concepts in her teaching. In yet another case, a student used *text flying* animation to label the different parts of a cattle graphic.

2. The use of the computer technology in these presentations had largely helped draw the audiences' attention. For example, when dealing with the topic of vomiting, a student used a series of graphics, such as a man vomiting a lot of food, a dog vomiting in a toilet, and a Halloween pumpkin "vomiting" a bunch of seeds, and so forth. These graphics had largely increased the learners' interests on the subject. In another case, a student used a video to show an intensive explosion that happened in Texas. This impressive supplemental learning material helped the audience understand more about the topic, which was the issue of safety.

3. Compared to the use of the overhead projector as a presentation tool, the use of PowerPoint had better presentation effects, especially when presenting learning materials (see Table 5).

Table 5

The Comparison Between Overhead Transparency and PowerPoint

Presenting Materials	Overhead Transparency	PowerPoint
Text	Black text, white background	A variety of choices of color, font, size, and so forth.
Graphics	Could use graphics, but not easy to change	Could insert different graphics and easy to change
Video clips	N/A	Could insert different video clips and easy to change
Audio clips	N/A	Could insert different audio clips and easy to change
Presenting methods	Progressive disclosure	Animation (to progressively disclose the content)

Although computer technology had brought in advantages on presenting learning materials, it seemed to me that the instructor's definition of presentation technique was far beyond the use of computer technology. According to my observations, the use of the computer technology in the students' presentations only counted for a small portion of the presentation techniques.

In addition to the use of computer technology, the instructor also pointed out other useful presentation techniques during the students' presentations. Some of these techniques were:

a. Not going too fast in presenting learning materials, leaving the students enough time to take notes.

b. Using proper terms related to the subject, such as using "cattle" instead of using "cows".

c. Facing the students while talking and not talking to the whiteboard and/or the PowerPoint slideshows on the screen.

d. Always following the teaching objectives.

Thus, although computer technology was helpful in presenting learning materials, these advantages must be combined with other teaching techniques in order to achieve the goal of successful teaching.

4. The instructor's teaching had influences on the students' teaching styles, especially when the instructor gave specific requirements for the students' presentations. For example, instructor A emphasized the students' employing animation features if they used PowerPoint in their teaching. This use of the animation features was actually aligned with the instructor's use of the progressive disclosure technique when he presented the learning materials on the overhead transparencies. In another example, when he was teaching, the instructor gave the students handouts listing all the objectives for a specific class session. For the students' presentations, the instructor also required the students to make handouts listing all the objectives in their teaching. Moreover, I

noticed that all the students liked asking the audience questions during their presentations to either arouse the learners' former knowledge or stimulate the learners' critical thinking. This teaching strategy was exactly the one that was strongly implemented in the instructor's teaching methods.

5. During their presentations, the students encountered some technical problems. One problem was that the remote controller that the students used to switch the PowerPoint slides did not work very well. It was probably because of a low battery, which largely limited the presenters' standing position. Although the instructor asked the students not to stand on the same teaching spot, the students could not stand too far away from the computer; otherwise the remote controller did not work. Although the students could change the slides by pressing buttons on the keyboard, this could be inconvenient for the students, since they had to walk to the computer keyboard each time when they needed to change the slides. Another issue was also related to the computer technology. One student mentioned that her video clip worked well when she was preparing the PowerPoint slideshows at home. However, as she transferred her PowerPoint document to the computer in the classroom, she could not play the video clip any more, probably due to a missing plugin on the classroom computer.

In short, it seemed that although the instructor did not use computer technology in his teaching on the day I observed, the modeling of overhead transparency use did not bring negative influences on the students' use of computer technology in their teaching. In fact, the instructor gave the students very good advice on how to use computer technology in their teaching. One example was that the instructor asked the students to

turn the computer screen toward the projection screen. In this way, the instructor explained, the students could always face their audience by looking at the computer screen, instead of looking back at the projection screen, something he modeled with his use of the overhead projector.

During these two classroom observations, I noticed a balanced modeling of a variety of teaching methods from the instructor as well as the skillful use of computer technology in the student presentations. Also, it did not seem to be necessary for the instructor to show the students specific computer technology skills, such as how to use a bullet and how to insert video and audio clips. In fact, the instructor's advice on the specific details of how to use computer technology in teaching was very helpful for the students to improve their computer skills in teaching.

In conclusion, instructor A seemed not to be an active computer user in his own teaching. However, his enthusiasm of teaching and his good advices on using different features of PowerPoint provided a useful guideline for his students' teaching activities. In fact, the students were skillful in using a variety of features of PowerPoint in their presentations. It was not clear how the students learned all these computer skills. They might have learned on their own, or they might have learned from their classmates or friends, or they might have learned from other instructors. However, since PowerPoint was such a commonly used computer application, it was not surprised for me that the students were so skillful in using it. It seemed to suggest that it was not indispensible for teacher educators to demonstrate the use of the commonly used computer applications in classrooms. It also seemed that even if an instructor's demonstrations of using computer

technology was insufficient, his/her good advices on how to use computer technology could still be considered as good modeling examples. However, I think it is still necessary for the teacher educators to demonstrate the use of the latest computer technology, since the preservice teachers need to update their knowledge of computer technology in the teacher education programs.

Observing Instructor B's Classroom

I observed instructor B's classroom on October 20, 2008. Instructor B was teaching ASTE 2710 (Orientation to Agricultural Education). This was not a methods course. It was just a class taught by a methods course instructor. His classes were on Mondays and Wednesdays from 1:30 to 2:20pm.

There were 22 students in this class. The classroom was medium sized. There was a big projection screen in the front of the class and two whiteboards on one side of the classroom. The classroom was equipped with two overhead projectors, a computer, and a computer projector. Forty-one seats were arranged in a U-shaped in the classroom.

I arrived at the classroom ten minutes before the beginning of the class. I sat in a back corner. The students arrived one after another, filling the back of the room first before the class started. Soon after the instructor entered the classroom, he asked all the students to sit in the front area, leaving me the only person who sat in the back area. Then, the instructor introduced me to the class. A couple of the students looked back and smiled at me.

Before starting his teaching on the subject, the instructor spent a few minutes talking about the students' grades from their previous exams and assignments. The

instructor kept all the students' grades in Blackboard, a Web-based course management system for online course delivery. He used the computer and the computer projector in the classroom, showing the whole class his grading system. The instructor turned off the ceiling lights in the front half of the classroom, while leaving the ceiling lights in the back on. The light of the classroom was appropriate: it was bright enough for the students to take notes but not too bright to affect the projection screen.

After talking about the grades, the instructor gave each student a handout, listing all the learning objectives for this specific unit. When he went through these objectives with the students, he showed the electronic version of the handout on the projection screen. The topic of this unit was *Agricultural Education Organizations*. The instructor used seven PowerPoint slides. The duration of these slides on the screen varied from three to 10 minutes, which gave the students enough time to take notes, since each slide contained a small amount of text. For most of his PowerPoint slides, the instructor used neither templates nor animations. The slides were usually in a plain style, with white background, black text, and a colorful organization logo, which was a graphic inserted into the slides. I assumed that the instructor did not use PowerPoint templates since the colorful templates could be a distraction for the students to remember the organization logos. Also, since there was not too much text on each slide, it was reasonable for the instructor not to use the PowerPoint animation feature for some of his slides.

When introducing each agricultural education organization, two students gave a two- to three-minute long presentation about its basic background. This was probably one of the strategies that the instructor used to get the students involved in the learning

process, since for a class of more than 20 students, it was not easy for the instructor to pay enough attention to each student. However, the instructor knew all his students' names since he could call them by name with no difficulty.

Instructor B spoke clearly in his teaching with an appropriate speed. He once made a face when waiting for his students' responses to his question, making all the students laugh. For most of the time, he stayed in the front of the classroom. Occasionally, he would step to the back of the room. On the students' side, I noticed that all the students were involved in the class activities. They spoke out their thoughts and answered questions freely. Several times, they cheered up for some exciting discussions. There was especially one student who liked to answer most of the teacher's questions and also asked a lot of questions.

On December 1, 2008, I observed instructor B's student presentation class. I arrived a few minutes earlier and saw that some students were setting up their PowerPoint presentation document on the classroom computer. According to the instructor's guidelines to the presentation, the students were required to present a 10-minute-long Life Knowledge Lesson in groups of four. The scoring system of the presentation did not include computer technology, although the use of audiovisual was encouraged. Four student groups presented. Three groups used the computer to show the class either film clips or PowerPoint presentations. One group of students did not use computer technology. Instead, they used a presentation pad to display the information and write down the audients' responses. Compared to instructor A's class, instructor B did not make comments on the students' presentation skills, since this was not a teaching method

class. However, the instructor helped the students adjust the computer volume and the lights of the classroom to ensure a better presentation result.

The student presentations revealed two effects of using computer technology in a classroom. On the one hand, I noticed that when a group showed a film clip, the whole class was focused and involved in the learning process. This example probably demonstrated the power of using computer technology to draw the students' attention and motivate their learning. Let alone the fact that it was very easy to get audiovisual products online. On the other hand, I also noticed that a group simply read out the teaching information on PowerPoint slides and displayed the slides one after another. I found it was boring to listen to the presenter and see the same words on the projection screen. This example probably warned us that the use of computer technology could bring negative as well as positive effects in teaching.

In addition, I noticed that computer technology did not take a big proportion in all the presentations. The students used computer technology in the following situations: starting/concluding presentations, showing objectives, and reviewing questions/answers. Besides of using computer technology, the students employed other teaching tools in their presentations. For example, each group designed a class activity that obviously helped arouse the audiences' learning interests. These activities included asking/answering questions, drawing pictures, and discussing issues in groups. Moreover, the students used the whiteboard, the presentation pad, and even dice in their activities. As a classroom observer, I enjoyed these activities and even involuntarily followed their processes. I was especially impressed by one student presenter who

seemed to have a talent of drawing. She was in the group that used presentation pads. When she needed to write down the audiences' responses, instead of writing down the text, she quickly sketch the contours that represented the concepts, such as people, a tractor, and even a map of the United States. I was wondering if it was her drawing talent that caused her group to choose presentation pads for the presentation.

Although instructor B loved computer technology, he did not set a high standard for his student to use computer technology in their presentation. This was consistent with the pedagogical beliefs he talked about during the interview: The computer was only a tool in a teacher's toolbox. His presentation guidelines showed that he encouraged the students to employ a variety of presentation tools. And this point of view was fulfilled in his students' presentations.

The observation of instructor B's classroom seemed to further confirm me that it was not indispensible for teacher educators to demonstrate the use of the commonly used computer applications, such as PowerPoint, in classrooms. Even in the computer literacy class (InsT 3500) that I am teaching, PowerPoint was not a major computer application covered in my teaching content, since most of my students have already been familiar with the application before they take my class.

In addition, I have noticed that the preservice teachers' use of computer technology seemed to be related to their instructors' requirements. For example, although both instructor A and B did not required their students to use computer technology in their presentations, instructor A emphasized a little bit more on how to use certain PowerPoint features when he explained the presentation requirements to his

students. The result showed that the students in instructor A's class used more computer technology than the students in instructor B's class. Also, in instructor A's student presentations, some students used very funny graphics and very impressive video clips in their PowerPoint slides, while the students in instructor B's class used mostly text in their slides. From my teaching experience, I have also noticed that when I asked the students to be creative in using Photoshop tools, their assignments turned out to be very creative graphic designs. Otherwise, their design lacked inspiration. Thus, teacher educators' modeling of using computer technology also exists in their assignment requirements, which could provide a useful guideline for the preservice teachers to be involved in computer technology integration in an active and appropriate way.

Observing Instructor C's Classroom

I observed instructor C's classroom on Oct. 27, 2008. The instructor was teaching SCED 3600 (Teaching English), a methods course for the secondary preservice teachers in English major. Her classes were on Mondays, Wednesdays, and Fridays from 1:30 to 2:20pm.

I arrived at instructor C's classroom at 1:25pm. The instructor from the previous class session was talking to a student there. None of the students from instructor C's class was in the room. The classroom was equipped with a computer, a computer projector, and an overhead projector. There was a whiteboard in the front of the classroom and a blackboard on one side of the classroom. Thirty-three chairs with built-in tables were available, arranging into two concentric circles. I found a chair in one corner of the classroom and sat down.

At 1:30pm, the first student showed up. In a couple of minutes, other students as well as the instructor came into the classroom one after another. The class started at 1:33pm. There were 11 students. I knew most of them, since they had taken or were taking the computer technology class that I was teaching. I think most of them were either in Junior or Senior year of their college. When they went into the classroom, they saw me and we greeted each other. Some of them asked me if I was there to observe their classroom, I gave a positive answer. The students sat in the inner circle, a few steps away from my seat. The instructor did not introduce me to the class. I noticed that my presence was not uncomfortable for the students. Also, it was obvious that I was not going to be involved in their classroom activities.

The objective of that class session was to practice using *backward design* technique to design a teaching unit. The instructor asked the students to begin with the assessment of the unit and brainstorm their ideas on designing the assignments. Instructor C put a presentation pad on the floor in the middle of the circle. One student was in charge of writing down the brainstorm ideas on the paper.

During the whole class session, the instructor used none of the other teaching equipment in the classroom, except for writing one word on the whiteboard. For most of the time, she stayed in the student circle. The instructor showed her great enthusiasm on her teaching. She wore a green sweater and a similar color pants, with a wide green and white silk band around her waist. She looked neat, energetic, and in high spirits. Her facial expressions and body language were rich. Besides of her frequent nodding head and laughter, she liked to open her eyes widely when she was listening to her students'

opinions. She made big gestures when she expressed her own ideas. Sometimes, she put her finger-tips a little bit into her mouth to show her students that she was thinking.

For the first half of the class, the instructor stood talking to her students, with her legs crossed sometimes. Later, she knelt and then sat on the floor. Her casual poses could have had some influence on the students. The student lay on her stomach to write on the presentation pad, while another student was finishing the lunch in the classroom. Also, the students liked to ask questions, speak out their thoughts, and sometimes, even develop a 10 second-long conversation on the topic among themselves. The classroom never lacked of conversations and discussions. Although sometimes the instructor would speak for a few minutes, the students would soon get their turns to talk. The classroom atmosphere was warm. Every student was well involved in the learning process.

In addition, instructor C was very skillful in leading the students' discussions. Some of her guiding questions were as follows:

Anything else we have for doing so and so?

After reading, what's on your mind?

So, how do we want to do this?

How would you like to do it?

Moreover, I thought it was a good idea of having a student writing down the discussion thoughts in the middle of the circle. Sometimes, when the student was writing, the instructor was watching, speaking out her words slowly, and correcting the student's spelling. This classroom activity helped develop a close relationship between the instructor and the students. Also, this slow process gave other students enough time

to take their notes. When they fell a little bit behind, it was easy for them to look at the presentation pad in the middle of the circle and copy down the words they needed. It seemed that the students enjoyed the class and got a lot of ideas from the brainstorm activities.

On November 19, 2008, I observed instructor C's student presentation class. Two students worked as a group to give a presentation. The presentation and the peer critique took a whole class period. Seven students attended the presentation. Again, I sat in a corner of the classroom. The presentation was part of a series of assignments that run through all the semester. The first assignment was about reading the textbook on how to teach English and write reflective papers on becoming professional educators. The second assignment required the students to create lesson plans for a two-week unit based on the effective instructional strategies suggested in the textbook. The presentation was the third assignment, which included presentation and peer critiques of each other's units.

This presentation did not include the use of computer technology. The topic of this presentation was *The Crucible Opinionaire*. The student presenters designed a classroom activity, a mock trial, which involved the audience to give opinions on 10 statements and also defend their opinions. The statements were arguable sentences such as "If someone does something wrong to you, it is right to do something bad to him or her in return." and "Good should be rewarded."

The student presenters asked the audience to, according to their opinionaire answers, go stand by the signs of SD (strongly disagree), SA(strongly agree), DS (disagree somewhat), and AS (agree somewhat) they put up on the wall prior to the

presentation. I noticed that the audience was very well involved in this activity. They were busy making decisions, moving around to different signs, and talking about their opinions to each statement. During the peer critique, the students gave their comments on the design of the unit. The instructor also added her comments, such as "I think it would be fun." and "[You would] need to assign points to the rubric."

After the class, I learned from the students that computer technology was not required in the presentations. Since most of the students were in my computer literacy class, I knew they were capable of using computer technology in their teaching, but had simply chosen not to do it.

In instructor C's classroom observation, I did not see any use of computer technology. It was an English class, where the central focus was on the communication between the instructor and the students. Although the instructor could use the computer to record the students' discussions and thoughts, she used a presentation pad instead. In this case, the use of the pad did not undermine her teaching. Rather, it had somehow enhanced her teaching, since it was easier for the students to sit in a circle to talk and to look at the pad. This, it was not necessary to use computer technology just for the sake of using it.

Observing Instructor D's Classroom

I observed instructor D's classroom on November 11, 2008. Instructor D did not teach the methods course during the Fall 2008 semester. Thus, I observed his ENGR 1000: Introduction to Engineering Design class. Thus, this was just a class taught by the

methods course instructor. Instructor D's classes were on Tuesdays and Thursdays from 10:30 to 11:20 am.

I arrived at the classroom a few minutes early. The classroom was located in the newly built engineering building. It was a big classroom with about 200 seats. The classroom had one computer for the instructor, one overhead projector, two computer projectors, two projection screens, a long white board in the front of the classroom, and a loudspeaker on each side of the classroom. It was the best equipped classroom among all the classrooms I had observed. There were about 43 students in the classroom. I sat on the very back row, in a unnoticeable seat. The instructor did not introduce me to the class.

When the instructor entered the classroom, he brought with him a variety of equipment, including a balance, tubes, funnels, beakers, a separating funnel, cooking oil, measuring glasses, hot plate, cooking pan, thermometer, and gloves. This turned out to be a demonstration class. The instructor demonstrated the process of producing biodiesel oil from cooking oil. During the demonstration, the instructor used the overhead projector to show, on projection screens, the text and colorful illustrations of the experimental steps. When he used the projection screens, he turned off the lights in the front half of the classroom. The classroom became dim. However, it was still bright enough for the students to see the demonstration. The instructor asked the students not to take notes, since he would have the text pages for them. I read through the text on the projection screen and found the instructions were clear and easy to follow. The instructor turned the lights back on when he wanted the students to focus on his teaching,

rather than reading through the text on the projection screens. As long as the lights were on, it was hard for me to see the text on the projection screens, and probably difficult for the students as well.

Sometimes, the instructor asked questions, such as “Why use biodiesel oil?”, to guide the students into discussions. Occasionally, he used a green marker to draw a chart on the whiteboard. However, since the marker was almost dry, it was very hard for me to recognize the writings on the whiteboard. The instructor did not use computer technology the whole class session. He demonstrated, explained, and discussed. The students watched the demonstration and raised their hands for permission before answering the instructor’s questions. Sometimes, the instructor would chat to the students while shaking a bottle. They even laughed on some content related jokes. The learning atmosphere was relaxed.

I noticed that when the demonstration got into slow places, such as waiting for the oil to cool down, some students developed small conversations with the peers sitting next to them. However, as long as the instructor explained the process for the whole class, the students stopped talking. I once overheard two students sitting close to me talking about Logan Canyon. One of them had earphones on all the time. I could not hear their detailed conversation. It seemed to me that the students sitting in the back were not as concentrated as the students sitting in the front. This was partly because first, the classroom was much bigger than was needed for the student group; second, the demonstration process was slow and not very complicated. During next class session, the students needed to step into a lab and repeat the process on their own.

On November 18, 2008, I observed instructor D's lab presentation. This was a lab for engineering students. There were 12 stations in the lab. Each station had a computer. Three students were preparing to present a design project. According to the requirement, the project was to "design, construct, and program a solution, utilizing the NI USB-6800 device, to maintain a desired level of water in a container with a variable leak." The students needed to use LabVIEW to work on this project. (LabVIEW is a powerful graphic programming language developed by National Instruments for data acquisition, signal analysis, and instrument control applications.) This meant that the students needed to use a computer to control the water level in the water tower. I saw the three students skillfully operating the devices. They set up the apparatus easily and quickly in less than two minutes, faster than their strictest requirement (3 minutes). They seemed to know what they were doing. The project was done successfully, since the students controlled the water levels, meeting exactly the instructor's requirement. One of the rubrics for this design project was to use Excel to draw a Gantt chart, that the students also turned in.

This presentation gave me the impression that the students in the engineering content area used more computer technology than students in other majors that I had observed. They needed to be more involved in computer programming and were very skillful in using computer programs and applications. It seemed to me that it was easy for these students to accept and get familiar with new computer technology, since following the trends of the development of computer technology was part of their content area requirement. However, since this presentation was about demonstrating a design

project, rather than presenting content materials, I did not observe the students using computer technology in their teaching, which was understandable, since this was a content class, rather than a methods class.

Instructor D did not use computer technology to teach that particular class, since it was a demonstration class. Although the instructor could have used PowerPoint to show the text and colorful illustrations of those experimental steps, the instructional result would probably be the same. Thus, it seemed to be unnecessary for the instructor to transfer all his presentation materials from transparencies and hardcopies to PowerPoint slides. Moreover, this observation made me realize more that computer technology is not isolated to other instructional tools and the instructional environment. Even if the instructor used PowerPoint to present his teaching materials, the dry marker and the unreasonable classroom size would reduce the instructional effectiveness.

Appendix C

Bracketing Interview

Gulfidan Can and I conducted this bracketing interview on May 14, 2008. Gulfidan Can was a doctoral student of Instructional Technology (InsT) Department at Utah State University (USU). We conducted the interview in room 217, a quiet office of the InsT department at the education building on USU campus.

(I showed the results of my interview with Gulfidan to Dr. Eastmond, my major professor. Dr. Eastmond reviewed it and asked one more question. He also suggested that I use his question to start the bracketing interview.)

Dr. Eastmond: Can you tell me a bit about yourself and your background?

JIAYI: I was born in Shanghai, China. There are four people in my family: my parents, my younger brother, and I. My parents, before they were retired, taught in universities. I came to the USA in 2000, a couple of years after I got my first Master's degree in China. Before I came to the USA, my family did not have a computer. My brother bought one in 2002. I have never owned a computer in my life so far. I have always used computer labs.

GULFIDAN: Can you tell me a little bit about your computer background?

JIAYI: When I was in China, I once majored in Electrical Engineering. I learned some computer programming languages, such as BASIC and FORTRAN. Also, I learned to design a Z80 single chip computer system to control the thickness of the steel sheets for some industrial factories. During my study at the Landscape Architecture Department at USU, I worked as a teaching assistant (TA) for an online course (LAEP1030: Introduction to Landscape Architecture) for two years. The instructor of this course was Professor John Ellsworth. So, I worked for him. This TA job offered me a great

opportunity to get familiar with the WebCT system and initiated my way to the InsT department at USU. Since I came to the InsT department in 2004, I have been working as a TA to teach a Macintosh computer literacy course, which is oriented to the secondary preservice teachers at USU. I teach general computer knowledge as well as some computer programs, such as Photoshop, iMovie, Instructional Architect, and so forth. When I started to teach, I did not know much about these programs. I have actually learned a lot during my teaching. And now I can say that I am familiar with these programs.

GULFIDAN: How about your teaching background?

JIAYI: Teaching the computer literacy course is mostly my teaching background. I have been teaching for eight semesters. In fact, my dissertation research topic is kind of derived from my teaching experience, because when I taught, I noticed that the preservice teachers had quite different computer skill levels. As the instructor, I wanted to improve my teaching, making sure that all my students learned in my class.

GULFIDAN: What is your attitude toward computer technology integration?

JIAYI: Computer technology can be a good tool in teaching and learning. It can be useful. It depends on how you use it and in what kind of situations you use it. I don't agree that as long as you use computer technology, you are a good teacher. If you use computer technology to improve your teaching, that is good. But it is not something that you use to show off.

GULFIDAN: Tell me a little bit about your research study.

JIAYI: My study is about teacher educators' computer technology integration at USU. These teacher educators teach methods courses for the secondary preservice teachers at USU. I did a pilot study last summer (2007). I interviewed eight teacher educators, including faculty members who teach content area courses and/or methods courses.

GULFIDAN: Why did you interview the faculty members who teach content area courses as well as methods courses? Are you interested in both in your research?

JIAYI: Because that was a pilot study, we wanted to get a big picture. Later, when I did the dissertation proposal, my committee members suggested that I use a homogeneous sample. So I decided to concentrate on the methods course teachers in my dissertation.

GULFIDAN: Why did you prefer methods course teachers to content area course teachers?

JIAYI: Computer technology integration may differ largely in different content areas, but may be more consistent in different methods courses.

GULFIDAN: So you are going to interview faculty members?

JIAYI: Yes.

GULFIDAN: What kind of results do you expect to get?

JIAYI: From my pilot study, I saw a big variety of faculty members' use of computer technology in their teaching. Right now it is hard to say. I am going to get the list of all the methods course teachers on campus and randomly select 10 of them. I think the results will vary according to the participants. I think the results will be closely related to each faculty member's own computer use experience. When I did the pilot study, I found that most of the faculty members I interviewed realized that using computer technology

was very important, but not everyone worked hard to integrate computer technology in his/her teaching. Many faculty members told me that they were very busy. I think that is a real issue that they need to deal with.

GULFIDAN: So you expect a big variety. And also even though they think computer technology is important, it does not affect their behavior.

JIAYI: Yes.

GULFIDAN: What are the cultural differences (on computer technology integration between China and the US)?

JIAYI: I don't think the computer software in China is as well developed as it is here. Lack of funding could be one big issue.

GULFIDAN: Do you think if they have the money, faculties in China would integrate technology more and improve their teaching practice?

JIAYI: I doubt it. That is because the culture as well as the educational system in China are different from that is here in the US. The Chinese culture emphasizes respecting the wisdom of our ancestors. We tend to accept and memorize the extant knowledge. The traditional Chinese educational system encourages the students to remember the facts. It does not usually emphasize developing the students' ability to analyze and synthesize the facts.

GULFIDAN: Do you think the use of computer technology could also help students to remember the facts?

JIAYI: I think a lot of educational computer software stimulates learners' independent thinking, requiring the learners to build up their own knowledge. So this may not fit very

well in the Chinese educational system. Also, it takes a long time to create an environment for the use of computer technology in teaching and learning. People need to be patient.

GULFIDAN: Do you think there are many classes that teach computer skills in America?

JIAYI: Actually, this is what I want to find out. I have also talked to some of my students, and many of them told me that the course they are taking from me was the only one formal computer course they had ever taken since they graduated from high school. So I don't think computer technology education by itself is highlighted very much here. And also, according to the literature that I have reviewed, most studies were conducted under some kind of grant, so it was not in a natural setting. It's like you got a grant and then bought computers for teachers to create a computer using environment. It is kind of forcing the teachers to use computers. But in natural setting, the department may assign a computer to faculty members without forcing them to use it. So, the teachers have more freedom to decide if they will use the computer or not, as well as how to use the computer.

GULFIDAN: Do you think the technology use depends on the department?

JIAYI: I do believe that. And I think it depends on the vision of the department head, other faculty members, and school expectations. But it also depends on the money, the equipment, and the space. You also need to develop a system to systematically introduce the computer technology. Although we have the Faculty Assistance Center for Teaching (FACT) at USU, it seems like the faculty members are not taking fully advantage of using it. Also, since each faculty member has different computer knowledge background,

it would not be wise to use the same kind of methods to introduce computer technology to all the faculty members.

GULFIDAN: When you select your sample, will you only go to the departments that use more technology?

JIAYI: No, I will sample from different departments, since I want to know more. Some of my students are art and music majors, and I did not touch those areas in my pilot study. But in my dissertation, I may explore those areas.

GULFIDAN: So you think computer technology integration depends on the professors' background and also their personal use of computers.

JIAYI: Yes. I think this assumption is also related to my teaching experience. I have to admit that before I started to teach, I did not quite like using computers. But after I started to teach, I kind of liked them. And the more I used the computers in my teaching, the more I liked them. And I feel confident on learning new computer programs and new computer skills because of my teaching. Probably other people have had a similar experience.

GULFIDAN: So you have a very positive attitude toward technology integration.

JIAYI: Kind of. But I also see some difficulties of the integration. For teacher educators, it takes a long time to get familiar with those software packages. Do they really need to learn those programs themselves? Or they just have someone to do the technology part of work for them. So they even don't need to know the details of the technology, such as how to create a product by using Photoshop, but they have the vision of the results and they can use the results in their teaching. And also as teacher educators, their main task

is not about learning computer technology, but to use computer technology wisely in their teaching. I think time is the biggest issue, because if you learn a computer program, you really need to spend time on it. And it is not like just one or two classes, since you need to practice a lot. When I first learned Photoshop, I was in a Photoshop class for one semester. One year later, when I started to teach, I realized that I was not good at using Photoshop. So I followed a book to learn. That was the second time I learned Photoshop. I felt like I knew a little bit better. But I still made mistakes even during my teaching. It was not until I taught Photoshop for three times that I felt confident in my Photoshop skills. So it took about two or three years. But on the other hand, I don't think the teacher educators should try to avoid computer technology simply because of the time issue. There are some good computer applications created for teachers. If you just try to avoid computer, you may not even know these applications exist.

GULFIDAN: So you think about the practical use of computer technology. The feasibility -- if it is necessary in terms of time. As far as I understand, you think it takes a long time to develop the use of computer technology in education. And computer technology integration depends on the educational system, the culture and the society, and the patience of the faculty members, maybe.

JIAYI: Yes.

Appendix D

Weight Survey

Please give a weight to each of the following factors. "1" means the least important; "10" means the most important. Please circle a number representing your opinions of the importance for each factor. Thank You!

Factors affecting computer technology integration
Positive:

- Advantages of using computer technology in classrooms
  1 2 3 4 5 6 7 8 9 10
- A supportive environment
  1 2 3 4 5 6 7 8 9 10
- Job obligations
  1 2 3 4 5 6 7 8 9 10

Negative:

- Course evaluations
  1 2 3 4 5 6 7 8 9 10
- Time issue
  1 2 3 4 5 6 7 8 9 10
- Unreliability of computer technology
  1 2 3 4 5 6 7 8 9 10
- Lack of advanced computer tools
  1 2 3 4 5 6 7 8 9 10
- Lack of computers in school districts
  1 2 3 4 5 6 7 8 9 10

Formal computer skill training
Positive:

- Helping develop computer skills
  1 2 3 4 5 6 7 8 9 10
- Helping set up online course systems
  1 2 3 4 5 6 7 8 9 10
- Gathering training information effectively
  1 2 3 4 5 6 7 8 9 10

Negative:

- Time conflicting
  1 2 3 4 5 6 7 8 9 10
- Overwhelming amount of information
  1 2 3 4 5 6 7 8 9 10
- Not well-organized instructions
  1 2 3 4 5 6 7 8 9 10

Positive and negative aspects of using computer technology

Positive:

- Providing advantages in teaching
  1 2 3 4 5 6 7 8 9 10
- Improving productivity
  1 2 3 4 5 6 7 8 9 10
- Offering easy accesses
  1 2 3 4 5 6 7 8 9 10
- Engaging the students and enhancing teaching
  1 2 3 4 5 6 7 8 9 10
- Presenting most of updated teaching resources
  1 2 3 4 5 6 7 8 9 10
- Enabling distance education
  1 2 3 4 5 6 7 8 9 10

Negative:

- Relying too heavily on computers
  1 2 3 4 5 6 7 8 9 10
- Inappropriate use/over use of computer
  1 2 3 4 5 6 7 8 9 10

Appendix E

Definitions of Computer Programs and Devices

Blackboard: Computer software used to manage e-learning and online communities, a class management system program.

CAD: Computer-Aided Design. A computer program that aids in the design and particularly the drafting of a part or product.

CAM: Computer-Aided Manufacturing. Computer-based software that assist engineers and machinists in manufacturing or prototyping product components (http://en.wikipedia.org/wiki/Computer-aided_manufacturing).

Course Management System: Software that facilitates e-learing or computer learning (http://en.wikipedia.org/wiki/CMS).

Document Camera: A real-time image capture device for displaying an object to a large audience. It is actually a high resolution web cam, mounted on arms to facilitate its placement over a page (http://en.wikipedia.org/wiki/Document_camera).

Excel: A spreadsheet computer application for calculation.

G&M Codes: A machine tool programming language.

iClicker: A hand-held device that transmits feedback from a student to a teacher's master control panel, allowing easy practice quizzes, opinion polls, and even quick feedback to the instructor. Students are usually required to buy iClicker. A new iClicker costs about $30.00.

iMovie: Video editing software for Macs.

iWeb: A template-based website creation tool made by Apple Inc. and included with its Mac computers (http://en.wikipedia.org/wiki/Iweb).

Photoshop: Graphics editing software.

PowerPoint: A computer-based presentation program.

QuickTime: A multimedia framework that can display various formats of video clips and audio.

Smartboard: A large, touch-controlled screen that works with a projector and a computer (http://en.wikipedia.org/wiki/Smartboard).

Web Browsers: Software applications used to display Web pages on the World Wide Web.

WebCT: An online course learning system. Instructors can use WebCT to display teaching materials, manage exams, have threaded discussions, and keep grades. WebCT is now owned by Blackboard Inc.

Word Processors: Computer applications used for composition, editing, formatting, and printing documents.

YouTube: A video sharing website where users can upload, view and share video clips (http://en.wikipedia.org/wiki/Youtube).

VITA

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EDUCATION

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Department of Landscape Architecture and Environmental Planning
Utah State University, Logan, UT, 2003

M.S. in Construction Economics & Management
Department of Civil Engineering
Southeast University, Nanjing, China, 1997

Associate Degree in Electrical Engineering
Department of Electrical and Aerospace Engineering
Nanjing Aeronautical Institute, Nanjing, China, 1988

TEACHING EXPERIENCE

Teaching Assistant
Dept. of Instructional Technology, Utah State University, Fall 2004 – Present
Design and teach a computer literacy course oriented to the preservice teachers in the Secondary Ed. Program. Use Macintosh computers. Have trained about 375 students.

Online Course Teaching Assistant
Dept. of Landscape Architecture and Environmental Planning, Utah State University, Fall 2003- Summer 2005
Assisted the instructor, Professor Ellsworth, to deliver LAEP 1030 (Introduction to Landscape Architecture) online courses (both semester-based version and Year-Long version). Tasks included maintaining the course website, helping the students solve computer technical problems, answering students' general questions, monitoring and participating in the threaded discussion, and keeping grades.

RESEARCH EXPERIENCE

Student Researcher
Dept. of Instructional Technology, Utah State University, Spring and Summer 2007
The purpose of this study was to obtain a preliminary understanding of the role of computer technology in the secondary education at Utah State University (USU). This study served as a pilot study for my dissertation. Different perspectives were explored. Eleven preservice teachers and eight student teaching supervisors and faculty members in teacher education programs were interviewed. The interviews were related to computer technology training and integration for USU preservice teachers and faculty members.

Student Researcher

Dept. of Instructional Technology, Utah State University, Spring 2007

Conducted an online course (EDUC 6550: Research for the Classroom Teacher) evaluation study. The theoretical framework underlying this evaluation is the First Principles of Instruction theory developed by Dr. David Merrill. Twenty students (67% of my randomly selected sample) responded to my survey questions by email. The results of this study showed that the course was well designed in terms of involving students in solving real problems and asking the students to design their own research studies.

Student Researcher

Dept. of Instructional Technology, Utah State University, Fall 2006

Conducted a qualitative research study by interviewing 46 students on the use of cooperative learning strategies in a computer literacy course at Utah State University. The findings showed that many students had experienced the effectiveness of the cooperative learning strategies in terms of enhancing learning processes and results, creating learning communities, and promoting social skills.

Student Researcher

Dept. of Instructional Technology, Utah State University, Fall 2005

Designed a test instrument to evaluate the computer literacy skills of preservice teachers and conducted a quantitative research study on 44 students to examine the reliability of the test instrument. The results showed that the test instrument's reliability was low. It was probably because the instructional materials of this course covered a wide range of computer literacy skills, among which many of them were not closely related. It could be more reasonable to test the instrument's reliability based on the items of the same computer concepts or skills, rather than treating the whole test as an integral one. Thus, more questions need to be developed for each of the concepts and skills in order to increase the reliability of the test.

Research Assistant

Dept. of Landscape Architecture and Environmental Planning, Utah State University, Summer 2003

Converted LAEP 1030: Introduction to Landscape Architecture online course from semester-based to open-entry open-exit (Year Long) online delivery. Worked with Professor Ellsworth and Utah State University Faculty Assistance Center for Teaching on threaded-discussion section redesign, PowerPoint lecture narration, and video production. The project funded through Utah System of Higher Education Technology and Distance Education Initiative Electronic College Curriculum Development grant.

GRANT AWARD

Year 2007 Research Grant from the Consortium of College and University Media Centers (CCUMC)

The title of this grant project is: A Study on the Use of Cooperative Learning Strategies in a Computer Literacy Course. The principal investigator (PI) of this study is Dr. Nick Eastmond. So far, we have done the pilot study, which includes the development of a questionnaire survey and test the reliability of this survey instrument by computing Cronbach's alpha. More than 1,000 data had been collected and analyzed. The Cronbach's alpha level (.86) showed that our instrument's reliability is high. We also finished the data collection of the main research work in the Spring 2008 semester. We are now analyzing the data and writing our final report.

PUBLICATIONS

Journal Article in Submission

Wan, J., & Eastmond, N. (2009) A Study on the Use of Cooperative Learning Strategies in a Computer Literacy Course.

Peer-reviewed Published Abstract

Ellsworth, J.C., Williams, A.D., & Wan, J. (2003). The design and delivery of an "Introduction to Landscape Architecture" course face-to-face and online: Comparing two delivery methods for "Imprinting"

course content. CELA 2003: Annual Meeting of the Council of Educator in Landscape Architecture, Charleston, SC, September 24-28.

CONFERENCE PRESENTATIONS

Wan, J. (2007). The Use of Cooperative Learning Strategies in a Computer Literacy Course. Annual Meeting of Teaching with Technology Idea Exchange, Orem, UT, June 7-8.

CERTIFICATION & HONORS

Merit Scholarship for excellent academic performance and accomplishments
Utah State University, 2003

Certification from International Teaching Assistant Workshop: With no limitation in teaching
Utah State University, 2001

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Excellent Chinese writing, reading, and speaking capabilities

REFERENCES

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