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THE EXPERIENCE OF TECHNOLOGY INTEGRATION BY TEACHER EDUCATORS IN HIGHER EDUCATION

by

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Abstract

With the advancing use of technology globally, it is becoming essential for K-12 educators to have knowledge of educational technology and its appropriate classroom use. Thus, it is important for higher education faculty involved in the preparation of those K-12 teachers to achieve technology integration in their teacher education programs. It is not sufficient to simply provide computers and peripheral devices to future teachers. The critical issue is the way in which those tools are used to promote student learning. Therefore, it is necessary for faculty in higher education to model the use of technology as a teaching and learning tool. In order to programmatically influence this change, universities must determine what promotes greater technology use among its teacher educators. This study investigates the development of technology integration by teacher educators in a Midwestern university's college of education. It explores the experiences of faculty who are attempting to integrate technology in their courses.

This study provides insights into the strategies and techniques that have aided one Midwestern university in its struggle to impact technological change in a teacher preparation program. The roles and classification of various components, such as primary and secondary benefits, can be generalized to other settings. Furthermore, the obstacles to technology integration have been identified in a context that informs administration and support personnel. Knowing the barriers should assist institutions in planning to accommodate and overcome these difficulties. The emphasis on systemic change is a critical component in any organization's strategic plan. This, however, must be balanced by an understanding of the unique aspects of an educational institution, its constituencies and its employee base. An outcome of this research is a systemic model describing the findings with the participants involved in this study. The model is based on time-availability-benefit factors which create a framework for the teaching and learning process of a single course. Motivation, an attribute of the instructor control, is dependent upon these factors and impacts the change process. Thus, a main result is the existence of this model which can be tested in additional educational settings so that other researchers may elaborate on it. This study does not attempt to address whether or not technology integration is a worthy goal. Instead, it focuses on successful strategies and techniques and opens the door to further exploration of unresolved impedances.

Dedication

In loving memory of my father, the man who showed me how to work hard, be honest, and have fun.

P.S. Family always comes first.

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In addition, the other members of my committee have played a significant role in my academic pursuits. Dr. Carl Hoagland offered me the opportunity to join a collegial team promoting online education and assessment. Dr. Matthew Keefer helped me advance my teaching skills through the conduct of student-directed activities in my role as adjunct faculty. And Dr. Timothy Baumann provided a critical review of the social impact aspects of the change process described in this dissertation. Without these committee members, I would not have been able to complete this project.

I offer a special thank you to the College of Education faculty who participated in this research project. There were many who agreed to be a part of this project and a few who were selected to share their insights, time and talents with me. Thank you for your candid reflection on the questions I raised, your willingness to share your perspectives, and your sincere welcome of me in your classroom. It is you, the faculty, who inspire me and the many other students whose lives you have touched to achieve our highest potential. May your dreams for the future educators you coach be fulfilled.

Finally, I want to express my sincere gratitude to my family for their dogged support and encouragement. My husband, Bob, and my three children, Laura, Amanda, and Bobby, sacrificed quality family time, suffered financial setbacks and endured coffee-laden weekends while I transcribed, coded, interpreted, and reviewed the multitude of documents and stacks of data sets collected to complete this document. I am thankful for the patience and love of my in-laws, Forrest and Marie (deceased) Suess. And, I thank God for the wonderful parents I was born unto, Betty and John (deceased) Leonard because they taught me to believe in myself.

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Chapter 1:

Introduction

Preparing pre-service teachers for their roles as educators, coaches, and disciplinarians can be a daunting responsibility. Teacher education programs across the nation have responded to new initiatives in national educational assessment and policy by launching critical review and reform programs. At the core of this process lies the difficult task of defining “teacher.” As experienced students, pre-service teachers have years of observation to draw upon in formulating their own “style.” Yet, as university faculty and program developers are aware, observation alone is not sufficient preparation for the role of the teacher. Professional educators must be able to link skills (experience) to theoretical foundations. Educational philosophies, while quite varied, provide such a theoretical base from which classroom teachers can grow. “Teachers need to develop understanding of the theories of knowledge (epistemologies) that guide the subject-matter disciplines in which they work” (Bransford, Brown, and Cocking, 2000, p. 242). Thus, formal education, including exposure to diverse learning theories and philosophical orientations, combined with field experience, is the cornerstone of a successful teacher preparation program.

However, in considering university and college educational programs, it seems that far too often students are not challenged to become actively involved in the process of learning. Typical higher education classrooms model the liberal education theory of learning (Elias & Merriam, 1995). Faculty still tend to rely on lecture and fact recitation rather than inquiry, discussion and reflection, three keys to developing higher-order thinking skills. Furthermore, it is even more rare that students in higher education classrooms are required to connect theory and life, as if education can occur in isolation from the progress and challenges of the world around the classroom. Studies suggest, however, that students are more motivated and more successful in their educational pursuits when they have a “need to know” (e.g., Bransford et al., 2000; Dewey, 1899). These occurrences are closely related to problems of life and living, either in an attempt to achieve solution to a real-world challenge or to a simulation that is a close facsimile of a real situation. From Jean Piaget (1899) to Malcolm Knowles (1980, 1998), learning theorists have identified the significance of this “need to know” in the growth and development of students. The question that remains, however, is how to achieve a learning environment that promotes these opportunities and supports students in their quest for resolution.

In contrast to “traditional adult learning settings”, technology-rich environments tend to focus on the role of constructivism in acquiring new knowledge (Collins, 1991). Successful utilization of technology-based tools in higher education is closely related to the ability of such an environment to capitalize on the socio-cultural aspects of learning as well as supporting individual cognitive growth. In addition, the precepts of andragogy focus on the self-directedness of adult learners, which can be facilitated through the use of computers, data communications, and Internet-based resources. Thus, constructivism and andragogy provide a philosophical foundation for the advancement of the use of technology in the conduct of educational practices in the twenty-first century. The integration of technology in higher education affords the students as well as the instructor the opportunity to learn in new ways using tools designed to promote self-directed learning, peer-to-peer and instructor-to-peer collaboration, and knowledge construction based on prior learning and experience.

Burge (1995) notes that teaching constructively requires the instructor to provide opportunities for complex information processing related to the learner's needs and prior knowledge. However, it also means the instructor is attentive to the learning strategies employed, not just the content. Savery and Duffy (1996) have identified eight constructivist instructional principles that guide the instructor in designing educational activities. These include designing authentic tasks that are anchored to a larger problem in the context of a learning environment similar to the complex real-world environment being modeled (e.g., Bransford et al., 2000; Savery and Duffy, 1996, Learning Technology Center – Vanderbilt University, 1996). The other critical component is ownership of the task and the process used to develop the situation (Knowles, Holton & Swanson, 1998).

Another constructivist approach constituting a framework for investigation of the use of technology in education is collaborative learning, which promotes individual constructivism as well as social constructivism. Collaboration may be the method chosen to stimulate individual cognitive development or it may be used strategically to promote interpersonal cognition. This approach to learning uses collaboration to achieve problem solving. As Bruer (1993) states, "Problem-oriented learning works because students learn in a context that is similar to the eventual problem-solving situation, which helps them associate the new knowledge with conditions in which they might use it" (p. 103). In this context of situated-learning, adults have an opportunity to adopt new techniques in solving familiar problems as well as applying prior knowledge to new problems. Typically, these problem-solving activities employ team-based strategies for the interpretation of the situation, analysis, planning and design of solutions.

Collaborative learning is ideally suited to this problem-solving construct because it provides a context for social interaction to promote learning. Roschelle (1996) demonstrated how conceptual change, a process of learning, is “achieved incrementally, interactively, and socially through collaborative participation in joint activity” (p. 211). Specifically, he contends that the conversational interaction of co-participants is necessary to achieve convergent conceptual change. Students engaged in a project activity-based dialogue enter into multiple negotiations of meaning of “metaphors-in-situation” (Roschelle, 1996). Thus, the activity provides a basis for the co-participants to negotiate, confirm, and correct their shared understanding within a specific problem-solving context.

Developing communities of learners in adult learning settings promotes collaborative learning, a highly interactive learning style. The notion of collaborative learning is closely linked to andragogical precepts by the self-directed nature of collaborative methods. For adult classrooms, the self-directed nature of their learning is key for the use of instructional technology in education. Since the instructor and textbook are no longer the sole source of information in higher education, technology, as a tool for accessing information, can be used to promote and facilitate the self-directedness of adult learners. Technology affords adult learners the opportunity to selectively seek the information they need to acquire new skills, to fill in gaps in knowledge construction, and to optimize the resulting information networks they construct. The adult learning model of student-centered learning promotes the use of tools and technologies that move the educational process beyond the classroom. Thus, the use of technology allows students to learn in the environment they choose, using the methods they wish, and at a pace that is suitable for their individual needs whether classroom based or individualized (Ross, 1981).

With the advancing use of technology globally, it is becoming essential for higher education faculty to have knowledge of educational technology and its use. The methods and media technology affords adult educators cannot be overlooked. Furthermore, their role as modelers of classroom methods and the application of learning theories necessitates their ability to demonstrate to their students the effective use of technology as educational instruments. This is especially true for faculty responsible for the preparation of K-12 classroom teachers.

As an institution of higher learning dedicated to the training of education professionals in current theories and techniques, the College of Education at the university participating in this study, and others, are actively pursuing opportunities to advance the technology-fluency of its graduates. The goal is to prepare educators for the classrooms of tomorrow by creating a technology foundation upon which they can continue to build. In order to achieve this, faculty must first embrace technology and implement a curricular plan that pushes their methods for education and instructional content delivery into a variety of new media. Developing courses, designing degree programs, and delivering a new message requires a significant time investment.

This field of study is ripe for academic research that relates curricular content, instructional delivery methods, and instructional formats to new technologies for learning. As Mehan points out, “The computer by itself is not an agent of change” (1989, p. 13). So technology integration in higher education must go beyond equipping classrooms with computers. There must be some reason for using the computers, both for the instructor and for the students. Without this impetus, the difficulties that arise with the introduction of technology tools may be seen as too great an impedance to the education of students to warrant the change. While “technology offers the potential to make life easier and more enjoyable . . . at the same time, added complexities arise to increase our difficulty and frustration” (Norman, 1988, p. 29).

Further, Mehan notes that the reality of the educational situation is that “it is what people do with the [computer], not the [computer] itself that makes a difference” (Mehan, 1989, p. 19) in classroom instruction. Thus, our institutions of higher learning need to address an issue beyond the acquisition and placement of technology tools in their facilities. The topic of concern, then, is how educators adapt to the need to integrate these tools into the instructional content, format, and delivery of their courses. Since the classroom is a mini-culture, the behaviors of students in that classroom have a context that goes beyond the individual students. Likewise, the school or college in which the classroom resides forms a larger culture that needs to support faculty endeavors. Faculty adaptation to new tools and methods is influenced by the culture of the organization, not just their personal preferences and past experiences. Cultural aspects, “. . . what people do, what people know, and things that people make and use" (Bogdan & Biklen, 1998, p. 28) color the behaviors of the students in a classroom. Thus, class behavior is dependent on who they are collectively as well as individually.

The Problem

The integration of technology in higher education teacher preparation is dependent upon the disposition of the teacher educator as well as the students. Teachers need to consider the appropriate role of, and model the use of, technology in the conduct of a course, both within and beyond the walls of the classroom. This will aid in developing a technology-foundation for future teachers. By demonstrating the tools and methods of technology integration, instructors will prepare teachers for their future classroom experience. Thus, technology integration is the informed change of educators' methods of instruction, and development and delivery of instructional content to achieve a paradigm shift, "bringing real-world problems into the classroom for students to explore and solve" (Bransford et al., 2000, p. 207). It is the development of curriculum that adapts techniques to the self-directed learning style of adults using tools available to the students in a variety of settings. "Increasingly, the computers of the very near future will be the private property of individuals, and this will gradually return to the individual the power to determine patterns of education" (Papert, 1993, p. 37). Although many of today's adult learners own personal computers, this shift of control over learning responsibilities may still need to occur in higher education settings. Having this approach to learning modeled by their educators, the K-12 teachers of tomorrow will more likely be able to employ learning strategies using integrated technology in their classrooms.

Statement of the Problem

As technology is being adopted by society at large to facilitate the storage and communication of ideas, how do universities take advantage of technology to further the preparation of teachers? A major component of the answer to this question, is the teacher educator. “Although teachers are supposed to excite students about learning, teacher preparation methods courses are often lectures and recitation. So, prospective teachers who do not have hands-on, ‘minds-on’ experiences with learning are expected to provide these kinds of experiences for students” (Bransford et al., 2000, p. 202). Thus, if universities want K-12 teachers to adopt the use of technology in their classrooms post graduation, they need to create an environment in which teacher educators model these tools and techniques. Herein lies the problem: the integration of technology by faculty in higher education classrooms is advancing too slowly. How can universities encourage change among its faculty?

This change incorporates the adaptation of theories of learning, such as constructivism and andragogy, to shift the locus of control over learning from the educator to the adult student. According to Langenbach (1988), “a self-directed learner is more likely to gain access to knowledge, as opposed to having someone else create the access” (p. 147). Thus, higher education would be engaged in the development of foundational learning strategies that would promote life-long learning, by enhancing the ability of adults to become self-directed learners. Furthermore, these methods, recognizing intelligence as being distributed in the environment through other humans and cultural artifacts, enhance the development of the "intelligent student [who] makes use of the intelligence distributed throughout his environment" (Gardner, 1991, p. 136).

Major Questions

Given the desire to achieve technology integration in higher education, a university must determine what promotes greater technology use among teacher educators. The research question, then, becomes "How does technology integration by teacher educators in higher education develop?" To answer this question, it was the intent of this study to examine the experiences of faculty who are attempting to integrate technology into the classroom.

Related questions include the following: How do teacher educators acquire the skills necessary to model technology integration? Similarly, where do students turn for the additional support they may need to keep pace with technology changes as they occur? Who is responsible for defining the methods and tools to be used to conduct technology-rich courses? How must curriculum be modified to accommodate these changes?

If technology integration in higher education is a desired outcome, universities must take stock of their current position with regard to faculty preparation and support, compensation for adapting curriculum and methods to accommodate technology-based learning, acquisition of adequate hardware and software tools, and appropriate student support. Each of these issues is addressed in this study.

Definition of Terms

Many of the terms used in this study have multiple or elusive definitions. Therefore the following will be the definitions used for the remainder of this dissertation.

Adult – There are various definitions given for this word. Some use it to mean a particular age, status, or set of responsibilities. For this study, it will be used to represent students who have completed high school, required formal education, and have enrolled in an institution of higher learning at the baccalaureate level or higher.

Andragogy – The philosophy of adult learning as espoused by Malcolm Knowles and Allen Tough.

Collaborative Learning – Socio-cultural methods of constructivist learning by which learning outcomes are derived from students' verbal interaction during hands-on activities allowing them to develop and refine a shared understanding (Roschelle, 1996).

Constructivist Learning – The philosophy of learning based on a person's incrementally constructing knowledge in the form of relational meanings (Roschelle, 1996).

Conversational Interview – A semi-structured interview of participants in which the researcher and participants share the details of an experience.

Course Management Software – Computer software used in educational settings to facilitate online instruction, asynchronous and synchronous discussion, virtual classes, email, scheduling and recordkeeping.

Education – The acquisition of knowledge through an intentional pursuit. Education may be a formal pursuit of knowledge, such as a degree program, or it may be non-formal, such as a continuing education program. It usually involves instruction conducted in some type of directed educational setting (Tight, 1996).

Phenomenology – The study of a phenomenon or event. A research methodology which seeks understanding of the phenomenon or event under investigation.

Self-Directed Learning – A form of study in which learners have the primary responsibility for planning, carrying out, and evaluating their own learning experiences (Caffarella, 1994).

Teacher – A person who directs the learning of others in an environment considered to be a directed educational setting.

Teacher Educator – A teacher whose students aspire to becoming teachers upon conclusion of their degree program.

Technology – Electronic devices used to complete a particular job in a shorter period of elapsed time or at a higher level of quality than can be realized without the use of the tool. Technology tools may include, but are not limited to, computer hardware, computer software, data communications and networking devices, the Internet, and peripheral computer devices such as scanners, printers, digital cameras, etc.

Virtual Visits – Classroom visits that occur via use of video cameras and the Internet, allowing multiple students to observe a classroom practitioner's work in a K-12 classroom. Virtual visits may occur live or asynchronously. Live visits may include a post-observation discussion between the observers and the classroom practitioner.

Significance of the Study

This study investigates the evolution of technology integration in a higher education setting. In particular, the purpose of this study is to understand how teacher educators appropriate technology integration practices in the conduct of teacher preparation courses. The significance of this study is both practical and theoretical. Identifying successful strategies, motivational initiatives, and frustrations encountered by higher education faculty members as they attempt to integrate technology in their courses will provide valuable insight for other faculty at this campus as well as academicians around the globe. Studying the role of the teacher educator within the framework of the andragogical and constructivist foundational theories of learning, including strategies of collaborative learning and self-directed learning, will contribute to the body of knowledge regarding the application of these theories in a technology-integrated higher education setting.

Much of the prior self-directed learning research conducted focused on adult learning in non-formal settings (e.g., Brookfield, 1986; Candy, 1991; Tough, 1971). Similarly, the principal research surrounding the issue of technology integration, and the impact of constructivism and collaborative learning in technology-rich environments, has focused on K-12 settings (e.g., Collins, 1991; McGilly, 1994; Pea & Kurland, 1987, Sandholtz, Ringstaff & Dwyer, 1992). While this study is based in part on this body of prior research, it extends these studies to address adult learning in a formal education setting. In addition, this study considers the goals and future directions of faculty as they refine their definition of and strive for technology integration in their teacher preparation program.

Chapter 2:

Review of Literature

Introduction

The purpose of this study is to understand how teacher educators adopt technology integration practices in the conduct of teacher preparation courses. This process is lagging behind the adoption of technology in other sectors of public and private enterprise. Thus, there is concern regarding the ability of educators to adequately prepare new teachers for the role they will play in educating the future citizens of our nation. Without observing role models appropriately integrating and utilizing technology tools in the conduct of their courses, it is less likely pre-service teachers will readily adopt these tools when they begin teaching. It is quite likely, however, their students will be expected to know how and when to apply these tools when they embark on their careers. As Gardner explains, “attempts to insulate the school from the potent effects of the mass media and the consumer society are problematic; it is far better to recognize these factors and attempt to marshal them productively than to ignore them” (1991, p. 223).

This review examines the general literature on the constructivist theories of learning, both individual cognitive development and socio-cultural philosophies, and andragogy, the culmination of adult learning theories. These philosophical foundations have manifestations in adult learning and in educational technology. The literature is discussed as it relates to these two principle fields of study.

Constructivist Philosophy

The constructivist philosophy "maintains that learning is a process of constructing meaning; it is how people make sense of their experience" (Merriam & Caffarella, 1999, p. 261). According to Bereiter, constructivism has at least three meanings: 1) "constructivism . . . asserts that knowledge is acquired by a process of mental construction"; 2) "constructivism has become a synonym for 'learning by doing' – in other words all kinds of hands-on activities and projects"; and 3) "the idea that theories and the like are human constructions much like material artifacts . . . and . . . the truth of propositions is a social construction" (2002, p. 208). Thus, there are many philosophical theories that feed into the constructivist learning theory. These include: pragmatism, existentialism, phenomenology, hermeneutics, and some modes of idealism (Ozmon & Craver, 1999). Furthermore, "the goal of constructivism is the growth of active learners through the construction and reorganization of cognitive structures" (Ozmon & Craver, 1999, p. 232). The constructivist theory is built on foundational work conducted by Jean Piaget (e.g., 1954), Lev Vygotsky (e.g., 1978), Jerome Bruner (e.g., 1986), and Howard Gardner (e.g., 1991). It also draws ideas from developmental stage theory, such as is found in the early theory of Piaget (e.g., 1954) and the stages of man concept developed by Erik Erikson (e.g., 1997).

In attempting to understand how people construct knowledge, observers must look beyond the individual to the context of the problem they are addressing. As Siegler points out, "much of the complexity that we observe in people's thinking is really a reflection of the complexity of the environment. Only by analyzing in detail the demands of particular tasks can problem solving be understood, since so much of it is an effort to adapt to the task environment" (1986, p. 72). In order to better understand the cognitive activities of the participants engaged in problem solving, one must appreciate the environment in which the particular problem-solving task is situated. Siegler contends that through analysis of the task environment, one can determine the cognitive operations used to effectively solve the problem. In cases where people cannot effectively solve the problem, one can still learn from an analysis of the task environment. However, what this analysis affords is a comparative backdrop for distinguishing "those actions that people take because the actions are adaptive on the task from those actions that they take because of limits on their information-processing capabilities" (Siegler, 1986, p. 72).

Theoretical foundations from pragmatism, existentialism, phenomenology, hermeneutics, and some modes of idealism give shape to the theory of constructivist learning. The philosophical origins of this theory provide descriptive information regarding mental processes, knowledge acquisition, the contextual nature of knowledge, and the ability of humans to construct new knowledge through problem solving. Constructivism is independent of the teaching methods employed; even a lecture can be a constructivist-learning event (Bransford et al., 2000). It is the cognitive activity of the learner that determines how a constructivist would view the outcomes of a lesson. Such a lesson is developed so as to rely on the learner to draw upon prior knowledge and to create links to that knowledge in relation to the new information being absorbed, analyzed and synthesized. This building block approach applies to both individual cognitive activity and social, or interactive, knowledge processing events.

Beyond the basic assumption that constructivism is a process of constructing meaning, the various constructivist epistemologies demonstrate significant differences in their respective consideration of reality, the role of experience, the nature of knowledge and the importance of individual versus social construction of meaning (Steffe & Gale, 1995). Thus, "constructivism has also helped reinvigorate debate between those who emphasize individual understanding and those who emphasize the socio-cultural dimensions of learning. For constructivists, the important question is not whether the individual or the culture has priority in learning, but the interplay between them" (Ozmon & Craver, 1999, pp. 233-234). In the work of Piaget, it is assumed that learning is an individual or personal activity in which the individual derives meaning from prior and current knowledge. This perspective, then, indicates learning is an internal cognitive activity (e.g., Anderson, 1987; Siegler, 1986; Papert, 1993). Thus, teachers who promote the individual constructivist theory would create opportunities for students to have "experiences that induce cognitive conflict and hence encourage learners to develop new knowledge schemes" (Merriam & Caffarella, 1999, p. 262).

On the other hand, the social constructivist view is that knowledge is "constructed when individuals engage socially in talk and activity about shared problems or tasks. Making meaning is thus a dialogic process involving persons-in-conversation, and learning is seen as the process by which individuals are introduced to a culture by more skilled members" (Driver, Asoko, Leach, Mortimer, and Scott, 1994, p.7). Thus, collaborative learning activities, requiring learner-to-learner interaction, spawn opportunities for social constructivism in educational environments (Pea, 1987;

Wertsch, 1991; Collins, 1991). According to Wood, "teachers should realize that substantive learning occurs in periods of conflict, surprise, over long periods of time, and during social interaction. . . . and teachers will need opportunities in which they can learn about their students' constructions. (1995, p. 337)

Constructivism, as one of the traditional theories of learning, is manifested in adult learning through the perspectives of experiential learning, self-directed learning, transformational learning, situated cognition, and reflective practice. Candy points out that "the constructivist view of learning is particularly compatible with the notion of self-direction, since it emphasizes the combined characteristics of active inquiry, independence, and individuality in a learning task" (1991, p. 278). Furthermore, "the central role of experience in adult learning is another point of connection. Andragogy and other models of adult learning see life experience as both a resource and a stimulus for learning; so constructivism too begins with the learner's interaction with experience" (Merriam & Caffarella, 1999, p. 263).

Socio-Cultural Theories of Learning

Any study of educational practices and their effect on learning must take into consideration the environment as well as the participants. Socio-cultural influences in learning color any observation of learning activities. As Wertsch states, "All these traditions are based on the assumption that, in trying to understand mental functioning, one cannot begin with the environment or the individual human agent in isolation. They take action and interaction as basic analytic categories and view accounts of the environment and human mental functioning as emerging from them" (1991, p. 9). Thus, as participants engaged in the educational process, teachers and learners are both contributing to the communal construction of new knowledge, interactively extending their common knowledge base.

> By the time the child has reached the age of seven or so, his development has become completely intertwined with the values and goals of the culture. Nearly all learning will take place in one or another cultural context; aids to his thinking will reside in many other human beings as well as in a multitude of cultural artifacts. Far from being restricted to the individual's skull, cognition and intelligence become distributed across the landscape (Gardner, 1991, p.109).

Vygotsky's theories signify the social origins of mental functioning in the individual (Wertsch, 1991, pp. 25-28). It is through interaction in collaborative problem-solving situations that students build an understanding of "complex systems and concepts, such as multiple causes and interactions among different variables" (Bransford et al., 2000, p. 212).

Research conducted in the interaction of students in technology-rich learning environments suggests that technology can assist teachers in their effort to eradicate students' misunderstandings and provide a greenhouse for the sprouting and growth of new understandings. As Gardner points out, "computer linkages are the optimal way for such communication to take place" (1991, p. 223). "The new electronic technologies, like any other educational resource, are used in a social environment and are, therefore, mediated by the dialogues that students have with each other and the teacher" (Bransford et al., 2000, p. 243). These tools provide an opportunity to extend the collaborative dialogues beyond the classroom walls, with student-to-student electronic communication and student-to-professional linkages. Scientists and other professionals are "establishing virtually communities for learning purposes" (Bransford et al., 2000, p. 212), called "collaboratories."

Andragogy – Philosophy of Adult Education

Malcolm Knowles developed a theory of learning that is based on the differences between adult learners and children. Knowles contends there are seven conditions of adult learning. These conditions deal with the learner (need to learn, goals, responsibility, and experience), the learning process (directed by and assessed by the learner) and the learning environment (comfort, trust, respect) (1998, p. 85). Andragogy assumes that learners are ready to learn those things they "need" to because of the development phases they are approaching in their many life roles as parents, spouses, employees, etc. This assumption underscores the importance of timing in matching learning experiences with the learner's "need" to know. To be effective, learning experiences must coincide with the learner's developmental tasks. However, Knowles tells us there are ways to stimulate learner readiness through exposure to better models of performance. According to Knowles, the role of the teacher is to engage in a process of mutual inquiry with his or her students. Similarly, Bransford et al conclude "teachers are learners and the principles of learning and transfer for student learners apply to teachers" (2000, p. 242).

Strategies for teaching recommended by Knowles include discussion, simulation, and team projects. It is important for the active participation of adult learners that they are able to choose activities that are engaging and enjoyable and meet the objectives of the course or program. Student self-awareness plays a substantial part in the process of matching learners "need" to know with their readiness. Strategies for increasing self-awareness are assessment, reflection and goals statement. Brookfield proposes that "development of critical reflection on experiences, along with the collaborative interpretation and exchange of such experiences, is . . . one of the most significant forms of adult learning in which individuals can engage" (1986, p. 98). One method Knowles promotes for adult learning is the use of learning contracts in formal educational settings. This method provides the learner and the instructor an opportunity to engage in the development of a mutually satisfying set of learner objectives, processes, and methods for measuring outcomes.

Self-Directed Learning

Three early models of self-directed learning were proposed by Malcolm S. Knowles (e.g., 1990), Allen Tough (e.g., 1971) and Cyril Houle (e.g., 1992). A comparison of these models identifies similarities in philosophy as well as significant differences in their implementation. According to Knowles, adults have a deep need to be self-directing in their pursuit of learning experiences. Malcolm Knowles' model of self-directed learning is based on his philosophy of andragogy, which demonstrates an increasing emphasis on experiential techniques that tap the experience of the learners and involve them in analyzing their experience. He contends that the use of lectures, canned audio/visual presentations and assigned reading in adult education programs are being replaced with discussion, laboratory, simulation, field experience, team project and other action-learning techniques.

Allen Tough's model, in contrast, applies more to learning experiences outside a formal, structured academic setting. The foundation of his model is Tough's belief that adult learners' goals tend to emerge as part of the process of inquiry. Further, he suggests that these goals are varied in their degree of clarity and precision, tend to be continuously changing, and typically generate new goals. Tough's research investigated what, why and how adults learn, including what help they obtain for learning. His research subjects were found to organize their learning efforts around projects. In these learning projects, the person's motivation is to acquire and retain certain prescribed knowledge and skill, or to produce some other lasting personal change.

Thus, in Tough's model of self-directed learning, the basic framework of design is the activities of the project(s). The learner and the selected helpers plan each project in a collaborative manner. The learner then carries out the project. In this model, learners may use the whole gamut of human resources available to them. This includes, but is not limited to, subject matter experts, teachers, colleagues, and individuals from the community. Other resources may also be used by the learner to help him achieve his learning goals. Typical material resources are: literature, audio/visual media, and computer-based applications or informational resources.

Cyril Houle developed a model for continuing education that builds on the concept of the self-directedness of adult learners seeking professional certification or desiring to remain current in their chosen field. While his aim is to impact continuing professional education, differentiating this type of learning from other adult learning, his model is broadly applicable to all settings. He divides the ways adults learn within professional settings into three major modes: inquiry, instruction and performance. When adults investigate a new idea they are engaging in inquiry. Instruction is the process of learners achieving pre-determined objectives through designed activities. And, performance is the process of internalizing an idea or practice. This process forms habits and makes the new idea part of the way a learner thinks about his work. Without this step of incorporating new knowledge into his life, the educational effort has had no impact.

Although there has been much controversy over Knowles' continuum of pedagogy to andragogy (from teacher-directed learning to student-directed learning), the basic premise that adults tend to be more self-directed in their learning has been widely accepted by adult educators (Candy, 1991; Langenbach, 1988; Merriam & Caffarella, 1999). Intrinsic motivators such as careers, finances, and self-evaluation require adults to take control of their learning. Knowles' theory of andragogy, with its focus on the characteristics and life situation of the adult learner, "remains the best-known model of adult learning" (Merriam & Caffarella, 1999, p. 278) fostering tenets of self-directed learning in its five basic assumptions regarding the maturation and experience of adult learners with respect to their desire and ability to direct their personal development (Knowles, 1980).

Self-directed learning has three major goals, the first of which has generated the most research in this area. That goal is to enhance the ability of adults to be self-directed in their learning (Brookfield, 1986). The second and third goals are the fostering of transformational learning as central to self-directed learning, and promoting emancipatory learning and social action (Merriam & Caffarella, 1999). Furthermore, the self-directed learning process has been discussed in the literature in three ways: the linear model (e.g., Knowles, 1975; Tough, 1971), the interactive model (e.g., Garrison, 1997), and the instructional model (e.g., Grow, 1994). According to Merriam & Caffarella, "the linear models often reflect more traditional ways of thinking about teaching" while "the interactive models more closely resemble how learners go about learning primarily on their own, and the instructional models are specifically designed to be used as ways to organize instruction in formal and non-formal settings" (1999, p. 316).

Brookfield (1986) asserts that educators of adults need to shift control of the process of learning from the instructor to the learner, in both formal and non-formal settings. Furthermore, he contends that "successful self-directed learners appear to be highly aware of context in the sense of placing their learning within a social setting in which advice, information, and the skill modeling provided by other learners are crucial conditions for self-directed learning" (p. 44). The successful conduct of adult education should be designed to accommodate the characteristics and motivation of the adult learner. This is true in formal settings as well as informal learning environments. Thus, faculty members in higher education need to consider the role of the theory of self-directed learning in the conduct of their courses.

Self-directed learning is based on a student's need to know, and constitutes a knowledge-building process that starts with the student's prior knowledge and experience-base. Adult learners, then, typically engage in formal learning activities because of personal goals and motivators. New knowledge is integrated into their existing knowledge structures, using familiar patterns and connections to prior experiences to build new links. Although much of the existing discussion of constructivism in schools refers to student-centered learning, it is apparent that student-directed learning may be enhanced through the intentional application of constructivist strategies. Student-centered learning, as opposed to student-directed, assumes the instructor is responsible for planning the student's learning activities, offering opportunities for students to engage in learning through constructivist methods.

Educational Technology

Educational technology, the use of computer-based tools and techniques in the conduct of educational programs, is a controversial field of study. "The most important question, of course, is whether such technological prosthetics actually improve classroom performance and lead to deeper understandings. The results are still not definitive, because, not surprisingly, some innovations lead to dramatic effects while others have little or no impact on significant forms of understanding" (Gardner, 1991, p. 223). It is not the tools alone that make a difference in a student's learning. It is how these tools are used within a larger context that influences the success of the learning activity. "The new electronic technologies, like any other educational resource, are used in a social environment and are, therefore, mediated by the dialogues that students have with each other and the teacher" (Bransford et al., 2000, p. 212).

However, there is a difference in that computer-based technologies afford learners more opportunities than other educational resources. They can be used as vehicles for quick access to a better (in terms of quantity as well as quality) source of published research, literature and tutorial materials. Computer-based technologies can be used for independent learning as well as supporting the communication required for collaborative project-based work. "An important function of some of the new technologies is their use as tools of representation. Representational thinking is central to in-depth understanding and problem representation is one of the skills that distinguish subject experts from novices" (Bransford et al., 2000, p. 243). Gardner claims his personal "view is that a well-trained and effective teacher is still preferable to the most advanced technology . . . [however], the capacity to immerse oneself in a problem using the latest technology and to be able to manipulate data or events electronically can make a significant contribution to student learning. . . . such educational interventions are viable to the extent that they can heighten exploration, apprentice-like and cooperative relationships, multiple representations of data, and the assumption of different roles" (2000, p. 223). Thus the challenge facing educators is to design educational technologies that incorporate current knowledge about cognitive development and the machine's ability to assist in complex problem solving. "Like training wheels, computer scaffolding enables learners to do more advanced activities and to engage in more advanced thinking and problem solving than they could without such help" (Bransford et al., 2000, pp. 213-214). The potential influence of these tools broaches every subject-matter discipline, from writing to mathematics.

While the concept of learning tools is not exclusive to the field of educational technology, computer-based tools are quickly becoming cultural artifacts that impose on our communities of learning a new context of discourse. "The third general theme that runs throughout Vygotsky's formulation of a socio-cultural approach is the claim that higher mental functioning and human action in general are mediated by tools (or "technical tools") and signs (or "psychological tools")" (Wertsch, 1991, p. 28). So, the technical tools of this century are influencing our language, making our knowledge base a more global enterprise, and extending the human capabilities of analysis and problem-solving. Technology tools take up the charter of field trips and apprenticeship programs in providing a less constrained approach to "learning through real-world contexts" (Bransford et al., 2000, p. 207). From digital-video programs to videoconferencing, technology-rich environments are providing highly interactive alternatives to traditional classroom learning. Thus, students are encouraged to inquire, explore, and analyze real-world situations, both individually and collaboratively.

<u>Adults as Learners</u>

Adult education begins with life situations that require an individual to adapt. According to Lindeman, "Every adult person finds himself in specific situations with respect to his work, his recreation, his family-life, his community-life, et cetera – situations which call for adjustments. [Thus] the approach to adult education will be via the route of situations, not subjects" (1926, p. 8). Furthermore, Lindeman contends that while traditional education requires the student to adapt to the curriculum, adult education builds the curriculum around the student's needs and interests, so that the adult learner becomes the focus of the educational practice and teachers and resources are secondary.

While there is no doubt that the life experience of the adult learner separates this student from the adolescent, there are similarities in the cognitive development of children and adults. "At the most basic level, children and adolescents search through the contents of their short-term memories in the same way as adults. They seem to search one unit at a time and require a constant amount of time for each additional search" (Siegler, 1986, p. 16). The difference, however, is in the time required to complete the search, with older children searching more rapidly than younger ones and gifted children performing at adult rates. According to Siegler, "This early ability to retrieve information rapidly from short-term memory may aid gifted children in seeing a wide variety of connections that other children do not see" (1986, p. 16). These connections are integral to constructivist learning among adults.

The work of Atkinson and Shiffrin in automatic processing emphasized the role of strategies within an information-processing system. Similarly, Newell and Simon used a computer simulation to study strategy formation and its dependence on the task environment. Both of these studies focused on theories of adult information processing. However, both have been used to aid in understanding children's thinking, indicating there are profound similarities in the cognitive development and long-term memories of adults and children (Siegler, 1986).

Thus, strategies that are successful in adult education programs may also be applicable to younger students' learning activities. The use of technology tools to improve long-term memory through deeper understanding, as may be achieved in problem-solving activities based on real-world contexts, may be as essential for younger students as for adults. This points to the need to prepare pre-service teachers by modeling the use of technology tools, constructivist methods and a self-directed learning approach in teacher preparation programs.

Change Management

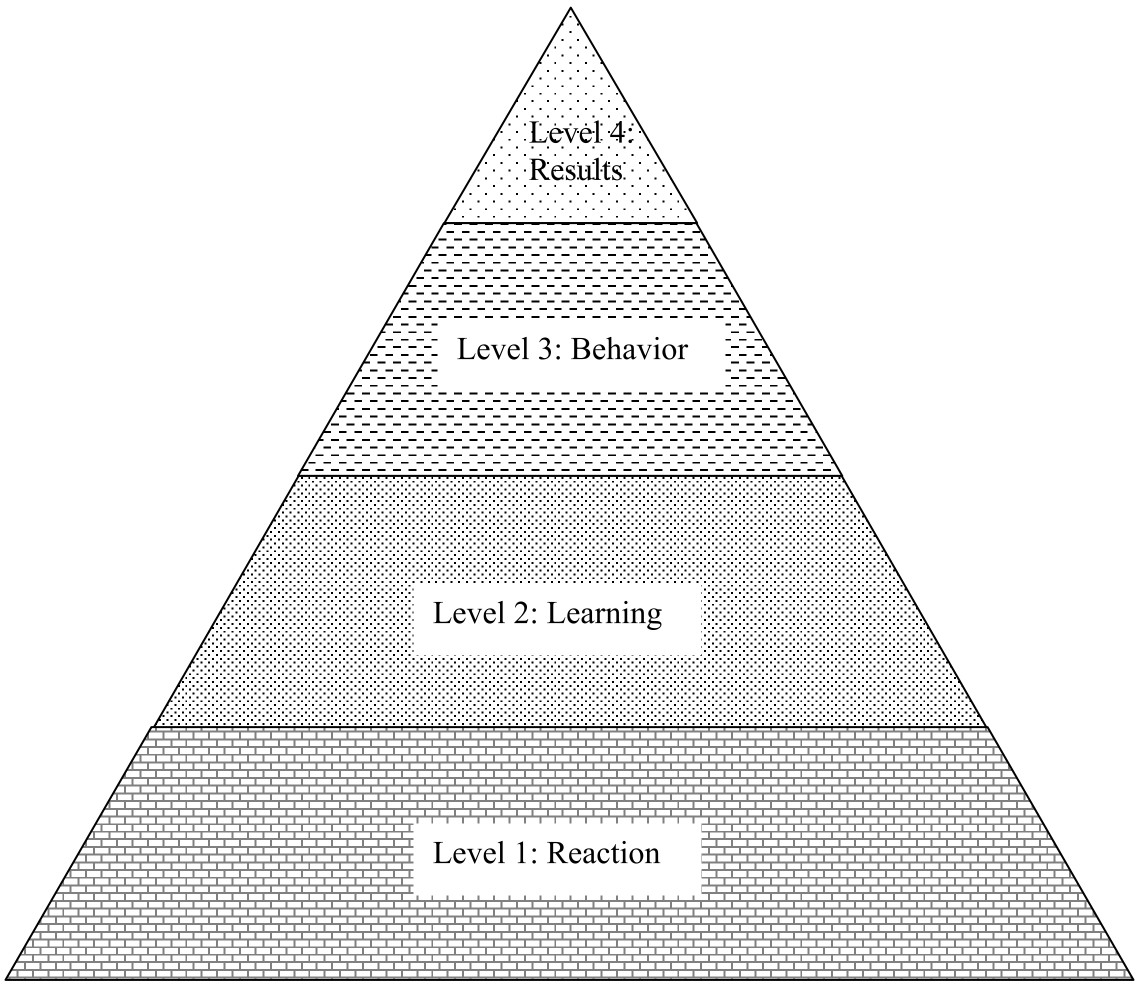
From John Dewey (1899) to John Bransford (2000), educational researchers have been proposing new answers to the question "How should teachers teach?"

These answers are based, at least in part, on studies of how people learn. However, at the core of each of these proposals is the central theme of change management. But the proposals may differ in terms of what is to change, who is responsible for managing the change, why change is necessary (how people learn), over what period of time the change will transpire (when), and in what settings (where). These aspects of change management are not unique to educational reform. For instance, the introduction of word processing software and personal computers in the work place had a profound impact on the way employees worked. While many managers still relied on their secretarial staff to "type" documents, most other employees created their own documents at their desk, reducing the need for secretarial pools. Simultaneously, this rise in independent file creation and data storage shifted the corporate focus from the issue of labor requirements to the issues of computer storage, space allocation, data retrieval times, and data security.

As Tom Werner noted with respect to the increasing interest in e-learning and concern regarding the quality of such programs, "We should approach e-learning implementations from a stronger position. Instead of being staff people looking for a vision, hoping for support, and working to please, we need to be business people – forming our own visions, initiating new conversations, and focusing on results" (2003, para. 5). While Werner's audience is corporate trainers, his words apply to academicians as well. Changing the way we do business (the business of educating) requires a new vision with a focus on results. To achieve this focus, one must develop a change management model for education. Kirkpatrick proposed a four level sequence of program evaluation (reaction, learning, behavior, and results). "Each level is important and has an impact on the next level. As you move from one level to the next, the process becomes more difficult and time-consuming, but it also provides more valuable information" (1998, p. 19). This hierarchy is indicated in figure 1 on the following page. The first level is aimed at determining the participants' satisfaction with the program, whether it is an on-campus college course or a field experience component of an educational program. Next is the learning level, which refers to data regarding "the extent to which the participants change attitudes, improve knowledge, and/or increase skill" (1998, p. 20). While the first two tiers occur immediately in a program evaluation, the third level, behavior, may only be initiated after serious consideration of the design of the evaluative instruments for this and the subsequent phase. An analysis of the behavioral change attributed to a change management program, or an instructional unit, must consider the participants' roles in the process as well as the outcome. And, finally, results are the perceived outcomes realized due to the change that occurred. Thus, the results are an evaluation of the degree to which the program objectives were met. Therefore, persons involved in directing change management programs "should begin to plan by considering the desired results" (1998, p. 24). Using Kirkpatrick's four levels of evaluation to assess and modify programs leads to an understanding of the (institutional) processes and their interfaces with other constituents, leading to a process modeling effort.

According to Stephen Covey, "All things are created twice. There's a mental or first creation, and a physical or second creation of all things. You have to make sure that the blueprint, the first creation, is really what you want, that you've thought everything through. Then you put it into bricks and mortar. Each day you go to the

Figure 1: Kirkpatrick's Four Levels of Evaluation



construction shed and pull the blueprint to get marching orders for the day. You begin with the end in mind" (1990, p. 95). This is precisely what change management is all about. There must be a vision and a focus; from these two comes a model. The model is evaluated apriori as well as post-implementation. The model provides a vehicle for communicating the focus, however, those not involved in establishing the vision may not be of the mindset of adopting "another program of prescriptive change." Rolling out a new educational program is akin to information technology roll-outs, in which the old hardware is trashed and the new equipment is dumped on the waiting innocent. As Werner suggests, "Roll-outs are based on two highly questionable mindsets: rationality and directiveness" (2003, Forget about roll-outs! section, para. 3). The former suggests people will go along with the change if the steps are clearly defined and presented persuasively. The latter suggests that the visionary has the power to decide what should happen to all people affected by the change and how it should happen. However, "The rational mindset misses soft, squishy things like fear, loss and uncertainty – the emotions that fuel resistance" (2003, Forget about roll-outs! section, para. 3). The directive mindset displaces people and their accountability in the management food chain. Thus, it would be wiser for a visionary to determine a process for pulling people <u>into</u> the change process rather than rolling it out <u>onto</u> them.

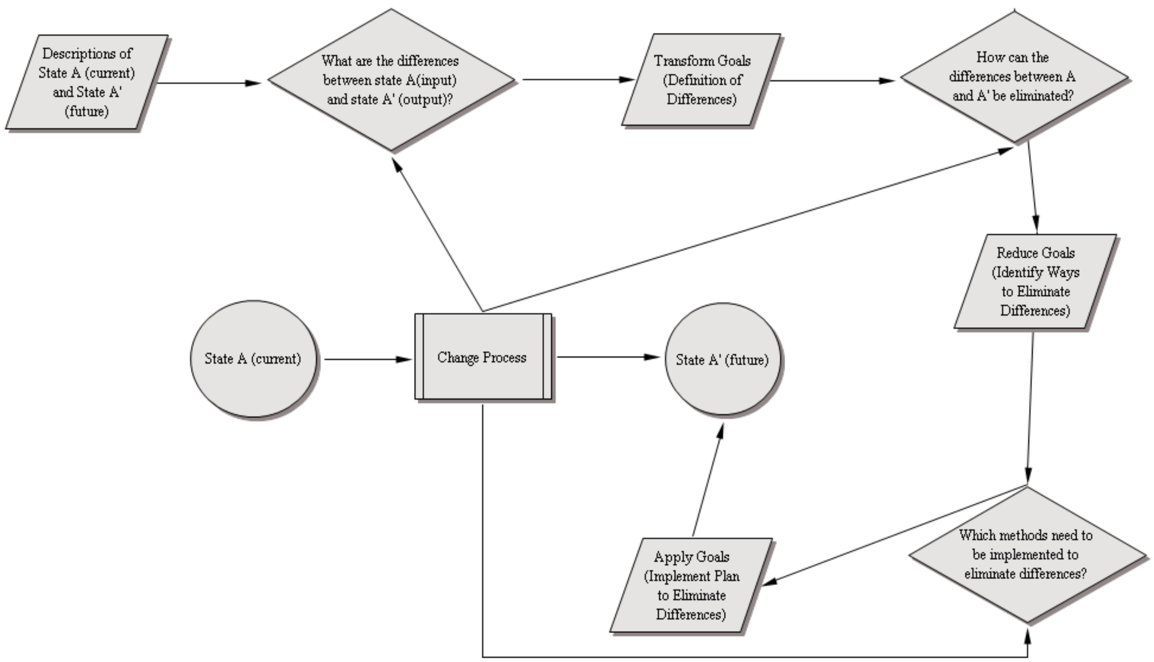
Through his research on adoption of innovations, Everett Rogers has observed the impact of change (1995). Everett Rogers spent decades studying the adoption of innovations, from hybrid corn in Iowa to modern math in Pittsburgh and snowmobiles among the Lapps in Finland. Rogers has identified five factors that pull adopters toward innovations: advantage, compatibility, simplicity, trialability, and observability. Advantage addresses the need for persons affected by the change to see that it brings about a new method, process, or program that offers something more than or better than other alternatives. Compatibility refers to how well the change accommodates the beliefs of the persons affected, "does it feel familiar?" Adopting the new method, process, or program must be simple to do. And it must prove easy to follow the new process under different trials. Finally, observability means the outcome must demonstrate visible positive results (Rogers, 1995). Thus, defining a change requires problem analysis that focuses on "defining the outcomes of the change effort, on identifying the changes necessary to produce these outcomes, and on finding and implementing ways and means of making the required changes. In simpler terms, the change problem can be treated as smaller problems having to do with the *how*, *what*, and *why* of change" (Nickols, 2000, The Change Problem section, para. 3).

Nickols speaks of "the change problem" as a state transition, moving from one state (A) to another state (A′) by achieving three types of goals: transform, reduce, and apply. These goals are defined as follows:

> **Transform** goals are concerned with identifying differences between the two states. **Reduce** goals are concerned with determining ways of eliminating these differences. **Apply** goals are concerned with putting into play operators that actually effect the elimination of these differences (2000, The Change Problem section, para. 2).

As illustrated in figure 2, this approach to change management begins with the desire to move from one state of operation (current state A) to another state (future state A'), either through modification of the current methods or via

Figure 2: Change Management Process



complete replacement of current methods. The change analysis process, then, requires definition of that future state, which is achieved by asking “what” questions – “What is our purpose?” or “What methods will help us achieve that purpose?” And, “What do we have to change to achieve this future vision?”

This process of defining the future state also involves asking “why” – “Why do we do things the way we do them?” or “Why do we do them at all?” These questions help us discern the purposes for the various functions within the current state, which will help us establish the necessary functions of the future state. And the third type of question posed is the “how” question – “How can we get people to adopt new practices?” This is often the starting point in the process of change. However, without asking the other questions, the future vision is ill defined and the change process may not be properly diagnosed and managed.

After defining the future state, the change management process requires analysis of the differences between this future state and the current state. Once the differences are identified (transform goals), the focus shifts to determining ways to eliminate the differences (reduce goals). Finally, the tasks are aimed at moving the current state toward the future state, by implementing the methods defined (apply goals). Again, this conceptualization of change implies a clear outcome objective, an analysis of alternative methods for achieving the outcome, and an implementation strategy for the selected alternative(s). Thus, change management is a process that implies a systematic approach.

Information Systems

"Life was simple before World War II. After that, we had systems."
Rear Admiral Grace Murray (Amazing Grace) Hopper

A system is a set of interrelated components that form a unified whole. The components of the system interact to accomplish specific goals. This is achieved by "accepting inputs and producing outputs in an organized transformation process" (O'Brien, 2000, p. 21). While this terminology is often linked with information management, the systems model can be applied to any collection of coordinated units. It consists of five major components: inputs, outputs, processes, feedback, and control. Analysis of any system will result in its decomposition into these components.

There are however, specific types of systems, the type described above is called a cybernetic system because it is a self-monitoring, self-regulating system. Without the feedback and control mechanisms, a system cannot be monitored and improved. A three-component system, consisting of only inputs, processing and outputs is called a dynamic system. Other types of systems are an open system, which interfaces with other systems, and an adaptive system, which can change itself as required for survival in its environment. According to Stair & Reynolds (2003), systems can be described as being: simple (few components) or complex (many interrelated components); open (interacting with its environment) or closed (no interaction); stable (very little change over time) or dynamic (rapid and constant change); adaptive (able to change) or nonadaptive (unable to change); and permanent (exists for a relatively long time) or temporary (exists for relatively short periods of time).

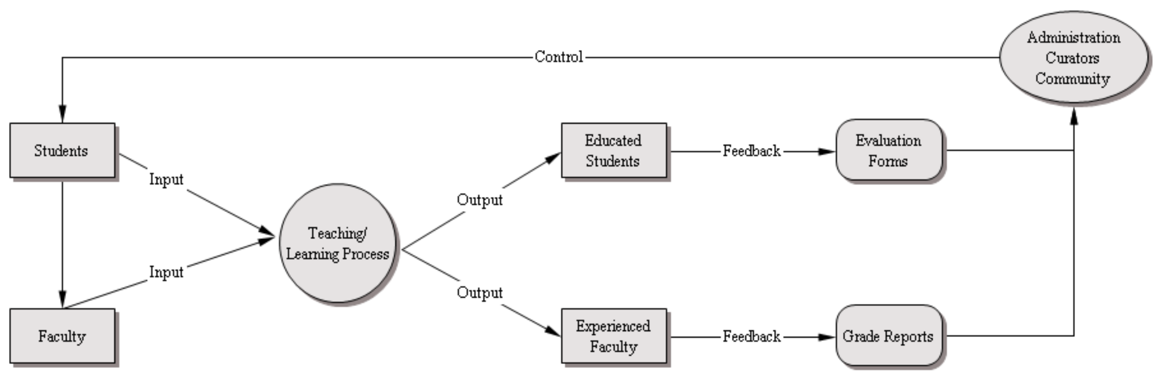
The definition of a system includes identification of the system boundary, which not only specifies the elements of the system, but also distinguishes it from the environment in which it resides. The organization of the elements within the system boundary is called the system configuration. This configuration is dependent upon the purpose or outcome of the system. Thus, "knowledge is needed both to define relationships among the inputs to a system . . . and to organize the system elements used to process the inputs . . ." (Stair & Reynolds, 2003, p. 10).

A Systemic Approach to Change Management

Often we hear of change that is referred to as systemic, change that affects an entire system. But how do we define this type of change in an information or knowledge-based system like an institution of higher learning? Using a traditional information systems modeling approach, we can decompose the entire university into system components: input, process, output, feedback, and control. At the university level these components can be defined, as illustrated in figure 3, such that the input elements are students and faculty, the process elements are learning and teaching, the output elements are educated students and experienced faculty, feedback elements are report cards and evaluation forms, and control elements are administration, curators and community.

However, with respect to this research activity, of specific interest is the information system described as the teacher preparation program, a subset of the

Figure 3: The University as an Educational System

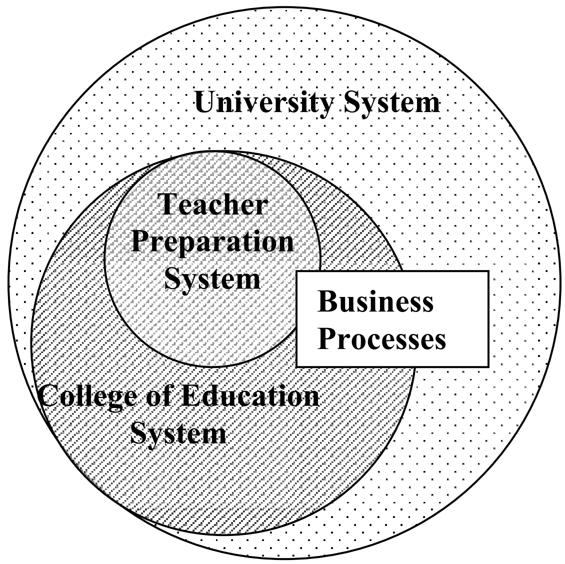


College of Education system, which is a subset of the university information system (see figure 4). How then do we model these information systems? Although the College of Education system model is very similar to the university model, the output, feedback and control components will include new elements (figure 5). For example, the output component still consists of educated students and experienced faculty, with the teacher preparation program specific element of certified teachers. Similarly, the feedback component has new elements specific to this environment such as certification exams (the Praxis), new teacher evaluations conducted at the K-12 schools hiring them, and faculty feedback via post-graduate teacher preparation program evaluations. Finally, the control component will be expanded to include K-12 schools, DESE (Department of Elementary and Secondary Education), and NCATE (National Council for the Accreditation of Teacher Education).

Taking a closer look, it is obvious that this decomposition continues as one looks at each individual class (or a sequence of classes) from the teacher preparation program (figure 6). For instance, the input component now includes such elements as textbooks, assignments, activities, and electronic resources. Furthermore, additional process elements can be identified, such as reading, writing, discussing, researching, assimilating, synthesizing, observing, and for faculty, facilitating, lecturing, and modeling. This detailed analysis of components impacts the elements of each of the five aspects of an information system.

At this level, the principal control is the instructor or the course lead faculty member (coordinator). What are the implications of this? Faculties have significant control over the degree and type of change that occurs at the course (or course

Figure 4: Interrelationships of the Three Levels of Educational Systems



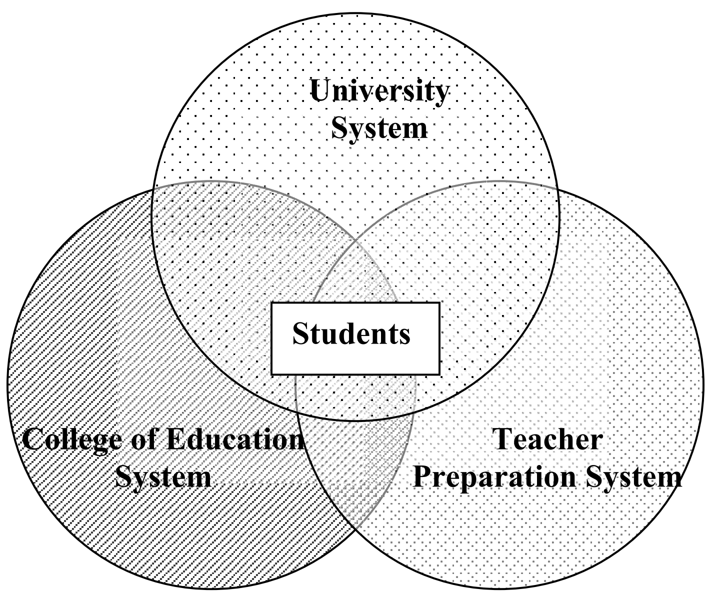


Figure 5: The College of Education as a System

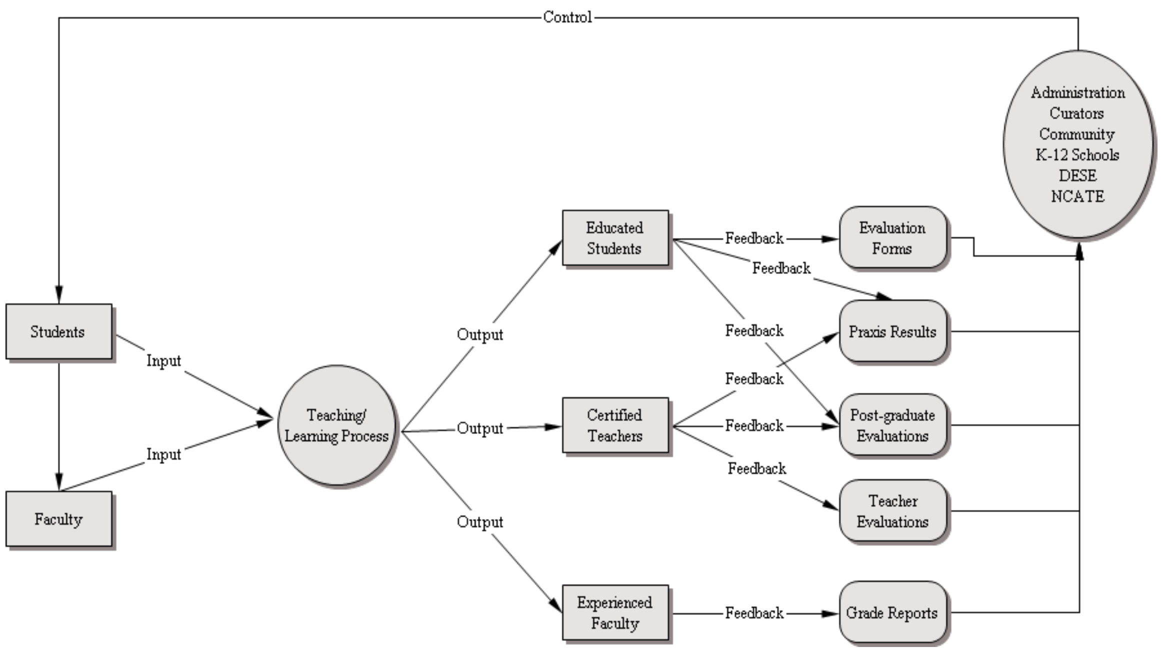
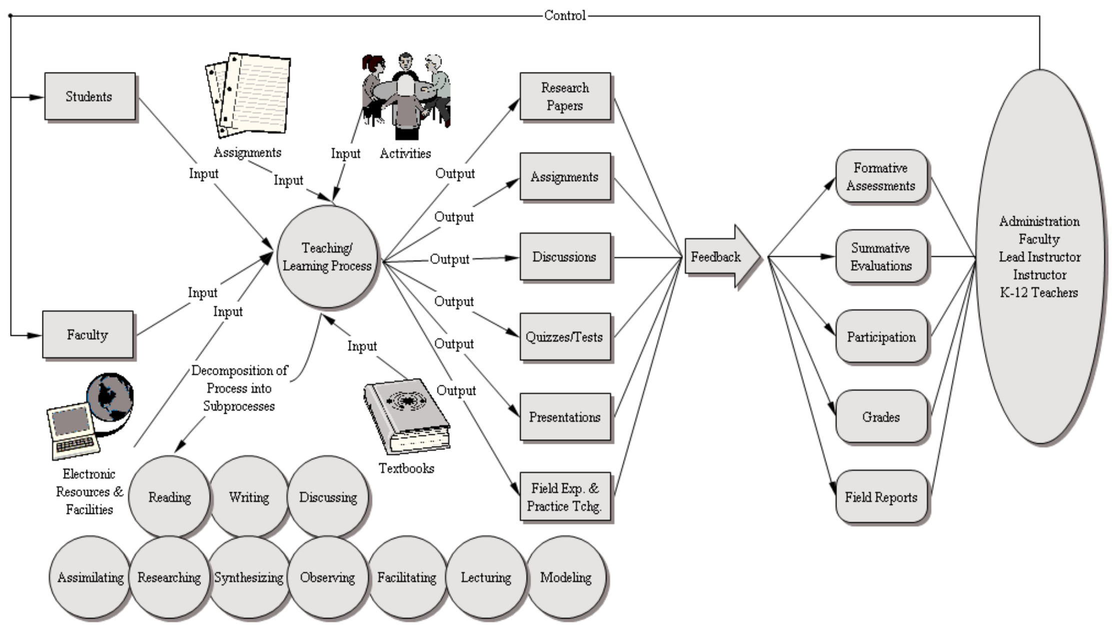


Figure 6: The Teacher Preparation Program as a System



sequence) level. Faculty select the resources available to the students, the nature and quantity of methods used to conduct the course, the type of performance assessments conducted throughout the class as well as those conducted at the end. Furthermore, this model indicates that change can be captured in the analysis of the information system if the differences in these components from one time to another time can be identified.

Since this study is concerned with the "how" of technology integration rather than its impact outcomes, the focus is on electronic resources, processing using these resources, output associated with electronic resources, and feedback that suggests a modification to the type or quantity of electronic resource utilization. Thus, this study looks at these components of "the systems" of the teacher preparation courses and determines their constituent elements at different moments in time. This determination is achieved by researcher observation and review of course documents, student surveys, and faculty interviews. One of the underlying questions is "what causes faculty to use the feedback to change a course, especially with respect to changes that enhance the role of electronic resources in the conduct of the course?"

<u>Summary</u>

> Technology has become an important instrument in education. Computer-based technologies hold great promise both for increasing access to knowledge and as a means of promoting learning (Bransford et al., 2000, p. 229).

The confluence of the constructivist philosophy and its associated learning strategies, andragogy and self-directed learning are recurrent themes in the literature on technology integration in education and in the literature addressing the learning of adults. Recently, research has been conducted in the use of technology in higher education settings. However, these studies are fewer in number than similar research conducted in K-12 classrooms. Both fields of investigation have been reviewed to determine the foundational precepts for technology integration to promote student-directed learning among adults in pre-service teacher education programs. According to Salpeter, “an intelligent look at the research leads away from an attempt to come up with a ‘thumbs up or thumbs down’ answer and finds us embarking on the more complex task of asking what types of technology, with which types of students, under what conditions lead to best results” (1998, The Overview section, para. 5).

Chapter 3:

Methods

Introduction

This study is concerned with the integration of technology in higher education courses designed for pre-service teachers. The use of computers, peripheral hardware devices, software applications and the Internet is fast becoming a functional pre-requisite for working members of our society. “What is now known about learning provides important guidelines for uses of technology that can help students and teachers develop the competencies needed for the twenty-first century” (Bransford et al., 2000, p. 206). Thus, educators must prepare students to use these tools as an integral component of their subject matter curriculum. This means it is desirable for teacher preparation programs to lay a technology-preparedness foundation upon which pre-service teachers can continue to build during their careers in educational practice. “Successful learning for teachers requires a continuum of coordinated efforts that range from pre-service education to early teaching opportunities for lifelong development as professionals” (Bransford et al., 2000, p. 205).

Assuming it is in the best interest of higher education teacher-preparation programs to encourage students to adopt the use of technology as a means of directing their learning, the faculty needs to adopt new practices in the conduct of their courses. These new practices may be reflected in their course syllabi as student assignments that require the use of computer technologies. In addition, course syllabi may indicate the instructor’s intent to use computer technologies as a tool for teacher-student and student-student communication in the classroom and beyond.

General Perspective

This study was principally a qualitative investigation based on the collection of data through document analysis (review of syllabi) and faculty interviews, with further triangulation of interpretations provided by student surveys and direct observation of classes. The intent was to identify practices and trends that support the quest for technology integration in higher education classrooms dedicated to the preparation of pre-service teachers. The syllabus review generated a list of prospective participants, based on the indication that their courses require the use of technology by the instructor or by the students, or both. From this, participants were recruited for individual interviews aimed at clarification of the language used in the syllabus, and its implementation in the conduct of the course. The interviews aided the researcher in attempting to understand the intent of the instructor in choosing to integrate the use of technology in the course. This format also provided an opportunity for the researcher to learn more about the motivation behind the instructor's choice. The integration of technology in higher education is dependent upon the availability of hardware and software tools, as well as support, for the instructor and the students. Thus, these aspects of the implementation of the syllabus also were discussed in the interviews.

Research Context

This study was conducted over the time period beginning in 2002 and ending in 2005. It involved the use of documents retained on file in the offices of the College of Education facility at the participating university. The courses involved in the review of syllabi are core courses in the teacher preparation sequence. These courses are:

A: Introduction to Teaching

B: Introduction to American Schools

C: Introduction to Learners and Learning

D: Introduction to Instructional Methods

E: Literacy, Learning and Instruction

F: Communication Arts Learning and Instruction

These courses are representative of the three levels of the teacher preparation program (figure 7). Syllabi are on file and available for each of these courses since 2001. For several of the courses, there are syllabi files dating back to 1995 (although they may have changed course identification numbers). Thus, the document review covers a period of eight years, fall semester 1995 through winter semester 2004. The observation of classes for each of these courses was initiated in fall semester 2002, with additional observations conducted in winter 2004. The faculty interviews were conducted during the fall 2003 and winter 2004 semesters. Student survey data was collected in fall 2002, spring 2003, fall 2003, and spring 2004. The temporal relationships of these activities are illustrated in figure 8 below.

Research Participants

The candidate participants were instructors for the above courses whose syllabi have been filed with the College of Education of the participating university for courses taught during the 1995-2004 time period. Participants include both adjunct (part time) faculty and full time faculty of the College of Education.

Figure 7: Teacher Preparation Program Levels

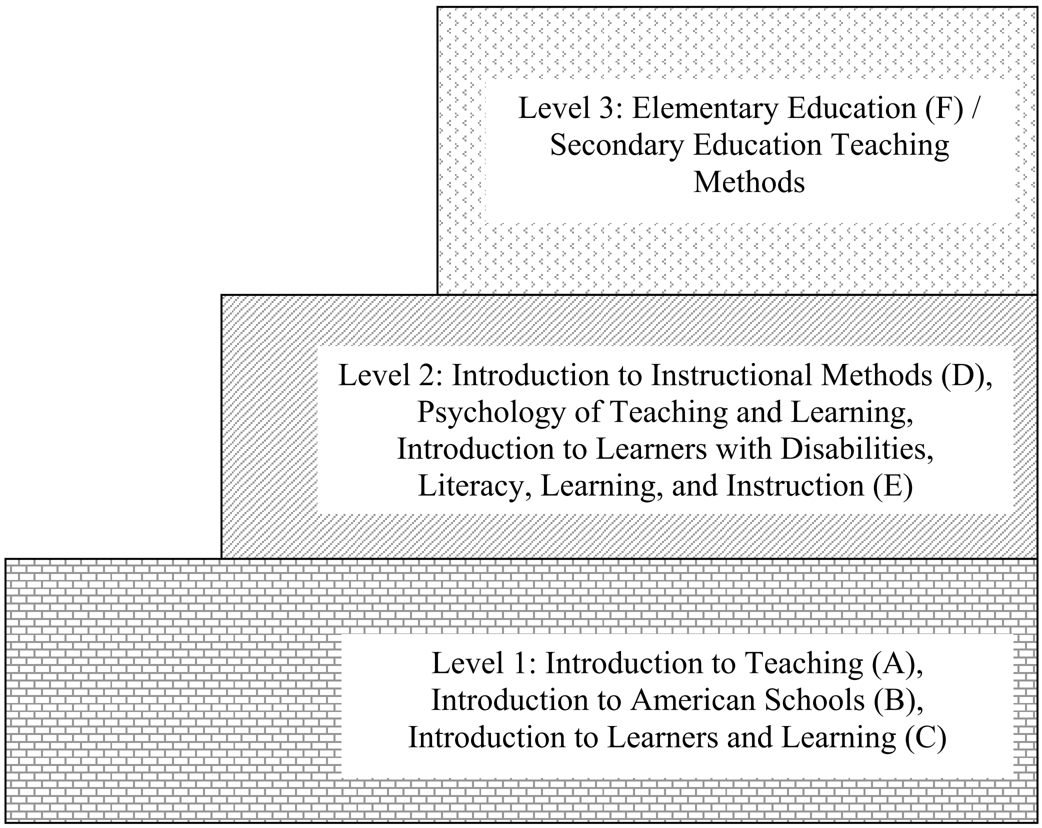
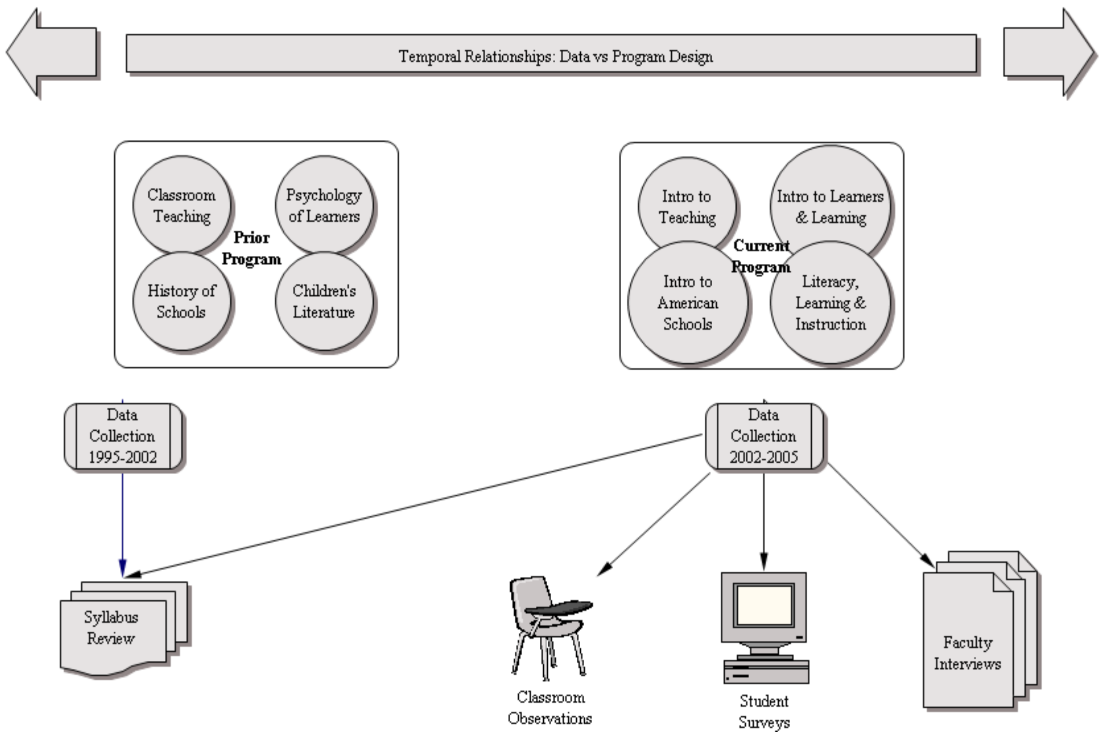


Figure 8: Temporal Relationships



Participants were selected based upon the results of the review of the syllabi for each course, availability and willingness of the faculty to participate, and different technology skill levels. This sample includes instructors who indicated in their course syllabus that they or their students would be using computer technologies during the course as well as faculty who had not yet adapted to the use of technology in teaching these courses. There were six instructors who participated in this study. Three instructors were chosen for the three level one courses, two for the two level two courses, and one for the level three course.

In some cases, participants had multiple syllabi for the same course, since they taught that course more than one semester in the period of time being studied (1995-2004). Thus, they may have modified their syllabus over time to include technology requirements or their intent to use computer technologies during the course. It is also possible that a participant may have taught, or may be teaching, more than one course in the set of teacher preparation courses involved in this study. Although the researcher was concerned with the possibility that a candidate participant may have chosen not to participate in the interview portion of the study, this concern was unfounded. In particular, the researcher thought this issue might arise with adjunct faculty since there was no compensation for their time investment in participation in this study. However, all invited participants were willing to participate in both the interview and observation portions of the study.

Instruments Used in Data Collection

The data collected in this study is of three types: 1) keywords and phrases used in documents reviewed 2) numeric values assigned to student responses to the electronic surveys and 3) transcriptions of one-on-one faculty interviews and notes recorded during classroom observations. The document review targeted the use of technology-related words or phrases, e.g. Internet search, word processor, presentation software application. It was also undertaken with the intent to identify constituent activities of the teaching and learning process. Thus, an attempt was made to match activities and technology use through the review of syllabi. The student surveys were designed to determine relative utilization (quantity and type) of technology tools by students and faculty engaged in this course sequence. The initial classroom observations familiarized the researcher with the purpose of each course, the instructors' objectives and teaching styles. Additional classroom observations were conducted to target the similarities and differences in the content, methods, and performance measures for the courses observed. The intent of the instructor interviews was to model the change process engaged by that instructor in moving from little (or no) technology integration to significant technology integration. Additionally, the researcher attempted to create state models identifying the past, current, and future vision of these courses with respect to technology integration. The interviews allowed the researcher to more fully understand the instructor's syllabus, observed course conduct, and the meaning the instructor associates with the keywords and phrases identified in both. This aided in understanding the implementation of the syllabus in the conduct of the course and the instructor's motivation behind the use of technology keywords in the syllabus. It also assisted in determining the process of change the instructor has experienced through their changing course requirements and the degree to which the instructor was satisfied with the then current state of their course.

Syllabus Review

The syllabi files for the teacher preparation courses selected were reviewed to identify all syllabi for courses offered in the 1995-2004 period that contained technology-related words or phrases. The keywords or phrases used in the syllabus were recorded along with the number of occurrences within that particular syllabus. Each syllabus was identified by course name and number, instructor's name, semester and year. A sample spreadsheet showing the data items collected from the review of course syllabi is available in Appendix B. The data collected during the syllabi review phase was analyzed using numeric comparisons of technology references among classes of the same courses as well as between course investigations at each level. In addition, a comparison was made across levels over time, in an effort to understand differences in technology integration across the teacher preparation program. Furthermore, concepts presented using similar wording, activities, or preparation strategies were identified, stored, and used to establish patterns across different syllabi for the same course. This assisted the researcher in determining the extent to which instructors' syllabi files follow a course template in statement of objectives and instructional activities.

Faculty Interviews

Participants were selected from the pool of candidates based upon the initial review of the syllabi for the courses identified above. It was estimated that there was the potential of having approximately seventy syllabi for each of the level one courses

(A: Introduction to Teaching, B: Introduction to American Schools, and C: Introduction to Learners and Learning) included in the study. The actual number varied from twenty-six to fifty-nine. Six faculty members were selected to interview, which is fewer than five percent of the teacher preparation faculty. Of these six, three (eight percent) were selected from the thirty-eight faculty represented in the syllabi review for the three level one courses. Two faculty were selected from the level two courses, which is thirteen percent of the fifteen faculty represented in the syllabi review for the two courses studied. Finally, there was one (eight percent) faculty member selected from the thirteen represented in the syllabi review for the level three course studied. These participants were selected based on the appearance of technology-related keywords and phrases in their course syllabus, interest in the project, and availability to participate. The participant permission and release form appears in Appendix B. As this form indicates, the purpose of the interview of this study was to gather additional data regarding the instructor's view of the activities necessary for learning, the role of technology in these activities, and the then current status of the course with respect to technology integration. The interview also assisted the researcher in understanding the language used in the course syllabus, its meaning and intent, from the instructor's perspective. Finally, the interview was intended to solicit the vision of the instructor with regard to future planning and design of the course, especially as it relates to technology integration.

The interview was a personal history rather than an observational study. Thus, there were anticipated gaps in the information provided. However, the interview provided sufficient additional data with regard to the instructor's choice to include technology integration indicators in the syllabus. Furthermore, the interviewee was able to describe the motivational factors involved in that choice. The interview was an open-ended interview, allowing the interviewee to lead the discussion with minimal redirection from the researcher. This design allowed the researcher to spend more time studying the underlying reasons behind the choices the instructor made rather than focusing on the outcome of those choices. Thus, the researcher used the questionnaire in Appendix B as a starting point in the conduct of the interviews. While these questions were part of each interview, they do not constitute the entire content of any individual interview.

Classroom Observations

Initial classroom observations were intended to help the researcher understand the interplay between the level one teacher preparation courses (Course A: Introduction to Teaching, Course B: Introduction to American Schools, and Course C: Introduction to Learners and Learning). In addition, these observations provided an opportunity for the researcher to become familiar with the instructors, their course objectives, their methods and styles of classroom instruction. The initial observations also gave insight into the demographics of the student population. Follow-up observations allowed the researcher to explore the quantity and type of instructor references to technology in the classroom, the students' reactions, and the demonstration of student products developed through the use of technology.

Notes made during classroom observations were either handwritten or entered into a word processing software package on a laptop computer. The note taking method used was the Corsaro method. Corsaro's note taking system is divided into four categories: field notes, methodological notes, theoretical notes, and personal notes. Field notes include a record of who is being observed, what is happening, why it is occurring, and how it is happening. Methodological notes are observations about the type of methods the researcher is using and its impact on the information being collected. Theoretical notes are annotations made during the observation reflecting personal insights or theoretical connections. Finally, personal notes describe personal factors associated with the observer or the participants that may be influencing what is being observed (Center for Excellence in Education – Indiana University, 1998, Techniques section, para. 1). This method provides an additional dimension to the coding of the qualitative data collected.

Student Surveys

To achieve triangulation, student survey data contributed the students' perspective with respect to the use of technology in their teacher preparation courses (see Appendix B – Student Online Survey Form – Fall 2002). The survey questions aligned with the tools and resources available to faculty and students in the College of Education. In particular, many of the questions were designed around the use of Blackboard in the conduct of courses. In addition to attempting to determine the areas of Blackboard used most by faculty and by students, the survey was seeking information regarding the nature of that use in terms of student-directedness, frequency, and relevance to course content. Students were also asked to indicate their level of use of a variety of technology tools and the method(s) to which they attribute their skill acquisition. Finally, the survey looked at accessibility issues for the students' technology endeavors. Although the survey was conducted online via links to the Blackboard site established for students in a field experience component course, there was no prior determination of students' comfort levels with respect to the use of technology. If conducting the survey online discouraged students with low technology comfort levels from participating, then this may bias the results by not capturing information from students with less technology experience.

This data comprised the quantitative analysis portion of the investigation. The survey instrument used to collect the student data is flashlight, an online survey generation and repository tool provided by Washington State University's Center for Teaching and Learning. The numeric data was downloaded from flashlight and converted to Excel spreadsheet format (see data sample in Table 1). Thus, the data was analyzed using statistical analysis software, SPSS. In addition to frequency distributions among the options on survey items, the researcher has investigated correlations between survey items and patterns in data from semester to semester.

Procedures Used

The initiation of this study required securing permission to access the syllabi for the teacher preparation courses involved in the study from the Department Chair for the Teaching and Learning Division of the University's College of Education. Review of the syllabi was conducted in phases: 1) the syllabi for the teacher preparation courses underwent a preliminary review to acquaint the researcher with the courses; and 2) the syllabi for one course were reviewed to identify frequently used technology-related keywords and phrases. These words were assigned codes that were used in the detailed review of a subsequent set of course syllabi. Additional keywords and interesting trends identified during the second syllabi review were incorporated into the next phase. 3) The third phase involved the review of syllabi for all courses, including the original two sets of syllabi. This review was conducted using the coding scheme established in the second phase. All data collected from the syllabi was coded and entered in Excel, where frequency comparisons were conducted within a course as well as across courses and levels.

A list of prospective participants was generated during the first syllabus review phase. Those instructors (faculty) who included technology-related keywords and phrases in their syllabus were selected as potential participants in the interview phase of the study. Permission to conduct research involving human subjects was requested of and received from the Institutional Review Board (IRB) Office of Research Administration (ORA) at the university. The participants identified were contacted and invited to participate in this study. There were several instructors who indicated preliminary willingness to participate in this study. Prior to conducting faculty interviews, each participant was asked to complete a participant release form (Appendix B).

Data Analysis

Data analysis consisted of qualitative analysis of syllabi reviews, faculty interviews, and classroom observations, as well as quantitative analysis of syllabi codes and student survey data. Qualitative data collected was coded using the Nud*ist data analysis software. This software allowed the development of a coding scheme used to differentiate the responses based on various factors, such as the number of occurrences of a particular word or phrase, expression of attitude, references to other faculty members, student roles in the learning activities, and types of student interaction. Coding the interviews, observations and preliminary faculty discussions facilitated interpretation of the results regarding faculty experiences in integrating technology in their courses. These experiences included faculty reflection on the locus of control over learning. Thus, this data was the faculty member's recollection and interpretation of their intention and implementation of the ideas expressed in the syllabus at the time of the course. The coding scheme for this project is available in Table 15 (see Appendix A). Each observation and interview document was divided into blocks. A block is roughly a sentence, or one entire concept or idea expression.

Quantitative analysis of the student surveys provided frequency distributions, which indicated trends in course changes (Table 3 in Appendix A). Statistical analysis of this data also suggested positive or negative correlations between survey items, indicating relationships between technology use by the instructor and technology use by the students. In addition, there were correlations between students' use of technology and students' observation of technology use in K-12 schools.

Summary of the Methods

The integration of technology in higher education is dependent upon the disposition and motivation of the faculty member and the students. In this study, syllabi were used as indicators of people's behavior. From a review of syllabi for specific teacher-preparation courses, a list of faculty who seemed to have adopted technology requirements was generated. This list was the participant pool from which interviewees were selected. Individual interviews were conducted to gather additional information about the faculty member's goals and motivation in adopting technology integration methods. The teacher preparation courses were observed and students from this program were asked to participate in a technology use survey. Data from the perspective of the instructor, the researcher, and the student was collected and analyzed. The intent was to identify common threads in the emergent theme of technology integration in higher education courses.

Chapter 4:

Results

Introduction

This study is concerned with the integration of technology in the teacher preparation program at a Midwestern university. According to promotional materials provided by the program, the participating university houses the largest teacher preparation program in its state, offering undergraduate degrees in elementary education, secondary education, early childhood education, physical education and special education. The College of Education (COE) provides 32 programs leading to teacher certification and seven graduate level degree programs. The COE has established initiatives that focus on the preparation of teachers for the 21st century, including: technology integration, community connections, academic partnerships, and faculty scholarship. These programs are evidenced by the creation of the COE Technology and Learning Center, a regional center for education and work programs, the COE's 14 endowed professorships, partnerships with 147 agencies in its community that serve children and alliances with 54 school districts, many of which are involved in the university's pre-service teacher field experience program (EMI Network, Inc., 2003).

Thus, the teacher preparation program of the university, its curriculum, faculty, and students, is a vital part of the educational community and beyond. In an effort to address the changing needs of public schools and their teachers, the COE took a proactive stance in 1996 and began the process of redesigning its entire teacher preparation program. The new teacher preparation course sequence was initiated in

2001. Along with the intentional alignment of required courses into three levels, the program was infused with additional field experience opportunities and adopted a planned technology preparedness initiative. Part of this work was in response to a white paper prepared by the Dean of the COE establishing technology integration and community collaboration as foundational elements in the 21st century teacher preparation program.

In restructuring the teacher preparation program, the faculty considered what they know from the research literature, from their experiences in the classroom and from curriculum options (theories) that have evolved throughout the 20th century. There were three key determinations made: 1) students needed more than one educational psychology class to establish a personal philosophy of education based on learning theories; 2) students needed more time in the field observing and working with teachers and learners in public school settings; 3) students needed exposure to practical applications of technology tools used to enhance learning (Interview, Course C Instructor, September 2002). To accommodate these objectives, three courses were designated as the level one courses in the teacher preparation program: Introduction to Teaching (A), Introduction to American Schools (B), and Introduction to Learners and Learning (C). Each course established an appropriate field experience requirement, with that component being focused on the classroom for A and C and occurring in the context of school board meeting attendance for B. Furthermore, it was proposed, and instituted on a trial basis, that the A and C courses be blocked so that their instructional sessions were back-to-back on the same day and their field experience hours were combined to occur on the second scheduled classroom day.

This way, the students could spend more consecutive hours in a K-12 classroom observing and assisting teachers and learners. In addition, the field experience days were periodically supplemented with lectures given by teachers in the field on various educational and classroom management topics. Thus, students considering entering the teaching profession would have first hand knowledge of the responsibilities and rewards of that occupation prior to their official application to the teacher education program.

With respect to the technology component, it was decided that the course content would be modified to accommodate activities requiring students to use specific software tools. For the Introduction to Teaching students, this requirement translated into a Microsoft Excel in-class activity and a Microsoft PowerPoint slide show presentation. In the Introduction to Learners and Learning course, students were introduced to web page development using Netscape Composer as a vehicle for presenting their final educational psychology research paper with links to sources and other supportive web sites. The use of technology in the Introduction to American Schools course was primarily centered on activities which occur throughout the level one courses: online quizzes, online discussions, use of Microsoft Word for essays and papers, and use of the Internet to conduct research and to identify quality educational resources.

Programmatically, redesign of the level two and level three courses was not approached in the same prescriptive manner. There was less emphasis on the integration of technology into the classes, both as an aid to teacher development and presentation of course content and as an instrument for student production of course artifacts. There was some indication that faculty in the upper level teacher preparation courses viewed the work that was taking place in the level one program as adequately preparing pre-service teachers in the areas of technology use and classroom integration (Interview, Course E Instructor, January 2004). Thus, there was not a concerted effort to teach technology skills and computer-based educational tools to students beyond the level one program. However, it was the intentionality of technology use in the level one program that made students' aware of the opportunities to integrate these tools into classroom practices. Thus, the reduced exposure of students to technology in the level two and three courses, especially those dealing with teaching methods, speaks volumes about the necessity of technology in education, or lack thereof.

In addition to the curriculum redesign, faculty at the COE experienced other significant changes during these years. The arrival of a new dean of the COE brought with it new methods of communication. Faculty no longer received newsletters and updates from the dean via paper distribution, rather all such communication was instituted electronically. Requiring faculty to utilize technology tools such as email was seen as one way of encouraging those unfamiliar with technology tools to become technology users. The dean was also instrumental in securing funding and approvals for the development of the Technology and Learning Center. This facility was designed to promote student and faculty use of educational technology tools. The configuration of computing equipment was ideal for small group interaction. There was also a separate area that could be reserved by faculty for large group sessions.

Finally, the COE was the recipient of federal funding under the PT3 program (Preparing Tomorrow's Teachers for Technology). The goal of PT3 was to have faculty model technology integration in their courses. This was accomplished through one-on-one and group meetings of faculty and peer mentors, technology use planning and analytic reflection (Suess, Hoagland and Polman, 2002). The PT3 team began recruiting and serving COE faculty in 1999, and continued through early 2003. Some of the faculty participants in this study also participated in the PT3 project. Thus, they had exposure to technology tools and mentors prior to the implementation of the redesigned COE teacher preparation program. Some were actively involved in both programs, while others did not participate in either opportunity. This was due in part to the fact that this study involved both full time tenure-track faculty and full time and part time non-regular faculty.

Level One Courses

The three courses designated as the level one courses in the teacher preparation program were: Introduction to Teaching (A), Introduction to American Schools (B), and Introduction to Learners and Learning (C). As was previously discussed these courses were designed to introduce students to teaching prior to their election to declare education as their academic major. Thus, these three courses expose students to classroom management issues and teaching practices, child development theories, and public school administration. Although the new teacher preparation course sequence was initiated in 2001, including the intentional introduction of technology tools, there was some evidence of prior use of technology in the precursor courses: Introduction to Classroom Teaching (which included topics from the current courses A and B) and Adolescent Psychology. Thus, the syllabi files for both the three new courses and the prior two courses offered were reviewed for references to the use of technology tools in teaching and evaluating student learning.

Introduction to Teaching

Since the winter semester of 2001, this course has exhibited fairly consistent use of particular technology references in the instructors' syllabi on file. Every syllabus reviewed included a reference to students typing reports and all but two listed the instructor's email address and referenced the use of Microsoft PowerPoint. Furthermore, 18 out of 21 instructors indicated their intent for students to use campus computer labs, either with their class or individually. Other references that appeared in more than half of the syllabi files were: students video-taping practice teaching activities, statement of a technology course objective, student use of email, student use of Microsoft Excel, and student reflection on and discussion of technology use in the field experience schools. In 2003 and 2004 semesters, most syllabi had the same appearance and very nearly the same content, indicating a type of "template" being used as a model by adjunct faculty. Thus, while the syllabus was merely an indication of the instructor's intent with respect to technology use in the course, faculty use of a "template" in syllabi creation may or may not be seen as an indicator of their intent to adhere to the syllabus in course delivery.

Figure 9 on the following page compares the average number of technology references in Course A syllabi by semester from winter semester 2001 to winter semester 2004. The averages were obtained from the total number of technology references per semester divided by the number of syllabi on file for that semester. The

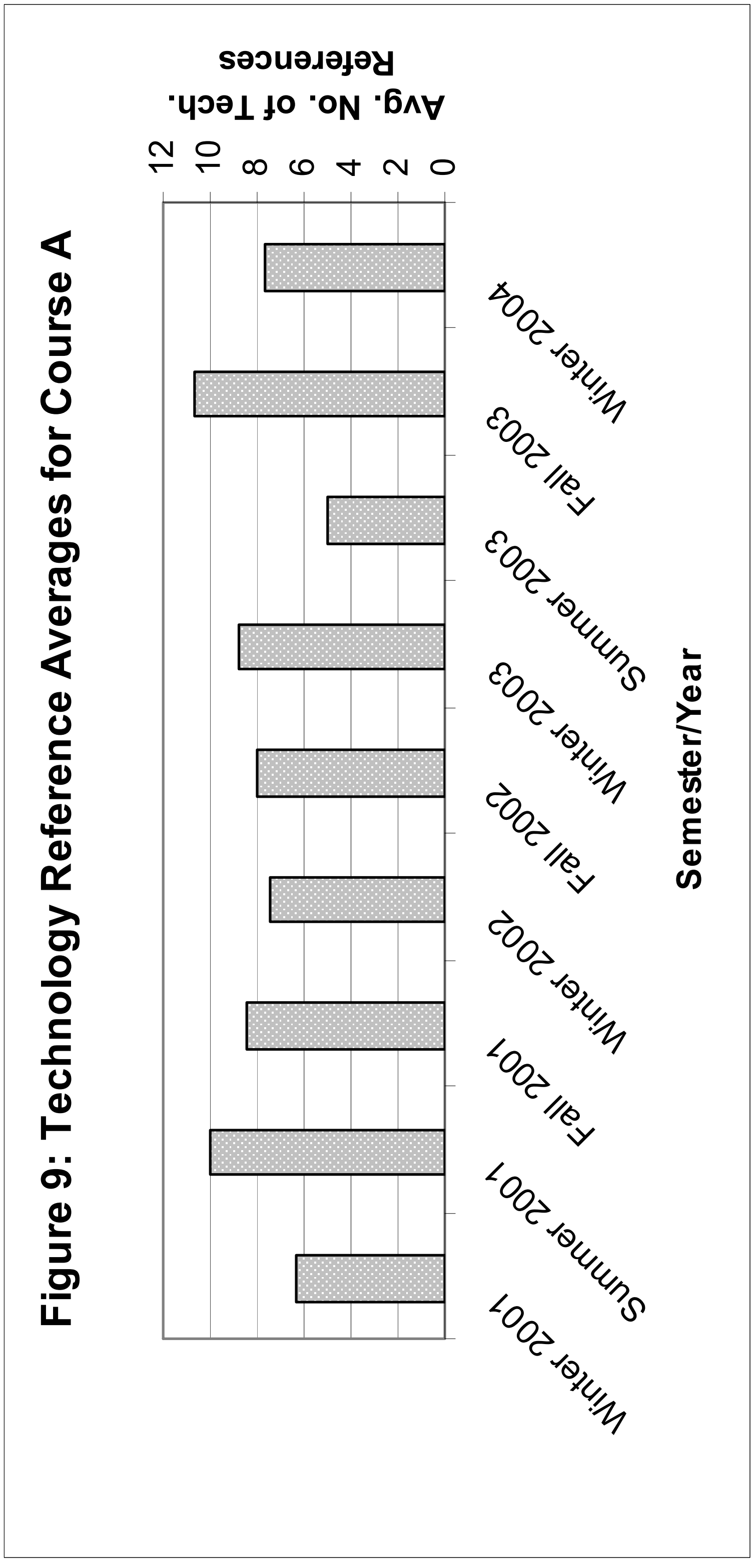


Figure 9: Technology Reference Averages for Course A

semester totals represent the sum of the totals for each instructor's syllabus as recorded in a syllabi review table (see Sample Syllabus Coding Form in Appendix B for technology reference categories). As the figure 9 chart shows, the average number of technology references over this period of time varies between five and approximately eleven, with both the high and the low value occurring in 2003. The net change from the first semester (winter 2001) to the last semester (winter 2004) of the syllabi study period is 1.34, or a 21.2% change (see Table 7 in Appendix A for Course A technology reference totals by semester).

Excerpt from Table 7: Technology Reference Averages for Course A

Sem	Year	No. of Inst'rs	No. of Tech Ref's	Typed Rep'ts	Video-tape	Tech Course Obj	Power Point	Email/ BB	Excel	Use Comp Labs	Tech Use – Field School	Inst'r Email
W	2001	3	19	3	0	2	1	1	0	2	2	1
S	2001	1	10	1	1	1	1	2	1	1	0	1
F	2001	2	17	2	1	2	2	1	2	2	2	2
W	2002	2	15	2	2	1	2	0	2	1	2	2
F	2002	2	16	2	1	1	2	2	2	1	1	2
W	2003	4	35	4	3	4	4	2	4	4	3	4
S	2003	1	5	1	0	0	1	0	1	1	0	1
F	2003	3	32	3	3	3	3	3	3	3	3	3
W	2004	3	23	3	1	2	3	2	2	3	1	3

However, comparing these numbers to the average technology references by semester for the precursor course, see figure 10 below, shows a marked increase after the restructuring of the level one courses. From winter semester 1996 to fall semester 2000, the number of technology references recorded for the syllabi files for the Introduction to Classroom Teaching course varied between one and five. There were no syllabi on file for the fall 1996 semester, thus it does not appear in the chart. Since

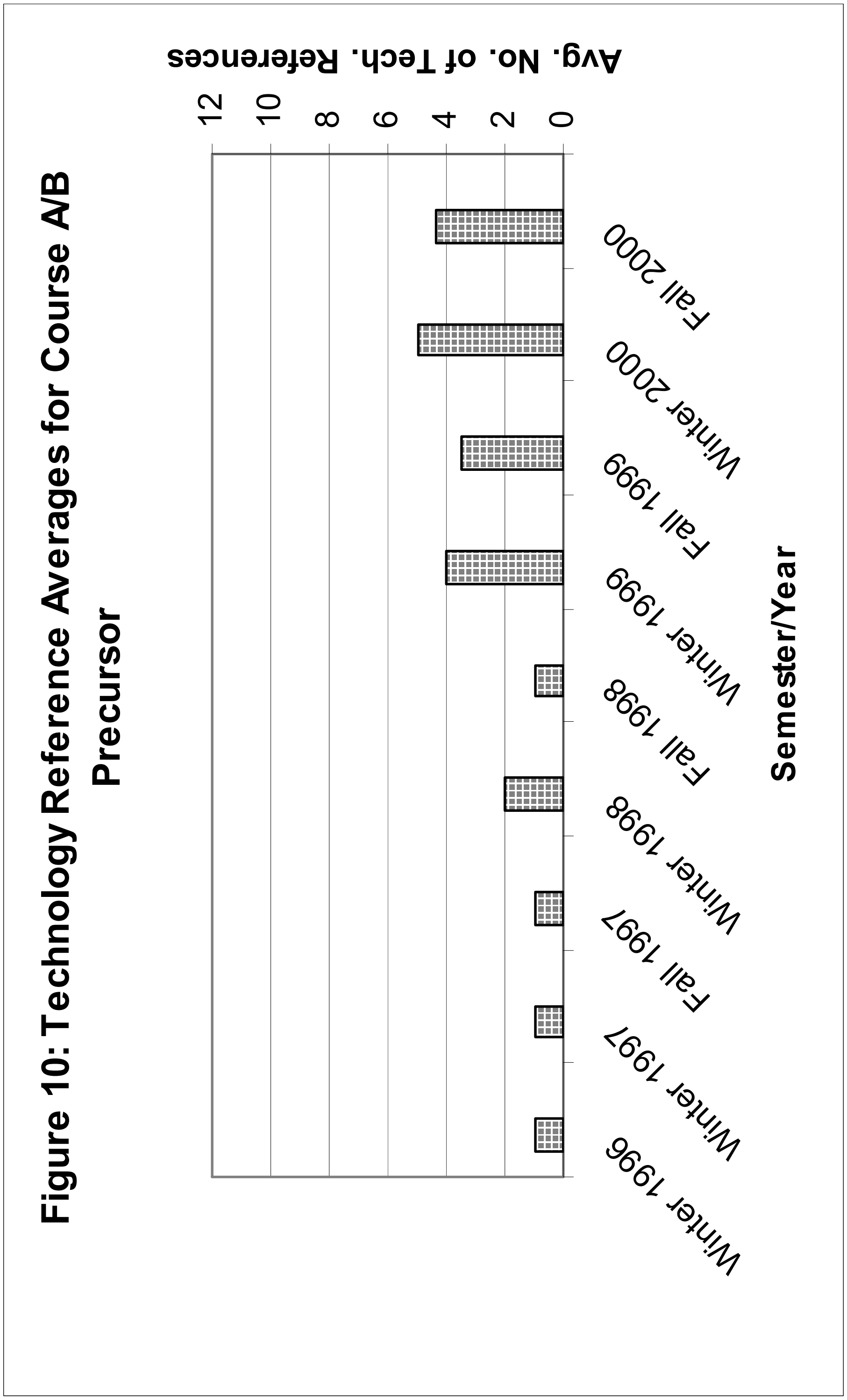


Figure 10: Technology Reference Averages for Course A/B Precursor
Avg. No. of Tech. References
0
2
4
6
8
10
12
Winter 1996
Winter 1997
Fall 1997
Winter 1998
Fall 1998
Winter 1999
Fall 1999
Winter 2000
Fall 2000
Semester/Year

there were also no syllabi on file for the summer semesters of 1996 through 2000, these semesters also do not appear on the chart. The technology reference data for the precursor course did not include any references from the second half of the syllabus coding table for semesters other than fall 2000. Thus, table 9 in Appendix A consists of the first half of the syllabus coding table for semesters prior to and including fall 2000 and one row of the second half for fall 2000 data values.

It seems that there was an overall increasing trend in technology references in course syllabi during the years leading up to the restructuring of the level one courses, with a net change from the first semester (winter 1996) to the last semester (fall 2000) of 3.0, or a 300% increase. In most semesters, the number of syllabi reviewed totaled three. Thus, the average for the semester could be greatly impacted by one instructor having several references to technology use. Likewise, one instructor having only one or zero references would have a large negative impact on the average for the semester. Yet, in only one semester, winter 2000, one year before the new courses were initiated, did the number of technology references reach the lowest level for the Course A averages.

Faculty Interviews and Observations

Prior to conducting classroom observations, a brief faculty interview was conducted. During this dialogue (August 2002), the instructor discussed her role in the program, "…there are two full time clinical faculty who serve as field liaisons for all level one and two courses. There were seven field schools originally, now there are partnerships with 150 schools. 700-800 students are placed at a school for field experience each semester. The field liaisons visit all of the classes that have a field experience component." In addition to these duties, the instructor taught two sections of Course A each semester and tried to coordinate with the other Course A instructors, especially adjunct faculty.

Our pre-observation discussion included an overview of the instructor's use of technology in the conduct of this course. Student use of the Blackboard course management software was required in this course, and students were introduced to it the first day of class. The instructor scheduled use of the Technology and Learning Center (TLC) in advance of the semester for the first day of class. During this whole-class visit to the TLC each student, working in pairs, would login to Blackboard. A second whole-class visit was scheduled for mid-semester when students were required to complete an Excel spreadsheet assignment with assistance from the TLC staff.

The instructor also indicated Blackboard was used to communicate each student's field experience site assignment. And, in Course A, it was used to post course documents, such as the syllabus and instructor prepared PowerPoint slideshows used in class. According to the instructor, the key components of Course A were discussion, "…I want it to be more engaging – there is a lot of discussion"; issues such as diversity and teacher compassion, classroom management, meeting students' needs, and finally, field experience expectations.

The first class session (Fall 2002) was primarily an opportunity for the instructor to tell students about the course, their responsibilities, and the instructor's expectations. At class commencement, there were 37 students in a room equipped with tables, chairs, and laptop computers to accommodate 32 students. Another 4 students were enrolled but not in attendance that day. This classroom was a "technology enhanced classroom" since it was equipped with computers for students' use. There was also a "computer on a stick" at the front of the classroom for the instructor's use. This system included a computer, monitor, keyboard, mouse, and a video cassette recorder (VCR) on a tubular metal frame with wheels. Both the computer and the VCR could display items via a ceiling-mounted projection system. There were ten "stickrooms", equipped with only the "computer on a stick" system and two "technology enhanced classrooms" available for education courses on an as-scheduled basis. Thus, instructors would request these rooms in advance (prior to final course scheduling) for the upcoming semester. However, there were 49 "stickrooms" and 10 "technology enhanced classrooms" elsewhere on campus for use by other colleges in the university.

The instructor encouraged students to consider switching to a night class, since night classes typically aren't as full as day classes. However, this was not well received. Of the 37 students in attendance, only one student indicated prior use of the computing equipment in the Technology and Learning Center. Several students had heard of Blackboard and some had experience using it in other courses. Every student was required to login to Blackboard and their student email account during the last portion of the class period, when the class walked to the TLC to use computers in pairs.

The most frequently occurring code in the first observation dealt with educational activities, and of these, the field experience component of the course appears most often. There were 81 codes for 42 blocks (typically a sentence) in the first observation document. Of these 81 codes, 24 were educational activities and 8 blocks (nearly 10% of the document) were coded for field experience. There were also 18 blocks coded for technology (one for technology, one for educational technology, four references to software, three for hardware, seven for Blackboard, and two for Internet_email), and 5 blocks coded for technology purpose (two for teaching_instruction, two for product_development and one for communication). Thus, much of the first day was spent explaining student responsibilities (especially educational activities in which they will engage), technology tools to be utilized, and the field experience component.

Subsequent classroom observations occurred in another room, a “stickroom”, since the class size was too large for the “technology enhanced classroom”. During these sessions, the instructor modeled the use of PowerPoint through her mini-lecture format. Several students had previously printed copies of the PowerPoint presentation on which they were taking notes. Mid-semester the instructor conducted a class on how to create a PowerPoint slide show. Students are required to present a summary of what they have experienced in their field observations and tutoring sessions, including a statement of how they view themselves in the role of teacher. This presentation must be accompanied by a PowerPoint slide show. This class session was primarily an instructor-led session in which the students received directions on how to use the software tool. The last part of the class session, the whole class moved to the TLC so students could work in pairs to familiarize themselves with PowerPoint. There were 21 blocks identified in this observation, with a total of 43 codes. Of these, 18 codes were for teacher-directed activities (13 blocks were coded as directions, 2 as explanation or response, 2 as instructor questions, and 1 as classroom management). Nine blocks were coded for technology (5 were software references, 2 were hardware, 1 was Internet, and 1 was a general technology reference). Three blocks were coded as educational activity (2 for presentations, and 1 for small groups or partners). Other codes included: student questions (1), student activity (1), number of students (1), student behavior (1), technology comfort level (1), and TLC (2). This class session involved the instructor demonstrating the use of technology tools to create educational products. Thus, the classroom portion of the session was primarily teacher-directed, with extensive technology integration. The student activity portion of the class session was a hands-on opportunity for students to engage in the use of technology. The student product, delivery of a presentation through the use of PowerPoint, dictated the student need for this type of class session.

Final classroom observations were conducted the last two weeks of the semester. During these sessions, students shared their PowerPoint presentations to small groups of peers. Only students presenting were required to attend each of the final few class sessions. During these observations, it was interesting to note that several of the students remarked on this being their first experience using PowerPoint. However, their slide shows made use of clip art images, various background templates, colors, animations, transitions, and sounds. In one session, there were two students out of the six presenting who experienced technology issues. One student couldn’t locate and open her file on the 3-1/2” diskette she brought to class. Another student helped guide her to her file through PowerPoint. The second student with technology problems kept getting an error message that the A: drive was not accessible. She had her PowerPoint on a 3-1/2" diskette and her sound files on a (compact disc) CD. After moving to another "stickroom", the PowerPoint file was opened from her backup diskette, but there were difficulties with the sound clips because the computer was too slow caching the files. Unlike the first student, she seemed to handle the frustration well, and proceeded through her presentation in a professional and confident manner.

The last observed session included nine students, seven of whom presented their class summary and reflection. One student commented on the lack of technology usage in the field school. She titled that slide "Out in the field – The Fantasy" and said the teacher did not use the computers in instruction while he was there. In addition, the students' only interaction with the classroom computers was an occasional half hour of game playing. This student seemed uncomfortable with technology and was surprised when some of the text fields "…didn't turn out like they did downstairs [in the TLC]." Even though the instructor had warned students that different computers may display text differently and encouraged them to practice their presentation in the classroom prior to their scheduled session. The fourth student presenting had a similar reaction, "There was a lot more animation when I did this at home…and wow those are some interesting fonts!" The fifth student had emailed her PowerPoint file to herself, but was unable to open it on the computer in the classroom. Another student asked if she had created the file on a Macintosh computer. Since she had, the instructor suggested she go to the TLC and get some help opening the file and saving it to her university network account. The student returned near the end of class and was able to complete her presentation. The sixth student had incorporated sounds as an effective addition to his PowerPoint slide show. Another student asked, “How did you edit your songs?” And the student responded with the name of the sound editing software he had used. This prompted another student to comment that “things are different on different Office platforms…different fonts and things like that.” Later, a student interjected that she needed “…to learn how to edit MP3 files.” Thus, a major component of these final sessions was technology, its use in preparing for class as well as its effective use in class.

Most of the students brought their PowerPoint files to class on 3-1/2” diskettes, as the instructor had suggested. It is interesting to note that although students had been using the Blackboard software throughout the semester, no one had ever saved files to their own digital drop box in Blackboard for later use. During the two sessions of student presentations, the class changed rooms three times because of problems with the A: drive on the computers. This underscores the danger of virus proliferation when students are encouraged to bring external media to share their computer files with their peers. However, using the university managed software system, like Blackboard or the students’ network accounts, should be less dangerous.

For the final two observations, there were 95 codes representing 67 blocks. Many blocks (19) were coded for technology level in these observations, about half of those were coded for comfort level, because some students seemed quite comfortable with the technology, and occasionally because a student seemed uncertain of how to access files or expressed discomfort in using PowerPoint. Other codes included: students (17 for number of students and 9 for student behaviors), educational activity

(4 for presentations, 3 references to field experience, 1 each for constructivist, individual activity, and writing papers), student-directed activity (4 for student activity, 2 for discussion, and 2 for questions), technology (9 for software, 5 for technology in general, 1 for hardware, 2 for Internet_email). One of the general technology references was a student's use of a digital timer to keep himself on schedule during his presentation. It was an unobtrusive, yet effective piece of technology.

Subsequent to the classroom observations, a faculty interview was conducted (see Interview Outline in Appendix B for a complete list of interview questions). This interview (fall 2003) revealed some very interesting points related to the use of technology in Course A. The instructor indicated that there are three technology requirements in this course: "Blackboard, email and the Microsoft Office package, it would be those three." The optional technology tool students use in this course is the Internet, "…when they are doing their PowerPoint, the ones that are more savvy do go out and find clips and art and things in the Internet. We don't really do searches because they do so much of that in other classes." However, when asked if the instructor used technology tools in the development of classes, the reply was, "No I can't say I have." Yet, when asked about the technology tools used to conduct class, the reply was, "Students create their own PowerPoint at the end, so I modeled a lot of PowerPoint styles and then in the end they create their own." So, the instructor does use technology tools to prepare for class, but perhaps because the technology she used, PowerPoint, was in some ways becoming less remarkable, she doesn't see it that way. Further discussion of the tools used to conduct Course A, included references to other Microsoft Office tools:

> Of course, the students did the Excel activity. I think the goal for [this course] was they at least get familiar with Microsoft Office. So of course they have to turn in all their papers and just this semester they had to use the digital drop box, which I really liked. They did the Excel activity, with, um, it doesn't really teach them Excel, but it gives them some experience with the database and spreadsheet and then the PowerPoint. So I would say I model it and then they have to do the application on all of those.

It appears there is some confusion about the tools, in particular with regard to the Excel activity and what the students are learning from it. Yet, the instructor seems eager to expose students to the various components of Microsoft Office and willing to use the tools as a means of demonstration. In response to question #35, "What were your reservations regarding the use of technology in this course?" the instructor shared this:

> I'm not good at coming to a group lesson on how to learn something. So with Blackboard, I think my goal has been just to add one new thing each semester. I didn't use it…, so for a while I was just using…I always loved grade book, so I used that right away, and then announcements and the email. Then finally with some help I added online quizzes, and then, like I said, this semester I did the digital drop box. So that was kind of my goal, to do it piece by piece and each time I found someone to tutor me one-on-one. Because I don't have the patience for people who are slower than me or faster than me, I just want to learn it and move on.

This is very revealing. In order for this instructor to integrate technology into Course A, there needed to be a benefit to both her and her students. In addition, she needed to master each skill at her own pace, through the assistance and support of a peer mentor. Tackling "one new thing each semester" was a method that would satisfy her need to meet the overarching technology integration objectives established for this course without being overwhelmed.

This instructor's definition of educational technology is very similar to those expressed by the other participants, "Well, I guess it would be technology used to facilitate or enhance the teaching and learning process." So she referenced this in describing technology integration with respect to this course:

> …But I also do a lot of mini lectures and use PowerPoint presentations…So I think that I did begin to use technology to enhance the instruction instead of just standing there. And I know the students love the Blackboard so they can keep current and know what's going on and taking tests online…

The Blackboard course management software is the common thread running through the interview. From her response to the first question ("How do you define technology?"), "Well I define it as using a computer in a variety of ways. I've used Blackboard a lot, I've incorporated it…" to discussing students' needs: "Blackboard is used and I am very proud to use it, it's just simply so easy to use, and the students like the immediate feedback…the accountability, [I] post grades quickly, they have to check." It is even the tool she references in her vision for future technology integration in Course A, "…probably my next thing would be on the Blackboard is to form them into these small groups. Now that they are reading two books now and they could have done those book talks…They could do that in groups…I could post the questions on the discussion board."

Other enlightening comments that give us insight into her view of herself as a technology user include: "Well, we've used Blackboard, gosh, more each semester, and I just love that. And I'm a pretty reluctant technology user. It's like when my mother forced me to do sewing. The same thing is with technology, you have to do a lot of trial and spend a lot of time and I'm okay if someone shows me what to do…" What an interesting analogy! Her comparing the acquisition of computer technology skills to learning to sew emphasizes the fact that there is more than one way to accomplish each task. It also relates to her "piece by piece" approach, as a sewing student would start with straight stitches and gradually add other, more advanced skills such as sewing darts, inserting zippers, and creating button holes. But the most telling part of her statement may be the connection between "when my mother forced me to do sewing" and "The same thing is with technology". Did she mean to represent a feeling of having technology integration foisted upon her? And, if so is it because she views herself as "a reluctant technology user"?

However one interprets these remarks, there is doubtless recognition of the instructor's accomplishments toward her personal technology skill acquisition goals. When asked what advice she would give to other faculty members attempting to integrate technology in their courses, her response was: "1) Jump in and do it even if you are very afraid. 2) Blackboard is fabulous. 3) Announcements, grades, email are the three easiest to start with. 4) Find a good mentor to help you." This simple list represents the core of the technology integration issue for educators. You've got to invest yourself, even though there is a cost. You need to appreciate and learn to use the tools available, but not all at once. And lastly, you need other educators to encourage, support and assist you.

Finally, educators need to acknowledge their capabilities in this area and recognize their shortcomings. This instructor clearly indicated there were tasks that were still beyond her:

> …I see the value in [virtual classroom visits], and I love doing it, I just don't think I have a good enough understanding of the technical…and I just don't want to waste anyone's time. I don't want to waste my students' time, I don't

> want to waste the classroom teacher's time, so that's the panic. What if I can't do it? It's all set up and nothing's running.

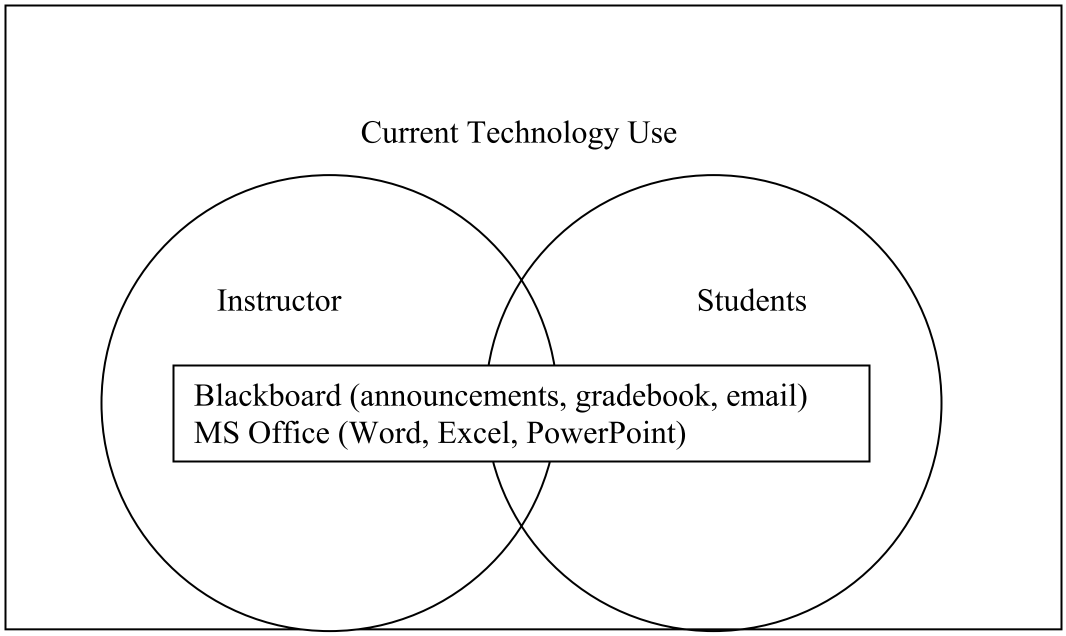
Even though there is value in the task, the instructor may not be the individual best suited to undertake it. While virtual classroom visits have been used in a variety of settings to virtually connect two populations, it is a relatively new practice in teacher preparation programs. The purpose is to allow multiple classes of pre-service teachers to observe the same educator practices in a K-12 classroom setting, which is not physically possible, but is possible through the use of video cameras and the Internet (Scordias, et al., 2003). For this instructor, the value is somewhat overshadowed by the technological components.

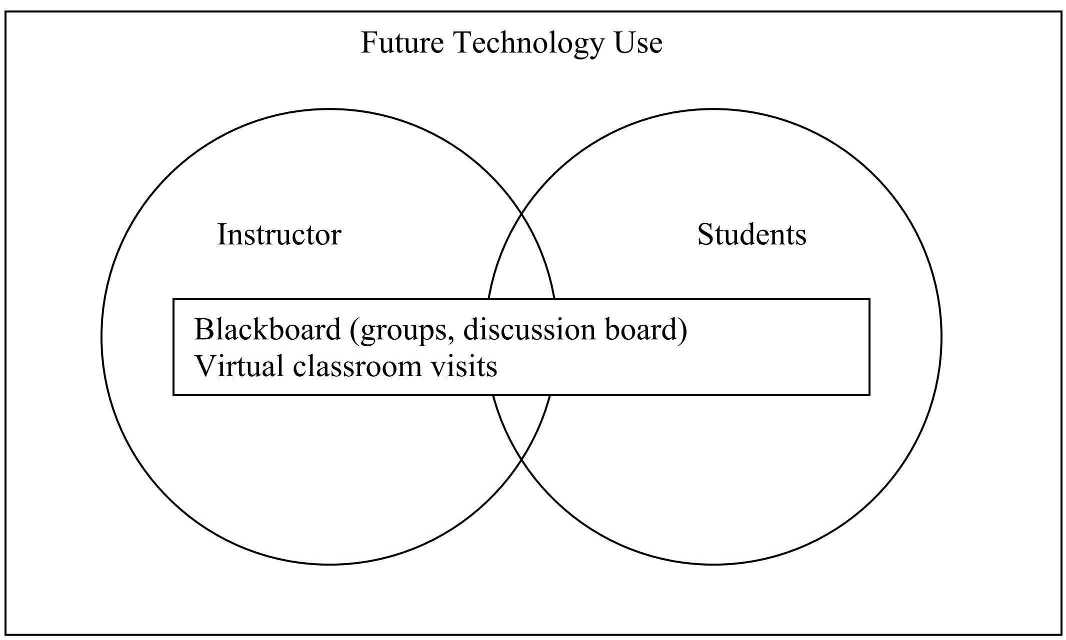
Thus, these documents identify opportunities to compare the current level of technology integration with the potential future role of technology in Course A. As is illustrated in figure 11 below, the Course A instructor is interested in advancing her use of technology in areas which directly impact her students. Thus, she wants to extend her use of Blackboard to include student groups and online discussions. She is also interested in her students' experiencing virtual classroom visits. So, the additional technologies that appear in the future use diagram are shared by the instructor and the students.

Introduction to American Schools

As was previously discussed, this course (B) was derived, along with Course A, from the precursor course, Introduction to Classroom Teaching. Thus, its syllabi files begin with winter semester 2001 and end with winter semester 2004 (as for Course A). Although no single criterion of the syllabi review was included in every syllabus, there were only two that did not reference the requirement of a web search

Figure 11: Current and Future Technology Use Diagram for Course A





activity. And two other syllabi did not include a technology objective in the list of course objectives, while all other syllabi reviewed did include such a statement of intent. All 2003 and 2004 syllabi, except one, included an online quiz requirement in the list of student activities while no prior syllabi included this requirement. Two faculty members did not include their email addresses on their syllabi, and two others did include them after 2001 but not in syllabi for semesters prior to 2001. As was also the case for other level one courses, the majority of syllabi did specifically reference the typing of papers (12 out of 18 syllabi). In addition, more than half (10 out of 18) also mentioned the use of email or specifically the Blackboard software. However, only three syllabi from 2001 and one from 2004 identify the campus computing labs as a student resource. As with the syllabi files for Course A, it seems that the 2002 through 2004 syllabi share a similar style, indicating a type of “template” being used by faculty teaching this course.

Figure 12 compares the average number of technology references in Course B syllabi by semester from winter semester 2001 to winter semester 2004. As before, the averages for this course were obtained from the total number of technology references per semester divided by the number of syllabi on file for that semester. The semester totals represent the sum of the totals for each instructor’s syllabus as recorded in a syllabi review table similar to the Sample Syllabus Coding Form in Appendix B. As the figure 12 chart shows, the average number of technology references over this period of time varies between approximately three and seven, with the low value occurring in winter 2001 and the high value in summer 2003. The net change from the first semester (winter 2001) to the last semester (winter 2004) of

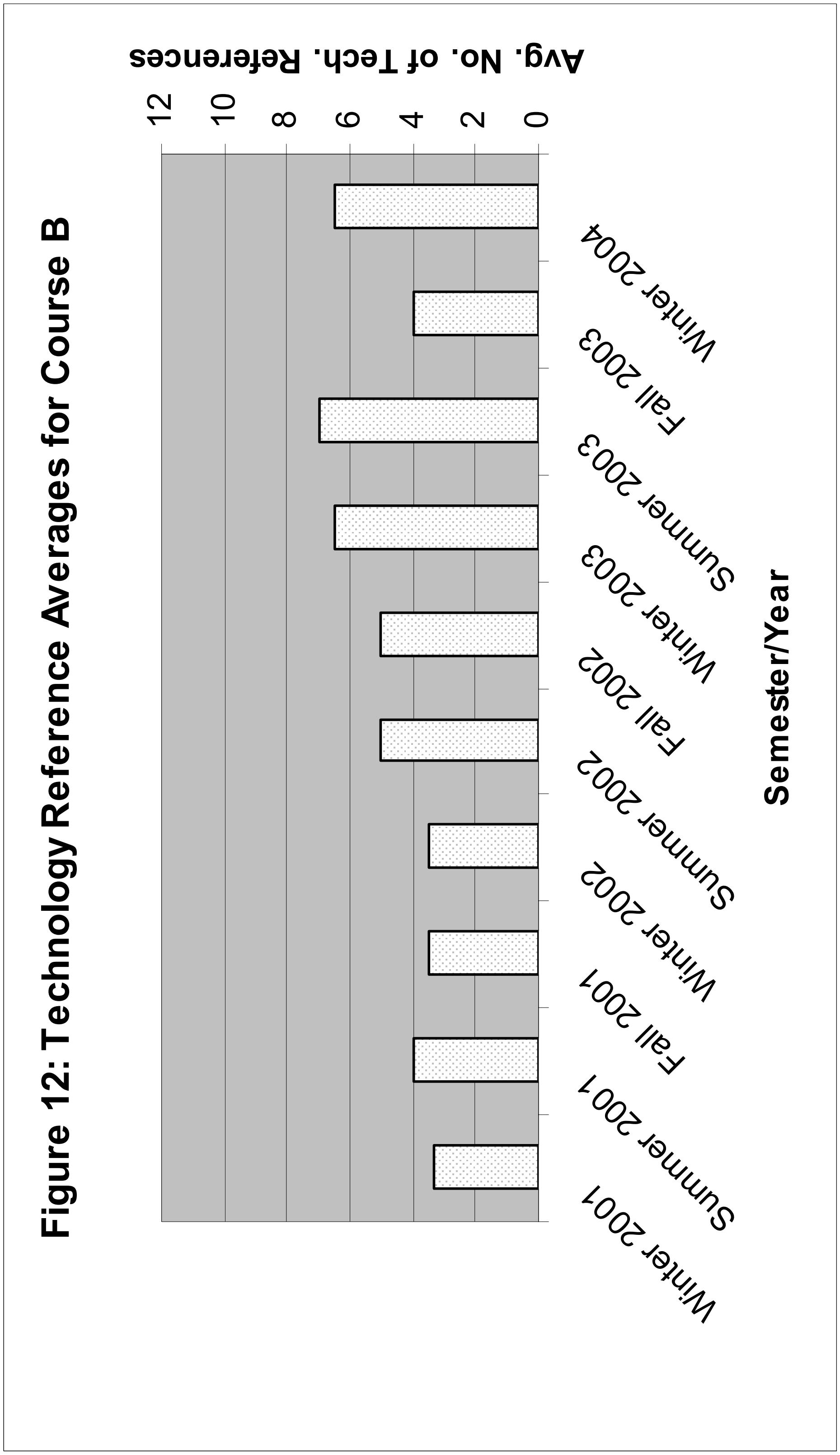


Figure 12: Technology Reference Averages for Course B

the syllabi study period is 3.17, or a 95.2% change (Table 8 in Appendix A shows the technology reference totals for each semester).

Excerpt from Table 8: Technology Reference Averages for Course B

Sem	Year	No. of Inst'rs	No. of Tech Ref's	Typed Rep'ts	Web Search	Tech Course Obj	Email/ BB	Online Quizzes	Use Comp Labs	Inst'r Email
W	2001	3	10	1	3	2	0	0	3	1
S	2001	1	4	1	0	1	1	0	0	1
F	2001	2	7	1	2	2	1	0	0	1
W	2002	2	7	1	2	2	0	0	0	2
S	2002	1	5	1	1	1	0	0	0	1
F	2002	1	5	1	1	1	0	0	0	1
W	2003	2	13	2	2	2	2	2	0	2
S	2003	1	7	1	1	1	1	1	0	1
F	2003	2	8	0	1	2	2	1	0	1
W	2004	3	19	3	3	2	3	3	1	2

While there is an increasing trend after the restructuring of the level one courses, comparison of the Course B numbers to the average technology references by semester for the precursor course, as shown in figure 10 on page 67, indicates this increase in technology references originates just prior to the 2001 restructuring. The final average values for the combined course (5.0 in winter 2000 and 4.0 in fall 2000) were slightly higher than the initial value for Course B (3.33 for winter 2001). However, the average values for Course B match or exceed the maximum (5.0) for the precursor course, Introduction to Classroom Teaching, beginning in the summer 2002 semester. For Course B, the number of syllabi reviewed each semester was typically one or two, except two winter semesters where there were three syllabi on file. So, again, the average number of technology references per semester could be greatly impacted, positively or negatively, by one instructor. Also, while the highest level for Course B (7.0) exceeds the highest level for the precursor course, this value falls below the highest level for Course A (10.67) and even below the overall average (8.04) for Course A across the nine semesters studied. So Course B demonstrates some gain in technology references over the precursor course, but not to the extent realized in the new Course A.

Faculty Interviews and Observations

Classroom observations were conducted on three separate occasions in the fall semester of 2002. Prior to observing the faculty member's teaching, a pre-observation interview was conducted (August 2002), in which the college's focus on four strands (technology integration, community connections, academic partnerships, and faculty scholarship) was discussed. The instructor wanted to address these strands in the teaching and learning at level one, so he chose to focus on six or seven educational philosophies in this course. The compilation of works studied included the text book selected for the course and various web sites which students could access through the "External Links" feature in the Blackboard software. As has been previously noted, the Blackboard course management software provided a technology thread for this course. In addition to directing students to the assigned reading on the Internet via "External Links", the instructor used the online assessment capabilities of Blackboard to conduct multiple choice and true/false tests over the material covered in class and/or the reading assignments.

While an advantage of this use of technology was the reduction in time spent grading assessments, since the software checks the students' responses, grades the test, and reports the results immediately, the instructor noted a few disadvantages.

Only recently had he tried to load test bank questions from the textbook publisher, previously the instructor needed to compose each question, typing it in using the highly structured assessment editor's interface. This was a very time-consuming task. There were also user issues, if multiple students attempted to take the assessment at the same time, the site would start to shut down on them, leaving students' sessions locked so they could not complete the test without asking the instructor to reset their attempt.

However, being able to share the electronic tests with other faculty teaching the same course would be a great advantage. From his perspective, variability in assessment across different sections of the same course was a serious issue. In addition, he was concerned with ways to utilize technology to assess students' deeper understanding of the philosophies studied. At that time, he required they write a paper on their personal philosophy of education. This task did require the students to use Microsoft Word or a similar word processing software, but it was submitted as a paper product, not an electronic document. He hoped to move toward using the Blackboard "Digital Drop Box" for student submissions in future semesters. Ultimately, he would like to replace the paper with a student project in which students design a school and a curriculum based on their educational philosophy.

This course was designed to include two web-based assignments; one required students to search for articles regarding contemporary educational issues at the local, regional, and national level. The other was a search for five web-based school models. This assignment led into the study of how technology was changing education. He was interested in developing an online version of this course to be offered as another format option for students.

Other ideas for the future of this course expressed include offering an in-service training for all adjunct faculty teaching the course so they are able to use the technology components he had developed and to align the instruction and assessment in accordance with a standard course syllabus. He was also concerned about the students' lack of legal knowledge and the growing need for this educational component.

A critical element in the level one teacher education program was the field experience requirement. There were 148 partner schools accepting students for their field experience hours. In the past, students were notified via email of their field experience school assignment. At the time of this interview it was handled through the Blackboard system. A course site called "Field Experience" had been established. Each student referred to this site to find their school assignment. Each level one instructor was also assigned a school. Thus, they could conduct seminars and meetings with the students at their field experience site. So, technology was recognized as an administrative aid in the field assignment task.

As we discussed the calendar of course activities for the fall semester, he indicated his perspective on teaching technology tools as a lesson on how we educate. He saw technology as a means to promote the shift from teacher as lecturer to teacher as knowledge base. He introduced students to the Blackboard software during the first class session, showing them where they can find documents and how they can access instructor-selected web sites. He also directed his class to the Technology and

Learning Center (TLC), identifying it as a resource to support their learning. He stated that he would take his classes to the technology fair held in the TLC later that semester. Finally, he discussed the role of teachers in establishing social democracy and how this relates to the "digital divide" our nation faces with respect to technology in the classroom.

The first classroom observations were conducted in two sections of this course on August 26, 2002. The instructor's principal objectives for this session were to introduce the students to the course, establish expectations, and to have the students begin to get acquainted with each other. The first session consisted of 37 students, 14 male and 23 female. This class met in one of the larger classrooms equipped with a "computer on a stick" for the instructor's use. The front wall of the room had a blackboard over which the screen could be lowered to display images from the computer or the video cassette recorder strapped to the tubular metal frame of the "stick". There was a projector mounted in the ceiling and a control pad on the front wall. The students sat in traditional desks arranged in six rows facing forward.

The instructor started by asking the students whether they had used Blackboard to try to access files for this class. A few students indicated they had trouble with the Blackboard file folders being empty for this course. The instructor suggested they try again. Then he told the class they had a paper of introduction due at the next class session. He said he wanted the paper handed to him in hardcopy, not emailed to him. Next, the instructor directed each student to make a nametag which would be collected at the end of class and then distributed each class session.

The main activity of the first class session focused around the students' completing a note card. The directions for doing this were in a Microsoft Word document displayed on the screen at the front of the room. The note card contained contact information, including the students' university email addresses, on the front side. The back side of the card was used to write specific data used for the ensuing discussions: 1) the student's recommendation of a book, movie, television show or event, 2) the student's favorite web search engine, favorite website, and why for each, 3) the name of the individual who has been the most influential in their life and why. Then, the students were directed to rearrange themselves in groups by the color of their name tags. Each group consisted of six or seven students. They discussed the first item on the back side of their note cards. Next, the students moved to form groups with only one person of each color in the group. These groups discussed the second item on their note cards. Finally, the students were instructed to re-arrange themselves in groups by the numbers on their name tags, with only one number per group. These groups discussed the last item on their note cards.

Once the class reconvened as a whole, with the desks moved from their circles back to the six rows, he asked them why they went through this activity. He directed the discussion to diversity and their responsibility to this community of learners. Then he addressed the role of technology in this course and demonstrated the use of Blackboard to access course materials and quizzes. He introduced the different areas of the Blackboard course site the students would be expected to use: "Course Documents", "External Links", "Student Tools", and "Announcements". When a student said she could not get logged in to Blackboard, he suggested she seek assistance in the Technology and Learning Center.

The first class session in the second section observed followed the same agenda of activities. The observation notes for each section consisted of 59 blocks (typically a sentence), with the earlier section having 111 codes recorded and the later section having 118 total codes. In both sections the majority of the codes dealt with teacher activities, 33 out of 111 for section one, and 30 out of 118 for section two. This is due to the fact that the first session involved significant time spent with the teacher giving directions and providing explanations to the students. Approximately 13% of the observation notes dealt with student activities, 14 codes out of 111 for section one and 15 codes out of 118, since the students were engaged in small group discussions and question and answer activities. For section one, 16% of the codes (18 of 111) were technology codes (3 for educational_technology, 2 for technology_integration, 3 for software, 1 for hardware, 7 for Blackboard, and 2 for Internet_email), and 8 for technology purpose (3 for classroom_management, 1 for teaching_instruction, and 4 for communication). Similarly, for section two, 20% of the codes (24 of 118) were technology codes (3 for educational technology, 3 for technology integration, 2 for software, 3 for hardware, 8 for Blackboard, and 4 for Internet_email), and 6 for technology purpose (3 for classroom management, 1 for teaching_instruction, and 2 for communication). Also, a large number of codes appeared in both observations for students. In section one there were 13 student codes used (12% of the 111 codes). These were allocated as follows: 2 for student needs_interests, 5 for number of students, and 6 for student behavior. For section two, there were 22 students codes recorded (19% of the 118 codes) as: 1 for student needs_interests, 19 for number of students, and 7 for student behavior. These statistics reflect the fact that the first session engaged the students in movement and several small group discussions. The first class meeting was also an opportunity for the instructor to share expectations, student responsibilities and technology tools to be used in the course.

The remaining three classroom observations were conducted in section two class sessions only. These observations were conducted during the sixth week, the eighth week and the thirteenth week of the semester. Thus, this gave the observer an opportunity to sample the course at the beginning, near mid-semester and at the end of the semester. During the second classroom observation, the instructor gave the students directions and tips for taking their first online exam. The instructor referred to this assessment as a "mastery of material" assessment, since the students can repeat the assessment until they achieve a grade with which they are satisfied. Therefore, he suggested they try to answer all questions first without using their notes, especially since the exam is timed and the students are limited to 50 minutes for each of the three parts. Then, after receiving the correct/incorrect feedback, the students can refer to their notes to clarify any questions they could not answer before retaking the assessment. The second main topic in this class session was the philosophy paper they would write. To prepare for this activity, the instructor had students discuss in small groups their favorite philosophy, which one they preferred and why.

The notes for the second classroom observation consisted of 45 blocks, with 101 total codes used. As before, the majority of the codes (29 out of 101, or 29%)

dealt with teacher-directed activities (2 for teacher_activity, 13 for directions, 1 for classroom_management, 8 for explanation_or_response, 1 for discussion, and 4r for questions). However, a large number of codes (15 out of 101, or 15%) were technology codes (1 for educational_technology, 3 for technology_integration, 1 for hardware, 8 for Blackboard, and 2 for Internet_email). Seven (7) blocks were coded for technology purpose (6 for teaching_instruction and 1 for communication). Similarly, there were 16 codes used for educational activities (2 for small_group, 1e for whole_class, 3 for writing_papers, 4 for reading, and 6 for tests_quizzes) and 9 codes for student-directed activities (1 for student_activity, 1 for student_initiated, 1 for discussion, and 6 for questions).

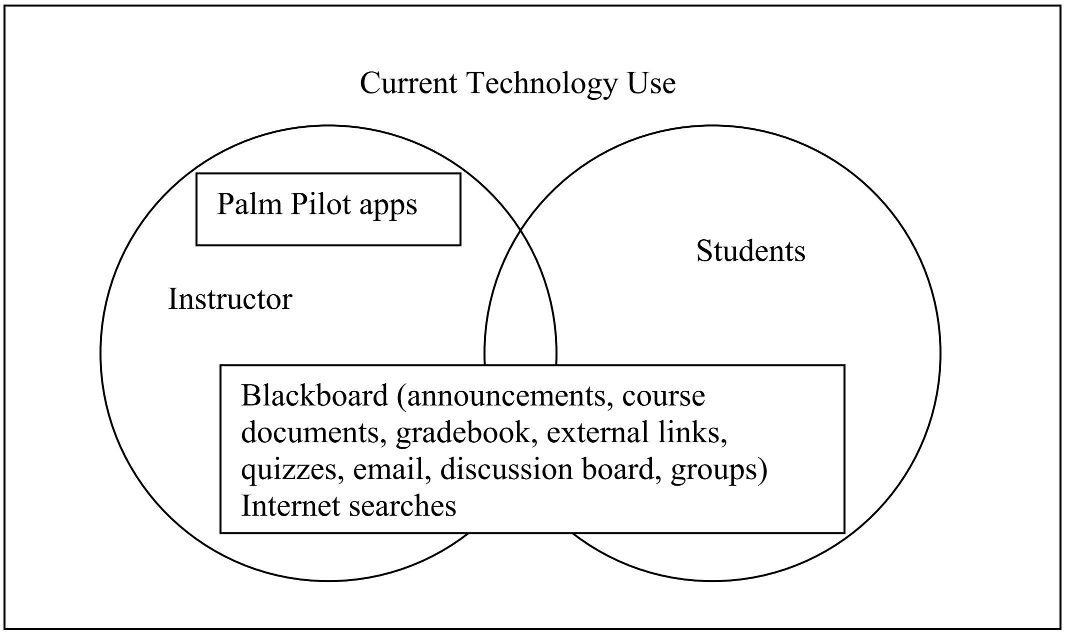
Observation number three occurred during week eight of the semester, or at mid-term. This session was primarily a class discussion focused on web-based school reform. Thus, for the 31 blocks of notes, there were 5 technology codes used (the total number of codes recorded was 34). All 5 technology codes were for Internet_email. These same 5 passages were coded for technology_purpose as teaching_instruction. As with each of the other observations, there were a large number of codes (5 of the 34) from the educational_activity cluster (2 for small_group, 1 for each of the following: individual, research, and writing_papers). In addition, there were 7 out of 34 codes for teacher-directed activities (3 for directions, 3 for classroom_management, and 1 for questions). Thus, the instructor's style of teaching involves student discussion, using technology in the classroom as well as having students use technology outside of the classroom, and typically follows a question – discussion – summary format.

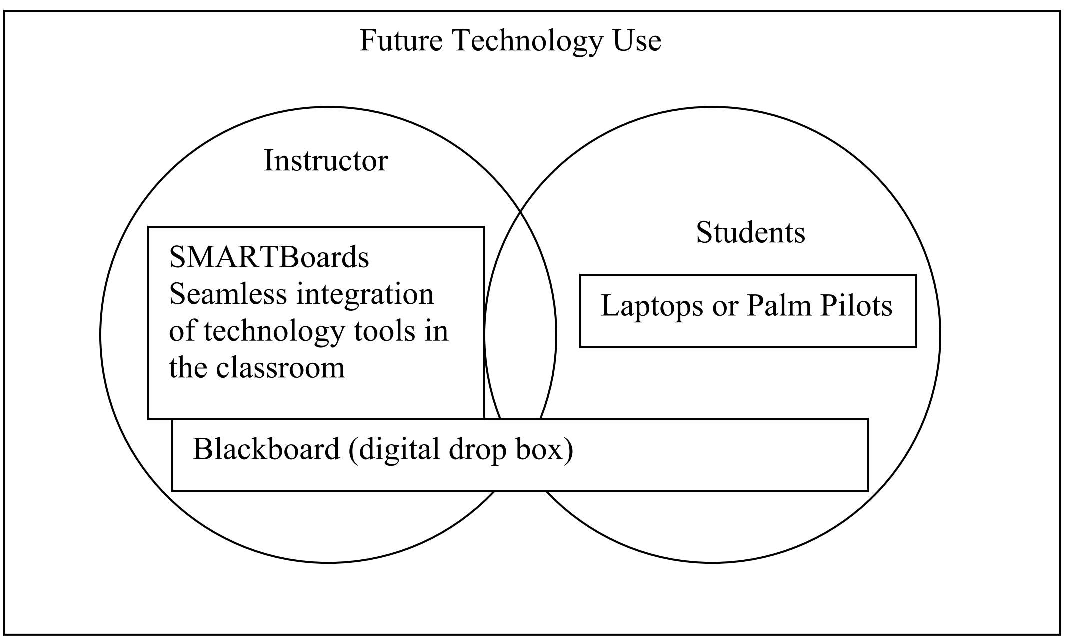
The final classroom observation (November 18, 2002) was a session in which the instructor did not include small group discussions as had occurred in each of the other observed sessions. However, nearly half of the class time was allocated to student participation in a whole class discussion of their observations of the classes they worked with during their field experience. Since the students had experienced many small group discussions with different members of the class, most seemed comfortable sharing their thoughts and experiences with the whole class. The central theme of these discussions was the role of technology in education. The session started with the instructor sharing information about current educational technology tools and uses (web cameras in classrooms, computerized notebooks to convert handwritten notes to digital text, AP courses online for rural schools, Internet access on cell phones, etc.). He asked students to consider these two questions: "How can technology raise test scores?" and "How can technology improve education?" Then he addressed government funding to encourage change in academia via programs such as the Title IID Enhancing Education through Technology Program. Finally, the instructor encouraged the students in class to "Find out the numerous ways you can utilize technology to orchestrate your instruction."

The notes from this session consisted of 77 codes over 41 blocks. Of the 77 codes, 34 were technology codes (8 for educational_technology, 3 for technology_integration, 3 for software, 11 for hardware, 3 for Blackboard, and 6 for Internet_email). Seven (7) codes were used for technology_purpose (4 for teaching_instruction and 3 for communication). The second largest category for codes used (17 out of 77 codes) was teacher_directed (7 for lecture, 2 for directions, 2 for explanation_or_response, and 6 for questions). The 6 educational activity codes included: 1 for field_experience, 1 for whole_class, 1 for individual, 2 for writing_papers, and 1 for tests_quizzes. The final two class sessions were to be a panel of administrators from area schools and course evaluations. Thus, the students would be participating in these sessions via questions, discussion, and written responses much as they have been active participants in the observed sessions. However, there were few opportunities for students to direct the course of events in the classroom. It appeared that the student-initiated and student-choice activities were the papers and projects they completed outside of class. Technology requirements for these out-of-class activities included the use of Microsoft Word, the Internet, university email, and the Blackboard course management system.

The final data collection piece for this course was a faculty interview conducted at the end of the fall 2003 semester (see Interview Outline in Appendix B for a complete list of interview questions). This interview provided insights into the instructor's view of the future of Course B and the technology required to achieve that vision (see figure 13). He indicated he was "…rewriting the course and will focus on issues of popular culture, a virtual timeline." For example, in the 1600-1800 era, the printing press influenced education; later periods included influences from electricity, the radio, and television; this era, 1990s and beyond, will realize the influence of the Internet on education. He claimed "…technology either reflects or drives change. Look at how communities have changed due to electric lighting, central heating and cooling, and travel. So too have schools changed." Furthermore, he saw technology as being ubiquitous, so he was "…able to facilitate and discuss

Figure 13: Current and Future Technology Use Diagram for Course B





topics, so when I get to my video clip it's there at a button push." Some day, technology will free the instructor so he can focus on building relationships among data elements rather than worrying about where it is stored. Instructors will be able to create in the classroom, make changes to instructional materials on the fly, adapt to the spontaneity of the classroom.

His vision of the future was influenced by his definition of teaching:

> [I] believe teaching is a performing art. I want to learn. I want to overcome my own frustration with my own public undergraduate and graduate education. Technology allows me to meet the needs of my class. Every child should be able to learn what they need to learn, taking artificial time out of the process.

This is what has motivated him to integrate technology into this course, along with being given "…the opportunity to do so." His advice to other faculty members attempting to integrate technology in their courses was "Do it or die! ...our customer base will eventually say 'I can buy it online and have a good experience doing it and get it done earlier.' …If you are serious about your teaching, not just being a service provider to students, [you will] do it or die!" So, he saw educational technology as the delimiting factor in measuring the success (and continued existence) of traditional higher education institutions as they compete with online educators for a student population. At that time, he saw it as a necessity, not a choice.

When asked whether he used technology tools to develop his courses, the instructor said, "Yes! I do research using the Internet. I use [Blackboard] for instruction and assessment. I use a variety of media – video tapes, film strips, CDs, and palm pilot applications." He spoke of the process of rewriting the syllabus for this course, as part of the reorganization of the teacher preparation program: "We figured out which instructional technology application was best suited for that course – an instructional tool, an evaluation tool, or a student-usage tool." Blackboard usage was identified as being key to Course B. For Course A the emphasis was on students learning to use Microsoft PowerPoint and in Course C they learn to develop a web page. So all faculty, including adjunct faculty members, teaching Course B must use Blackboard. This includes assessing student learning by having them take online exams, using the grade book, using email through Blackboard, and having students submit their final philosophy paper via the digital drop box. During the fall 2003 semester, he started using the discussion board component of Blackboard for this course. He randomly assigned students to small groups on Blackboard and posted the same discussion questions for the students to review and comment on within their groups.

Although the instructor saw Blackboard as being the technology focus for Course B, Blackboard usage was not restricted to this course. In fact, it appeared to be the common technology thread throughout the teacher preparation program's level one courses. As stated in the instructor interview for Course A, "…Blackboard is so easy to use and I use it a lot because it helps students keep up-to-date with what's going on in the classroom…" So, this course management software made it possible for faculty and students to get a toe-hold on technology in an educational setting that informs, connects, and advances users.

Question #8 asked whether there were specific technology tools students were required to use in this course. In addition to Blackboard, students had to use Microsoft Word to type their papers. However, he noted it is "…still not as convenient to give electronic feedback" on student papers. There is a gap between communication and learning that needs to be addressed. Educators need tools to assist them in providing meaningful, instructional feedback in a shortened time frame. It seems that technology has speeded-up the process of delivery only to shine the spotlight on the real bottleneck, an instructor's reflective review of the work submitted. While online quizzes help to provide immediate feedback to students, they do not address the deep-learning assessment that teaching requires.

Then, when asked whether there were other technology tools optionally used by his students (question #9), the instructor responded, "Students take laptop notes; some use palm pilots to take notes. They like it when I post my notes, major point summaries, for them to download. Two students used audio recorders because of reading disabilities." Thus, technology use in the classroom encompasses more than the teacher-driven computer file projection system witnessed in the classroom observations. This instructor views technology in the classroom as "…any use of any electronic device to enhance learning, teaching and assessment." The key is integrating these tools on an individualized basis to meet each student where he is currently and facilitate his movement to where he needs to be at the end of the course. After all, isn't the promise of educational technology the ability to let students learn at their own pace, using their preferred methods?

When asked how technology applies to the teaching and learning activities of this course, the instructor said, "…writing papers does not require technology, nor attendance at a school board meeting…we could do it all without technology, but technology enhances their learning and my ability to assess." He went on to say that an interesting technology exercise would be to have the students keep a log from the time they arose from bed until they arrived at school of how many different ways they've received input, Internet news, email, satellite radio, television, etc. Again, his position was that technology is ubiquitous, so it is already part of the learning process. As educators we simply need to make that connection more explicit.

Finally, when we discussed activities that have been introduced in the course because of technology and the benefits students derive from their use of technology in this course, he pointed to the web searches for current articles on school reform, online quizzes, and the use of Blackboard to contact thousands of people at one time regarding field placements. He stated that, "Technology has focused me on the impact on the learner. As an educator, technology is driving how I am re-organizing the material. Personally, I am making changes that will impact the technology." The benefits to the students include "…more in-depth coverage of the material. They control about 75% of their grades because of the way I use technology [for mastery assessment]." And, "…most importantly, seven to ten years from now it will make them more likely to interact with students in the way students want." He spoke of the digital divide as being profound, as witnessed by his students in their field experience activities. There is a great disparity between the K-12 schools in terms of computer availability and student skills.

Two other significant issues that arose in this interview are our need to handle the 24x7x365 aspect of technology. As he said, "I need time when I'm completely unplugged." Technology promotes the student misconception that they have access to their instructor all the time and it is difficult to put parameters around that. Also, we discussed the issue of becoming “a beginning student again” when we undertake a new learning initiative, like bringing Blackboard into our courses. It’s “uncomfortable”; there’s a “learning curve” we have to address; time has to be spent “figuring out what you are and aren’t going to do [with it]”; but it makes us “more empathetic” to our students.

Introduction to Learners and Learning

Unlike Course A and Course B, this course (C) is not a derivative of the precursor course, Introduction to Classroom Teaching. Rather, Course C, Introduction to Learners and Learning evolved from an earlier version of adolescent psychology. Since Course C and its predecessor are similar courses in structure and content, they were considered as one course. The syllabi files for Course C and its predecessor date back to fall semester 1995. This is illustrated in figure 14. Although there were technology references in all of the syllabi, the average number of references jumped from 3.0 to 7.5 from fall semester 1999 to winter semester 2000, the year preceding the restructuring of the courses. Another large increase occurred between the fall semester 2000 (4.0) and the winter semester 2001 (9.5). The average number of technology references per semester remained high (above 7.0) throughout the remaining time periods of the study, with exceptions in the summers of 2001 (there were no syllabi on file for this semester) and 2002 (there was only one syllabus with 6 technology references). Thus, the restructuring of the level one courses appears to have had an impact on the number of technology references in the syllabi files for Course C.

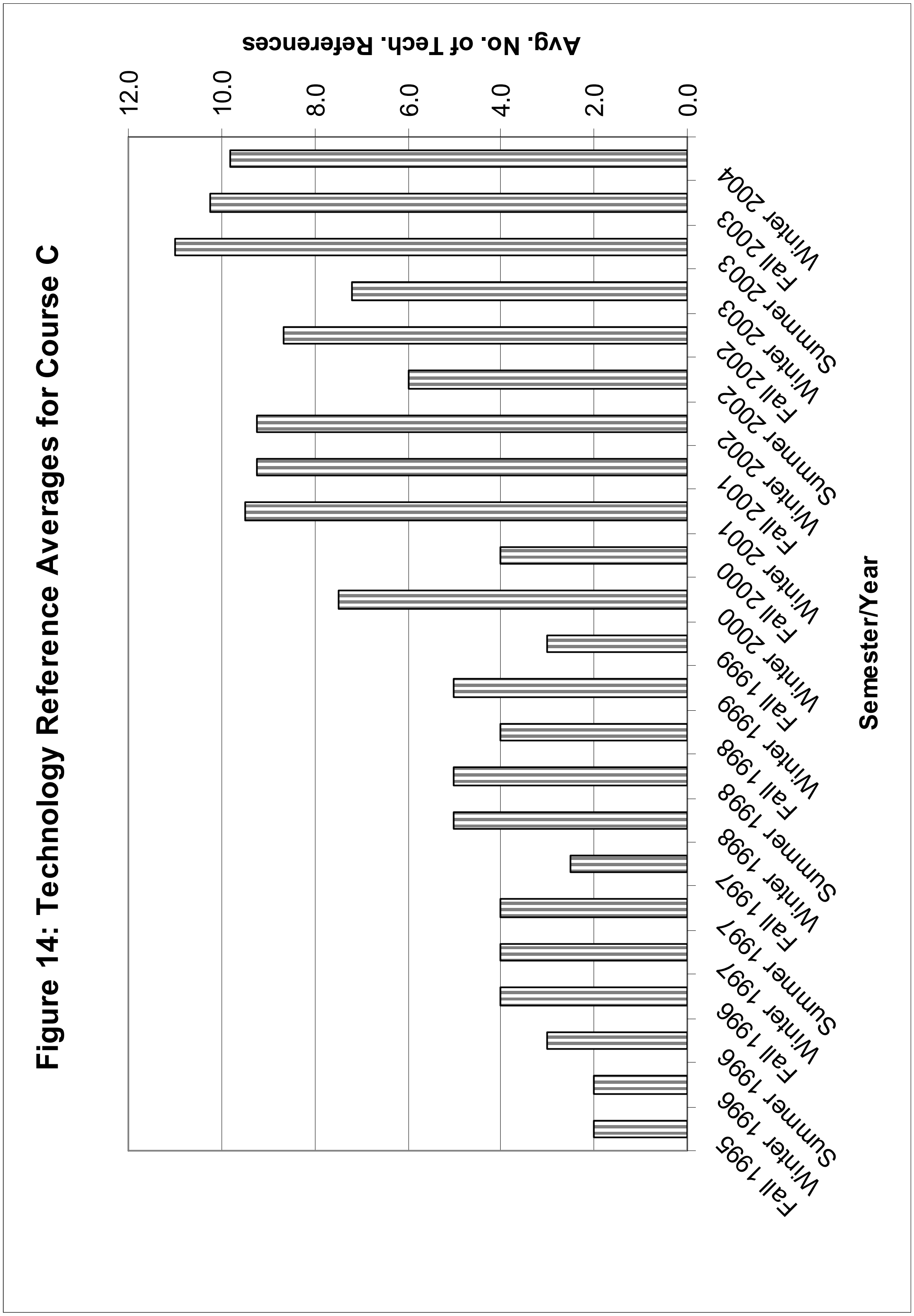


Figure 14: Technology Reference Averages for Course C

During the winter 2001 to winter 2004 time period, only two syllabi did not include the instructor's email address. Three criteria were included in 27 out of the 31 instructors' syllabi files: students must type their reports, videotapes will be used as a teaching tool, and student use of email and/or the Blackboard system. This third criterion, student use of email and/or the Blackboard system, appeared in all but one of the 2003 and 2004 syllabi files. Furthermore, all but one of the instructors who did not include these three criteria in a particular syllabus did include the criteria in syllabi for other semesters. Thus, the omission of one of these three cannot be viewed as an intentional change in the conduct of the course. Also, 25 out of the 31 files included a technology objective in their list of course objectives. However, four of these five instructors did include technology objectives in other, later, syllabi. Since there was some indication of a Course C syllabus "template" or style guide in later semesters, this change may have resulted from the instructors having compared their list of course objectives to other instructors' syllabi course objectives. Finally, it is interesting to note that 24 syllabi files referenced a web search activity and 22 referenced a web page development activity, neither of which appeared in syllabi from semesters prior to winter 2000.

Figure 14 above compares the average number of technology references in Course C syllabi by semester from fall semester 1995 to winter semester 2004. As before, the averages for this course were obtained from the total number of technology references per semester divided by the number of syllabi on file for that semester. The semester totals represent the sum of the totals for each instructor's syllabus as recorded in a syllabi review table similar to the Sample Syllabus Coding

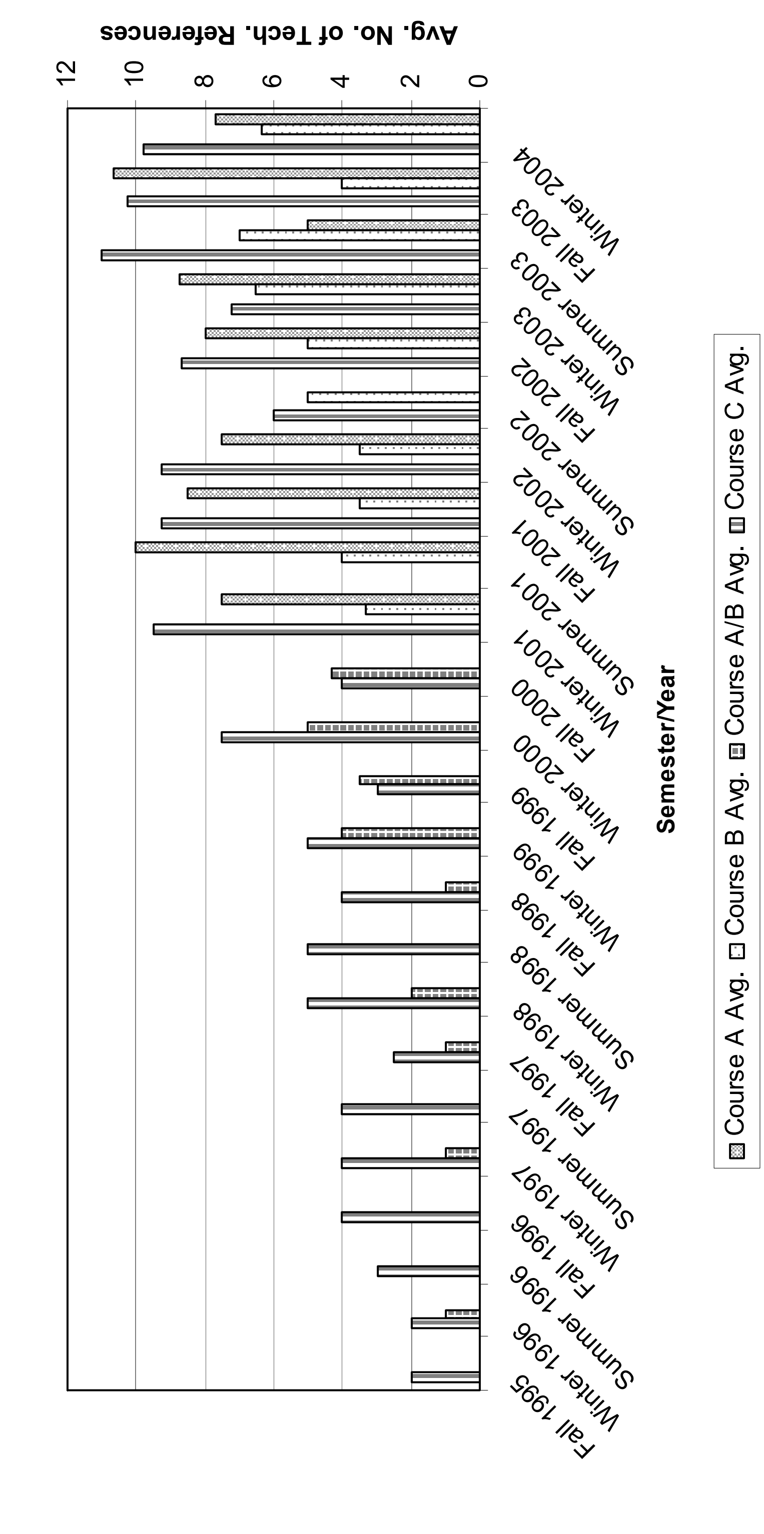
Form in Appendix B. As the figure 14 chart shows, the average number of technology references over this period of time varies between two and eleven, with the low value occurring in the first two semesters, fall 1995 and winter 1996, and the high value in summer 2003. While the net change from winter 2001 to winter 2004 was negligible (0.30 or a 3.2% change), the net change from the first semester, fall 1995, to the last semester (winter 2004) of the syllabi study period is 7.80, or a 390% change. Table 10 (Course C) and table 11 (Course C Precursor) in Appendix A show the technology reference totals for each semester. These tables differ from the previous technology reference tables for courses A and B in that there are three additional technology criteria (the last three columns): audiotape and transcription of interviews, web page development, and television or video game assignment. Since these criteria were never referenced in courses A and B, they were omitted from the technology reference tables for those courses.

Excerpt from Table 10: Technology Reference Averages for Course C

Sem	Year	No. of Inst'rs	No. of Tech Ref's	Typed Rep'ts	Video-tape	Web Search	Tech Course Obj	Email/ BB	Inst'r Email	Web Page
W	2001	4	38	2	3	4	3	3	4	4
F	2001	4	37	4	3	3	4	4	4	3
W	2002	4	37	4	4	4	4	3	4	3
S	2002	1	6	1	1	1	1	0	1	0
F	2002	3	26	2	3	2	3	3	3	2
W	2003	5	36	4	3	3	4	5	4	3
S	2003	1	11	1	1	1	1	1	1	1
F	2003	4	41	4	4	3	2	3	3	3
W	2004	5	49	5	5	3	3	5	5	3

As before, it appears that the increase in technology references for Course C begins just prior to the 2001 restructuring of the level one courses. Only two semesters have average values (6.0 in summer 2002, 7.2 in winter 2003) for Course C that are lower than the highest semester average value (7.5 in winter 2000) for the Course C Precursor, all other semesters during the winter 2001 to winter 2004 time period exceeded the predecessor course averages. During this time the average number of technology references recorded for the syllabi files for the Introduction to Learners and Learning course varied between six and eleven, which is much higher than the data values for Course B and somewhat higher than the values for Course A. A comparison of the three level one courses and the precursor courses appears in figure 15. This chart identifies the average number of technology references by course for the level one courses from fall semester 1995 through winter semester 2004. Since there were no syllabi on file for these courses for the summer semesters of 1999 and 2000, these semesters do not appear on the chart. Finally, a composite of the averages for all three courses from the level one program can be seen in figure 16. The data values are averages based on the total number of technology references and the total number of instructor syllabi files for all three level one courses each semester. As was stated previously, the data indicates an overall increasing trend in technology references in course syllabi during the years leading up to the restructuring of the level one courses, with winter semester 2000 having the greatest average number of technology references (6.3) before the restructuring. However, in all but one semester (summer 2002) during the winter 2001 through winter 2004 time period the average values exceeded that of winter 2000. The net change for all level

Figure 15: Level 1 Average Number of Technology References By Course



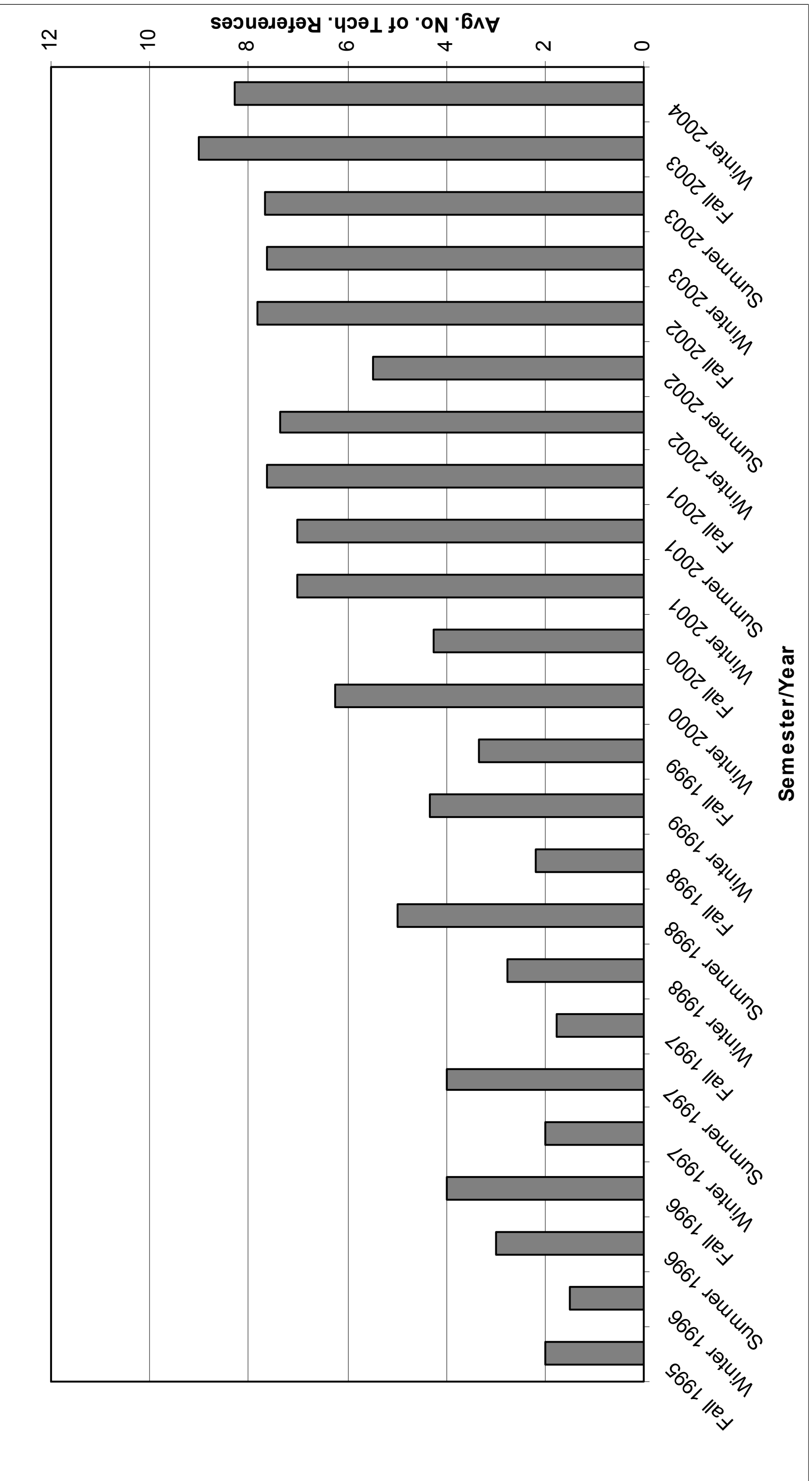


Figure 16: Total Technology Reference Averages for Level 1 Courses

one courses from the fall semester 1995 (2.0) to the winter semester 2004 (8.3) is 6.3, or a 315% increase.

Faculty Interviews and Observations

An initial faculty interview was conducted in the fall semester of 2002. Although informal classroom visits occurred over the fall 2002 through fall 2003 semesters, formal classroom observations were made during the winter 2004 semester, after the final faculty interview (December 2003). During the initial faculty interview (September 2002), the researcher learned more about the pre-planning process involved in restructuring the teacher preparation program, and in particular the level one courses. For instance, based on a review of other similar programs and educational technology research, it was determined that "pull-out technology doesn't work". Learning theory and transfer of skills studies indicate "bridges [between technology and teacher education] must be built deliberately and continuously." Thus, the level one courses needed to address: how learners learn, administration and management of American schools, classroom management and instruction, intensive field work and technology in education.

Since many students join the program at level two, the College of Education needed to work with area community colleges to develop common courses with the same objectives as their level one courses. They also had to identify the core courses for level two of the teacher preparation program, so that the requirements for these courses were communicated to the area community colleges. The concept was to build on the course skills acquired in level one.

Thus, technology had to become part of the level one curriculum and certain assignments had to be integrated as part of each course. It was decided that Course C would incorporate a group web page development activity; all instructors would use Blackboard (especially the features that supported group dialogue and cooperative development); textbook CD-ROM accompaniments would be used in class and by students individually. The real challenge was getting all faculty, including adjunct educators, who teach the seven or eight sections of Course C each semester to incorporate the complicated tasks into their curriculum. One step toward that solution was the creation of a course site in Blackboard for the Course C instructors. This was an ever-present resource for instructor materials and external links. So, any Course C instructor could copy materials and links directly from this site to their individual course sites. In addition, they could each contribute things that they developed and used in their classrooms.

Other, more global issues, such as electronic portfolios for graduation were discussed. Although level one students were not required to purchase the electronic portfolio software, in part because at this level the student is not required to have declared a major in their undergraduate pursuits, they should be able to use artifacts developed in level one courses in their portfolio. Thus, providing them the opportunity to create and store digital products will advance their portfolio collection prior to their advancement to upper division courses. As the instructor stated, “I am fearless about new learning. My question was ‘How can we do this?’ [I am] illustrating how you can teach things you are not a master of.” Her strategy has been to help student groups identify a leader for the technology part of their project and "make the tech part low risk". Reinforce the students by telling them "You can do this. You will do this. And it's not a big deal."

The first formal classroom observation occurred on January 21, 2004. During this first class session of the semester, I assisted the instructor by taking individual photos of the students using the instructor's digital camera. In addition, each student signed an attendance sheet in the order their photos were taken so that the instructor could use this technology tool as an aid to become acquainted with the students more quickly. There were 31 students in class, 12 male and 19 female. One of the first activities of the day was the announcement by one of the field experience supervisors that students needed to visit the cart in the hall for information regarding the required police check allowing them to visit the K-12 schools.

The instructor used Blackboard to show students how to access course information, including the teacher education standards, information for building a portfolio, and links to other external resources. Throughout the class session, the instructor used the "computer on a stick" at the front of the room to explain activities and procedures to students. The room was relatively small and the 31 students filled nearly every desk available. The class remained in their desks, facing forward in seven rows throughout this first class session.

A review of the coding of the notes from this observation indicated there were 54 blocks of text with 109 codes represented in those blocks. The most frequently occurring codes were from categories 1 (technology) and 4 (teacher-directed). In particular, there were 26 blocks coded with technology codes (3 for educational_technology, 2 for technology_integration, 4 for software, 3 for hardware, 11 for Blackboard, and 3 for Internet_email). The teacher-directed codes were used for 28 blocks of text (1 for teacher_activity, 9 for lecture, 9 for directions, 1 for classroom_management, 5 for explanation_or_response, 1 for discussion, and 2 for questions). Two code categories had 15 codes used in the observation notes: educational_activity (2 for field_experience, 1 for collaborative, 2 for small_group, 1 for whole class, 2 for individual, 3 for writing_papers, 1 for presentations, and 3 for reading) and technology_purpose (2 for classroom_management, 3 for teaching_instruction, 4 for product_development, and 6 for communication). As this code count indicates, the instructor interacted with the Blackboard course management software system throughout the class session. After showing the students where specific course materials were, she explained how the students could use Blackboard to communicate with their reading groups to discuss the books they had been assigned to read. In addition, she pointed out the group file exchange capabilities so that they would be able to prepare their group presentations online or face-to-face. The only student-instructor interaction during this first session occurred as question-answer or short duration discussions about the technology tools and the instructor's directions for completing the assignments.

The second class observation was a student presentation session near the end of the semester (April 12, 2004). During this session, student groups demonstrated the web pages they created to teach their audience (in class and on the web) about a specific topic the group selected and researched. Each web page included links to other web sites, as part of the assignment was to critically review web-based information uncovered in the research component of the project. The student groups determined the allocation of responsibilities, with most groups divvying up the subtopics so that each student created one web page and then they collectively created a group page with links to each student's product. One of the groups presenting that day designated a technology leader who was responsible for creating the group page and collecting and linking all of the other pages to that initial web page. This strategy did not seem as successful as that of the other groups, since one person's materials were not received by the technology leader in time to be added to the presentation.

The observation notes for this class session included 76 codes over 33 blocks of text. There were a large number of codes recorded for categories 1 (technology – 19 codes) and 2 (educational_activity – 16 codes). There were three other categories with a significant number of codes each: 10 (students – 9 codes), 11 (technology_level – 10 codes) and 14 (technology_purpose – 10 codes). The category 1 codes (4 for educational_technology, 4 for technology_integration, 2 for hardware, 2 for Blackboard, and 7 for Internet_email) and the category 14 codes (4 for teaching_instruction, 5 for product_development, and 1 for communication) reflect the nature of the class session. During this session, student groups taught their peers about topics they selected using the "computer on a stick" to showcase the web pages they had created. In some cases, they discussed the methods used to create the linked product. The educational_activity (category 2) codes (3 for collaborative, 4 for small_groups, 5 for research, and 4 for presentations) also illustrate the purpose and methods used in this student activity.

Student group size and student behaviors, especially references to technical problems that arose during the presentation were covered by category 10 (student) codes (4 for number_of, and 5 for behavior). Four groups presented their research results during this session. The groups ranged from three students to six students in size. There were instances where pages were linked to the a: drive rather than an http:// address; files were missing from the removable media (typically 3-1/2" diskettes) used to store the web page product; or where the text formatting and sounds surprised the presenter. Some students handled these technical difficulties in stride, even having paper copies to pass around the room for missing text files. Others were unable to present their material at all. However, even those who were stymied by the technology-related problems, had a technology-based solution in that they had submitted an electronic version of their product to the instructor via Blackboard's Digital Drop Box. This session indicated the students' use_level (category 11.1 – 5 codes) and comfort_level (category 11.2 – 5 codes) with respect to technology in teaching and learning activities.

During the final interview with this instructor (December 2003), we discussed her definition of technology, "a set of tools that extend our capacity as learners to do work", and of educational technology, "Broadly, I would say that educational technology is technology that is directly geared toward support of education." These two definitions embody the teaching with technology style she exhibits in the classroom. This instructor encourages students to engage in the use of technology tools to help them learn from others and to allow them to share their understandings with others. Thus, I witnessed a strong focus on Blackboard as a multi-dimensional communication system that permitted students to dialogue and share draft documents with one another as well as a means for depositing final products in the teacher's electronic in-box. Furthermore, the group web page development activity took students through a complete phase cycle of searching the Internet, selecting information and critiquing its source, synthesizing the information, and producing an Internet-based summary with external links. The students were able to use technology to learn and to teach. They discovered that technology tools can be used to gather information, evaluate information and share their outcomes from these activities.

With respect to technology integration, the instructor indicated that “The decision to integrate technology as opposed to having technology pull-out courses was [made by the group] after reading the literature, [and based on] our own experiences with technology, that it is not something that transfers readily.” This reflects the pre-observation interview discussion regarding the faculty committee’s restructuring of the level one courses of the teacher preparation program. Her answer to question #3 continued:

> And so, …we made a commitment saying teachers of the 21st Century needed to be technologically literate. How do we accomplish that? We basically created these seven core courses, three at level one, four at level two. We wanted to build developmentally on the technology learning. So, in order to accomplish the activities and assignments, one would have to use technology. And that we would recognize we would need to provide a lot of support, which was the provision of the Technology and Learning Center, in order for that to happen, both for faculty and for students.

This quote indicates the intentionality of the faculty committee to 1) integrate technology into the teacher preparation courses and 2) to provide scaffolding for both faculty and students as they embarked on their quest for educational technology literacy. It also highlights the notion that the level one efforts will be enhanced at level two, something which does not appear to have taken hold in this program.

In response to question #4, regarding her use of technology tools in the development of her classes, the instructor stated:

> I have created a permanent site for the Course C materials that doesn't go away that all of the instructors can get access to. We're not using that as actively as I would like, but it is still there and at the end of the semester I would like to have people put anything they've developed in their sections, put it up there so we all have access and it is a way of sharing.

This again resonates from the pre-observation interview. While at the surface, the concept is that instructors are ready to willingly share materials they have generated for their courses, there are some underlying issues regarding consistency:

> My feelings are pretty strong that if we are going to have a developmental program we do have to have quality control in terms of content, core content, and skills over the many sections. And since we have rotating people teaching this, it is a real challenge to keep that core there. So, definitely in developing the course materials I would say increasingly, we use the resources of Blackboard and other options.

So, technology can be the vehicle for faculty to self-elect to share their course materials and experiences or it can be a method for ensuring each instructor conducts his course following the same guidelines. While the former is difficult to manage, the latter may be viewed by some as stifling faculty creativity. Yet, few will argue that a program of this magnitude needs to address the issues of consistency in assignments and assessment methods.

As she continued to answer this question, the instructor touched upon the subject of facilities as an infrastructure component that impacts course design:

> This semester I am teaching in a classroom with computers and I find that I do, as I have gone through this term, I have done more things because they could have access, individually or in pairs, to a computer. So the availability makes a difference in how you think about your planning.

Since there were only two "technology enhanced classrooms" available for education courses on an as-scheduled basis, it was highly unlikely one instructor would always have access to one of those rooms for their Course C classes. This relates to the issue of preparation time instructor's need to adequately plan in-class activities that utilize technology. Having different environments for different sections of the same course makes it difficult to provide consistent exposure to educational technology. As this instructor said,

> …if I knew the [Course C] teachers regularly had classrooms with computers some [technology] things would emerge. If I went back to not having [the student computers], I would have to do things differently. I can't imagine doing this course without at least a computer on-a-stick. Facilities is a big issue!

When she was asked whether she uses technology tools to conduct her class, her reply was,

> …So they are kind of learning technology just by finding what a tilda is; just little things like that that happen because they are hands-on and I say, 'Did you find it? Go to this page.' So you just kind of have this ongoing interaction and as things become available, if a question comes up, someone can do a quick little mini-search. As I said, it becomes integrated as something that becomes available as issues emerge in class.

This highly interactive, technology-on-the-fly environment requires students have access to computers in the classroom. Not all instructors embrace this method of instruction, their lesson plans aren't always this flexible. But, for those who truly want seamless integration of technology, the facilities and equipment can be a limiting factor. Another example of technology in the classroom was uncovered in her response to the second part of question #5 (What tools?):

> I pretty much assume that they can access those things [Microsoft Word, Excel and PowerPoint]. One thing we did with the outside reading books, they met in their group and talked about the book and their task was to create three

> to four PowerPoint slides on the core ideas in the book. So we set that up and they presented them right then and there. They are actually learning PowerPoint and Excel in [Course A], but because I know that and I know when they did that, then again, weeks later in my class they're doing it in groups. They know the technology for PowerPoint. I find that if you just kind of assume they can do these things, they just kind of say, 'Oh I guess I am supposed to do that.' It's partly just acting like they are technology literate and that goes a long way to kind of having them see themselves that way and they just kind of do it. But for the most part there's less and less resistance. …there's somebody in the group who knows what they're doing enough to get the group through.

She captured the central theme of integrated technology across the level one courses in this dialogue. The intent is to have the students engage in the use of technology as it becomes appropriate for product development that enhances teaching and learning. Having a plan that outlines the skills the students are expected to acquire across the courses helps the faculty as well as the students. Being able to assume the students have this technology exposure is a great asset. And encouraging students to take risks and to work collaboratively will assist them in acquiring the requisite skills. However, again, many students join the teacher preparation program at level two. So, level two courses also need to address the differences in individual students' technology backgrounds.

I asked her when she started requiring students to use technology in this course and why. She indicated student use of technology became a requirement when the new Course C was created, because that was "part of the grand design." She went on to say, "It seems like forever." Then she followed up with a reference to the students' self-directed use of technology:

> I did notice in their papers …some of them are using some of the links from the textbook. So they are using the Internet, I would say pretty actively because they were out there searching early on for their web page stuff and

> found other stuff, because some of them reference that in their writing. So they are using the web as a source of information.

With respect to her initial reservations regarding the use of technology in this course, she said:

> I think the support element. I would meet with the [Course C] teachers and there were people who were fairly resistant or who weren't resistant but just didn't have tech skills. It was a really big hill for them. So kind of a problem control issue, which is still a concern. …[for] some of the adjuncts we had …it was kind of a leap. So I really relied on the TLC's people a lot to be supportive to the [student] groups and to the faculty and that created some issues. …There were some communication issues about an assumption that after the first time [they helped with a class] the instructors would take over. And I was very clear that was never going to happen. That we needed ongoing support, that there were different players all the time.

These comments point to a second aspect of infrastructure, technology support staff. It is not enough to have facilities and equipment for faculty and students to use, but they also need sufficient support as they undertake new technology challenges. She continued:

> We don't keep up because it's not something we use all the time, we have other areas to keep up an expertise. For this to work, we needed support for the long haul. And I'm even, as I said, talking about the field work and things, too. Seeing people walk away because of the multitude of demands…even [for] people who agree it does enhance the quality of the program it's a difficult choice because it's taking time away from other activities in terms of perception. So there are issues outside the course itself that impact it.

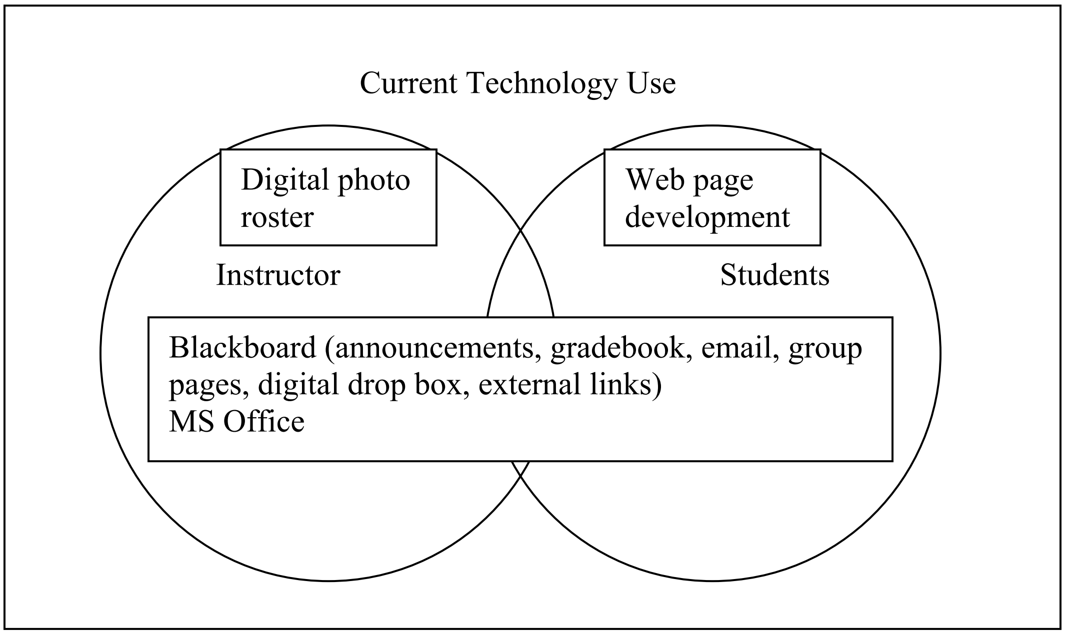
Thus, the support must be an enduring foundation, not a temporary scaffold. Even as experienced practitioners become familiar with the technology tools, there will be new versions, upgrades, and maybe even new tool sets purchased by the university. Faculty are rarely involved in these acquisition decisions and usually are even less prepared to adapt to the changes. Although training may be an option when new software is acquired, it seldom is provided for new versions or upgrades and frequently conflicts with teaching schedules. However, faculty training alone is insufficient since instructors need to be assured their students will be able to handle the changes, too.

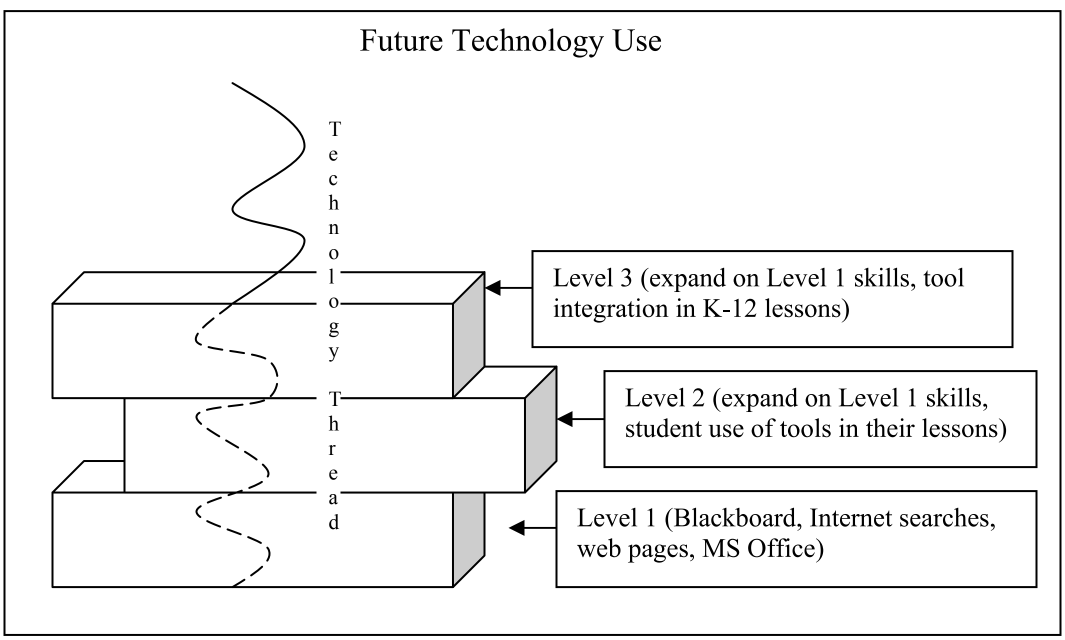
Finally, we discussed her current reservations with regard to the use of technology in this course:

> I would say I am absolutely convinced it is doable and it was the right path to go down. I think our students, on the whole, are going to be prepared very well. But I also think we now need to be more proactive in developing specific skills in level two. …My guess is that those four core classes are not talking to one another as the original design would support.

While she has no reservations with the use of technology in this course, or any of the level one courses, there are concerns that the overall program is not consistently applying the technology integration objective to the core courses at all levels. This is illustrated in figure 17 below which captures her future vision as the development of a common technology thread connecting the three levels of the teacher preparation program. This thread starts with the introduction of the use of technology in teaching and learning via skill acquisition and instructor modeling in the level one courses. It continues on into the level two courses as students begin to develop mini-lessons using technology tools. And, finally in level three the students develop actual K-12 classroom lessons that integrate the use of the technology tools to which they have been exposed, and those they have witnessed in their field experience. This view builds on the concept of a shared objective with multiple, specific applications developing into a fluid and comprehensive educational technology component of future teacher preparation.

Figure 17: Current and Future Technology Use Diagram for Course C





Observations and Common Perspectives

A comparison of the average number of technology references by course for the three level one courses is available in figure 16 (see page 105). This chart shows Course C: Introduction to Learners and Learning as the leader in most semesters (7 out of 10) from winter 2001 through winter 2004. Three semesters in this time frame, one of which was summer 2001, the semester for which no Course C syllabi were on file, show Course A: Introduction to Teaching as having more average technology references in the semester than the other two level one courses. While Course B syllabi consistently demonstrated an average technology reference number at or above four (7 out of 10 semesters), the values never exceeded those of the other two courses in a given semester.

Although the level one course restructuring clearly established a technology integration objective, it appears the three courses were each allotted certain computer technologies to focus on. For Course A, it seems the intent was to introduce students to Microsoft Office tools, such as PowerPoint and Excel, and to incorporate a reflection on the use of technology in the field schools the pre-service teachers visited. The unique tool that repeatedly appeared in the Course B syllabus files is the use of online quizzes and for Course C it was the web page development student activity. For both Course A and Course B there was an emphasis on use of the campus computer labs, especially the COE Technology and Learning Center. Likewise, for Course B and Course C there was the web search student activity. In each course there began to appear to be a syllabus "template" which included the same technology course objectives as well as many of the same student activities and performance assessment products after the restructuring of the level one courses, most obviously in the last two years of the study period (2003 and 2004). As was previously discussed, while this will have a bearing on the number of and type of technology references found in the syllabi files for these courses, it does not preclude an instructor from electing to “stray from” this plan and choose not to integrate these technologies in the course. So, the syllabi files are an indicator of instructor intent, but not a view of the actual conduct of the course. Therefore, the student surveys and instructor observations and interviews were important components in this analysis.

Overall, however, the syllabi files do reflect the intent to infuse more technology rich opportunities for students in the level one teacher preparation program. Figure 16 on page 105 charts the total technology reference averages for all three level one courses. This aggregated view shows a dramatic increase in technology references beginning in the 2000-2001 school year. This is at least partially attributable to the restructuring of the level one courses and the COE’s directive to focus on technology integration in the education of pre-service teachers.

The instructor interviews support the conclusions drawn from the syllabus review. All three level one instructors spoke of the COE’s plan to integrate technology into the teacher preparation program. They each acknowledged the directive to programmatically change the curriculum so that these three courses shared responsibility for technology integration by allocating certain tools and skill sets to each course. As the syllabus review indicated, Course A has primary responsibility for teaching students to use Microsoft PowerPoint and Microsoft Excel. Course B was assigned the use of Blackboard to conduct online quizzes and the web search activities. Course C was designated responsibility for web page development. In all three courses, the students were to be exposed to the various features available in Blackboard.

While each of the instructors expressed a desire to technologically prepare their students for their future classroom assignments, their motivation for integrating technology into these courses was quite different. The Course A instructor did not address any personal benefits derived from integrating technology in her course. Her motivation came from the directive to restructure and a sense of self-preservation with respect to peer pressure from her colleagues in the PT3 program, stating: “The key motivator is the helpful people in the TLC. Next are the PT3 goals, because I didn’t want to be embarrassed. And because I feel it is so helpful to students to use Blackboard.”

On the other hand, the Course B instructor saw the task of technology integration as a personal venture, indicating benefits to himself as well as acknowledging secondary benefits to his students and to their students:

> [I] believe teaching is a performing art. I want to learn. I want to overcome my own frustration with my own public undergraduate and graduate education. Technology allows me to meet the needs of my class. Every child should be able to learn what they need to learn, taking artificial time out of the process.

Finally, the Course C instructor addresses the personal satisfaction derived from influencing change:

> [What motivates me to integrate technology in my course is] my philosophy of teaching and learning and my view of what 21st Century teachers need to do; my concern with the digital divide and the achievement gap. Teachers need to feel comfortable with tools to address these issues. …This is part of the …restructuring of the whole program. It is very exciting, being part of

> changing something not easy to change. We were ambitious and we did it. We are a lot further along than if we each tried to do it on our own.

Thus, the interviews give us insight into the level of personal commitment each instructor had achieved with respect to educational technology and technology integration in their classes. The observations also indicate the degree to which the instructors were comfortable modeling technology in their classes. The Course A instructor started the semester by having her students leave the classroom they were assigned, which was equipped with student computers, to visit the TLC. Rather than having the students share the computers in the classroom to try logging into Blackboard and their student email accounts, she had them work in pairs doing this under the watchful eye of the TLC staff. She did not show them Blackboard or model the use of PowerPoint during this first class session. However, both of the other instructors used their "computer on-a-stick" equipment to show students how technology can help them in the classroom. They both introduced Blackboard, the features and information it provided their students. The Course B instructor used Microsoft Word as a teaching aid, by projecting the directions for tasks and the questions for student discussion at the front of the classroom. Finally, the Course C instructor introduced her own technology, the digital camera, as a means for quickly connecting to her students and learning who they are individually.

It appears the faculty decision to integrate technology in the level one courses through the structured assignment of select student activities and technology tools to each course, was a successful approach. The caution that prevails, however, is that faculty not involved in that decision may have different agendas. Getting every level one instructor to commit to the plan and embrace these activities as integral to their course curriculum is a more difficult task.

Level Two Courses

Students must apply to the Teacher Education Program before enrolling in their level two courses. The requirements for application include satisfactory completion of the level one teacher preparation courses and 60 hours of college or university credit earned at this institution or another accredited school. The core courses at level two include: Introduction to Instructional Methods (D), Psychology of Teaching and Learning, Introduction to Learners with Disabilities and Inclusive Education. In addition, students majoring in Elementary Education or Early Childhood must complete Literacy, Learning and Instruction (E). Other education programs may require additional level two courses. For this study, the two level two courses included in the syllabus review were Course D: Introduction to Instructional Methods and Course E: Literacy, Learning and Instruction.

While level one courses provide students the opportunity to “explore education as a profession”, level two is designed to assist the student in “analyzing the nature and process of education” (University Course Bulletin, n.d.). Thus, at this level there is more of a focus on instructional methods, including a more extensive field experience component. It is at this level where students begin to view their instructors as educators modeling techniques they may choose to use in their future classrooms. Issues such as inclusion, diversity, learning styles, learner development, educational philosophies, classroom tools and assessment techniques are fundamental at this level. This may be the level at which students determine their need for technology tools as teachers as well as learners. Thus, as for level one, the syllabi files for the selected level two courses were reviewed for references to the use of technology tools in teaching and evaluating student learning.

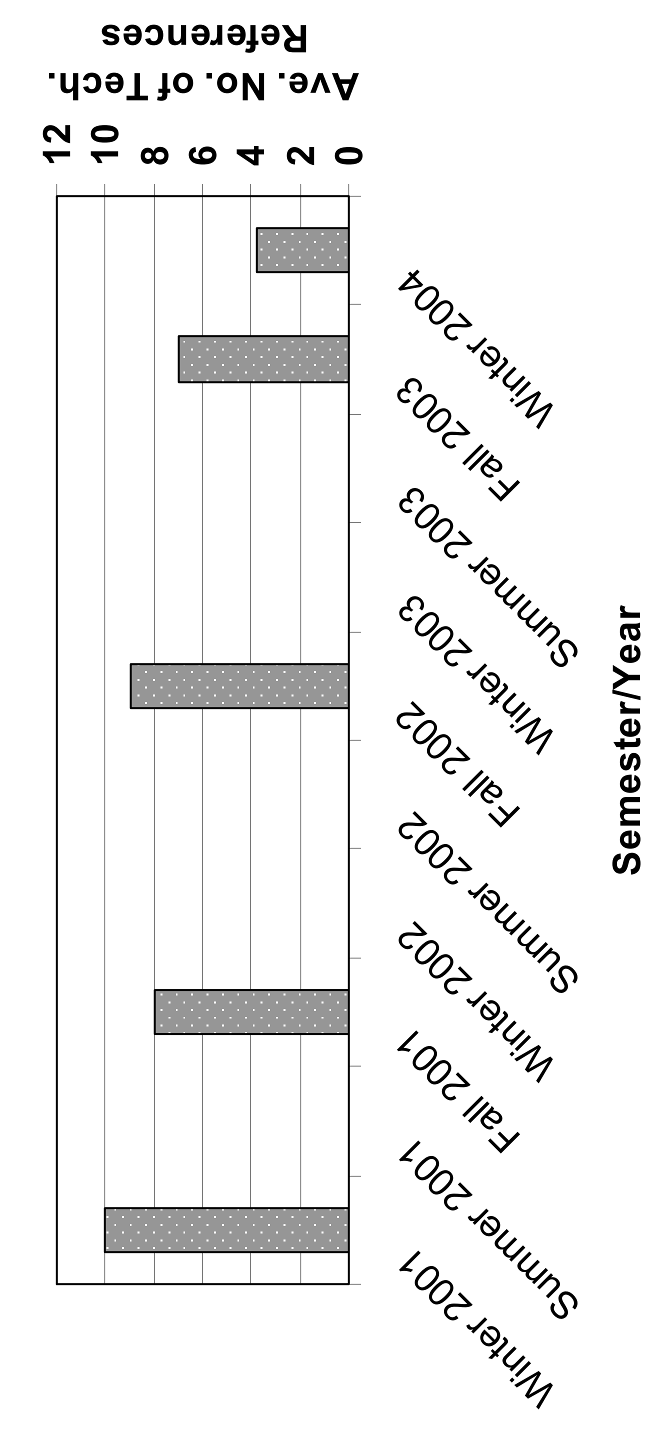
Introduction to Instructional Methods

A review of the syllabi files for this course (D) indicated a decrease in the average number of technology references over the period of this study, as shown in figure 18. The chart in figure 18 is a comparison of the average number of technology references in Course D syllabi by semester from winter semester 2001 to winter semester 2004. As for the level one courses, the averages for this course were obtained from the total number of technology references per semester divided by the number of syllabi on file for that semester. The semester totals represent the sum of the totals for each instructor's syllabus as recorded in a syllabi review table similar to the Sample Syllabus Coding Form in Appendix B.

In the winter 2001 semester the average was ten references, however this was based on only one instructor's syllabus. Thus, moving to the fall 2001 semester (there were no syllabi on file for the summer 2001 semester), the average number of technology references for the three instructor syllabi on file was eight. This value was

exceeded in fall 2002 (nine average references). However, in the final two semesters of the study, fall 2003 and winter 2004, the average number of references dropped off from 7.0 (based on one instructor's syllabus in fall 2003) to 3.75 (based on four syllabi files in winter 2004). Thus, the net change from the first semester (winter 2001) to the last semester (winter 2004) of the syllabi study period was -

Figure 18: Technology Reference Averages for Course D



0.625, or a -62.5% change (see Table 12 in Appendix A for Course D technology reference totals by semester).

Common references across the study for this course included: listing the instructor's email address (all syllabi on file), statement of a technology course objective (9 out of 11 instructors), students typing reports, students photocopying their assignments prior to submission, and students video-taping practice teaching activities. The final three references appeared in 8 out of 11 instructors' syllabi. There were seven references to both students conducting web searches and student use of email or the Blackboard system. Finally, five of the six instructors in the first three semesters, winter 2001, fall 2001 and fall 2002, included references to a student web quest activity. This may be related to the instructors' exposure to web quests as part of the PT3 program. Thus, there were some correspondences between faculty experiences and their intent to use technology in their classes.

Since this course is a second level teaching methods course, and since the reference to videotaping practice teaching appeared in a large number of the level one teaching methods syllabi files, its frequent occurrence in the syllabi for Course D was anticipated. However, it is interesting to note that while Course A had a high frequency for student reflection on the use of technology in the field experience schools visited by the pre-service teachers, Course D syllabi did not have a single incidence of this reference. Similarly, in Course D syllabi there was only a single reference to the use of software tools such as Power Point (fall semester 2002) and Excel (winter semester 2001), or use of the campus computing labs (fall 2002).

Excerpt from Table 12: Technology Reference Averages for Course D

Sem	Year	No. of Inst	No. of Tech Ref's	Typed Rep'ts	Photo-copy	Video-tape	Web Search	Tech Obj	Powr Point	E-mail BB	Excel	Use Comp Labs	Inst'r Email	Web quest
W	2001	1	10	1	1	1	1	1	0	1	1	0	1	1
F	2001	3	24	3	3	3	0	3	0	3	0	0	3	3
F	2002	2	18	2	2	2	2	2	1	1	0	1	2	1
F	2003	1	7	1	1	1	1	1	0	0	0	0	1	0
W	2004	4	15	1	1	1	3	2	0	2	0	0	4	0

Figure 19 compares the average number of technology references in the syllabi of all six courses studied by semester from winter semester 2001 to winter semester 2004. As for the level one courses, these averages were obtained from the total number of technology references per semester divided by the number of syllabi on file for that semester. The semester totals represent the sum of the totals for each instructor's syllabus as recorded in a syllabi review table (see Sample Syllabus Coding Form in Appendix B for technology reference categories). In contrast to the increasing trends observed for the three level one courses, Course D seems to indicate a decline in the use of technology in this course over the period of the study.

Faculty Interviews and Observations

Classroom observations of Course D were conducted on two separate occasions in the winter semester of 2004. No pre-observation interview was conducted, however the instructor agreed to participate in the program after a brief overview of the project prior to the first classroom observation. The final instructor interview took place in February 2004, after the first classroom observation and prior to the second. The class meetings were in a room that was neither equipped with student computers nor a "computer on-a-stick" for the instructor's use. The room had

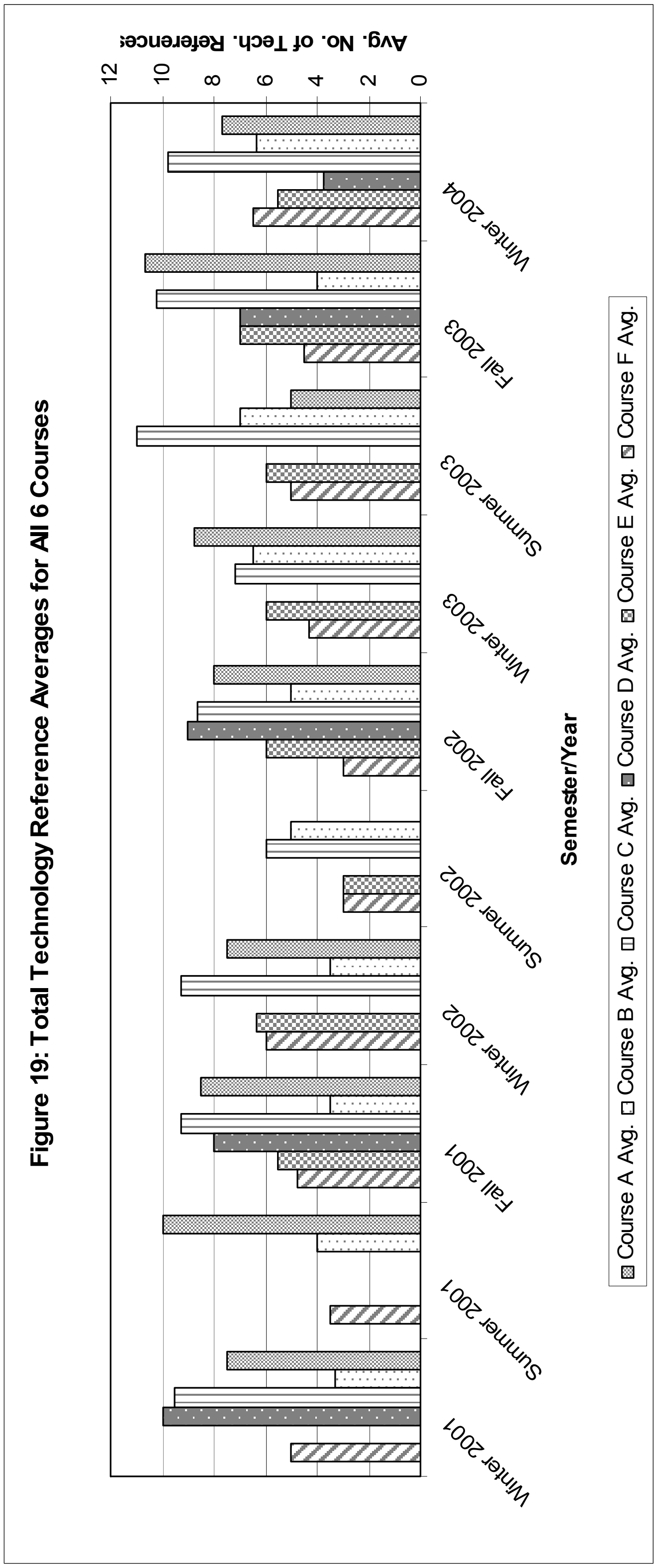


Figure 19: Total Technology Reference Averages for All 6 Courses

tables arranged in a “U-shape” with the instructor’s course materials on a table in the middle of the “U”. Behind the instructor’s table was a cart with an overhead projector on it. The other technology tools available in the classroom were another overhead projector on a cart and a television cart with a television and a video cassette recorder on it. There were 18 students in the class, 15 female and 3 male.

The first classroom observation occurred on February 17, 2004, about four weeks into the semester. Thus, the students and the instructor were already familiar with each other. The instructor started the class session by reminding students the quiz was the first task on the agenda. She used the overhead projector to show a map of the United States and instructed the students to list the 50 states and their capitals on a piece of paper. The students were taken aback by her directions. Then she turned off the projector and told her class she was showing them what we often do to our K-12 students. The “real” quiz was handed out on slips of paper. The students were instructed to decide which of the two quiz questions they each wanted to answer and then to discuss their answer with one other person at their table. After two minutes she told them to write their answers. These first few minutes demonstrated the instructor’s style used throughout the class session. Information she wanted to share with the entire class was projected on the screen at the front of the room from her overhead transparencies. Students were given paper materials to refer to in completing small group activities. Her lecture was divided into small chunks with questions and discussion sandwiched around each lecture fragment.

The observation notes for the first classroom observation consisted of 136 codes and 100 blocks of text. The most frequently occurring codes were from category 4 (teacher_directed) with 45 total codes recorded from this category (2 for teacher_activity, 6 for lecture, 5 for directions, 8 for explanation_or_response, 6 for discussion, and 18 for questions). Since her Socratic style successfully drew responses from her students, the next most frequently used code category was 5 (student_directed) with the following distribution: (14 blocks coded for discussion and 7 coded for questions). There were 16 blocks coded for classroom (2 for seating_arrangement, 12 for equipment, 1 for location, and 1 for physical_features). The high frequency of equipment codes is due to her interaction with the overhead projector. She used transparencies to guide her lecture and student discussions. Thus, the next most concentrated code category was technology (10 codes for educational_technology, 2 for software, and 1 for hardware). The overhead projector accounted for the educational technology codes; references to the electronic portfolio system accounted for the other technology codes. Two other significant code categories were: 14 codes for educational_activity (1 for classroom_work, 3 for small_group, 3 for whole_class, 2 for individual, 1 for writing_papers, 1 for reading, and 3 for tests_or_quizzes) and 10 codes for technology_purpose (all 10 were for teaching_instruction).

The second classroom observation was on March 4, 2004 in the same classroom as the first observation, but with a different section of this course. There were 28 students in class, 18 female students and 10 male students. After a quick review from last week's class session, the instructor had the class rearrange the tables so they could work in small groups. The lesson began as a whole class lecture and question-answer sessions as for the prior observation. Then the student activity was conducted with students working in groups of three or four students. The instructor moved around from group to group, asking questions, answering questions, and assisting students with the activity. The only technology equipment used was once again the overhead projector.

This observation was represented by 136 codes over 95 blocks of text. As was the case with the first observation, the most frequently occurring codes were from category 4 (teacher_directed) and category 5 (student_directed). 51 of the 136 total codes were from category 4 (3 for teacher_activity, 12 for lecture, 6 for directions, 6 for explanation_or_response, 8 for discussion, and 16 for questions). 22 of the 136 codes were from category 5 (3 for student_activity, 1 for student_initiated, 15 blocks for discussion, and 3 for questions). There were 15 blocks coded for each of two categories: classroom (1 for seating_arrangement, 12 for equipment, 1 for location, and 1 for physical_features) and students (3 for needs_interests, 6 for number_of, and 6 for behavior). The educational_activity category was represented by 13 codes (2 for classroom_work, 8 for small_groups, 1 for whole_class, and 2 for individual). These codes represent her emphasis on face-to-face discussion and small group activities. This instructor used technology (overhead transparencies) to inform and guide her students in their analysis of their readings. She used hands-on activities and small group discussion to help students understand the key concepts and to model techniques they could use with their students in their K-12 classrooms.

The two observations beg the question, “Does the instructor choose not to use computer technologies in her classroom, so she doesn’t request a room equipped with a ‘computer-on-a-stick’? Or, is it a matter of not being assigned a computer-equipped classroom, so she creates classroom materials that require no computer technology?" While she spoke of student assignments, lesson plan creation and sample teaching, she did not indicate whether the students were required to use computer technologies to produce documents. There was mention, however, at the beginning of the second observation period of a missing video camera for one of the group's sample teaching sessions. Thus, video recording equipment is used to record the students' teaching their lessons as planned. This activity is required, but occurs outside of the classroom.

The final interview with this instructor (February 2004) provided some insight with respect to the role technology plays in her classes. Her definition of technology was, "…an integration of tools that are used to access information and produce better output." And her response to question #2 "What is educational technology?" was:

> Educational technology in a K-12 setting looks different than it does for adult learners. [For K-12 students] educational technology is a way to assist in creating output; changing what their performance looks like. In higher education it is enhancing learning; allowing students to go deeper; integrating experiences, building onto their knowledge base.

Then when asked about her definition of technology integration with respect to the classes she teaches, she replied:

> For the instructor or for the learner? It is different. For the learner, using [educational technology] is based on the individual, on exposure and learning models. It is used in the production of lesson models (word processing, PowerPoint, LiveText, research on the Internet).

These definitions helped to explain her lack of use of computer technologies in the classroom. She expressed a need for her students to use technology tools outside of the classroom as they completed their assignments, but did not identify a purpose they could serve in the classroom.

When we discussed the technology tools she uses to develop her classes, she mentioned Blackboard, “I use Blackboard to post announcements and to have them access things I want them to. I don’t use the Discussion Board anymore because it takes away face-to-face contact. I use Blackboard to provide scaffolding, as a form of communication, to access web sites that go with the textbook.” Her comments about online discussion versus face-to-face discussion arose again when she was answering question #7 “When did you start requiring students to use technology in this course? Why?” Her response was that “…[it] was always required. [The level two coordinator] pushed that. She wants more on Blackboard, using the Discussion Board, posting grades to the Gradebook. But I don’t want to reduce face-to-face discussion.” She went on to say that while some of her students use email to communicate with her, she will not email students their lessons. She is concerned about the damage non-face-to-face discussion can cause. However, she thinks some courses, depending on their context, can benefit from online discussion, “…[students can] use it to chat on theories in educational psychology classes.”

Later in the interview, the instructor indicated that she had used the Discussion Board “early on” and then stopped requiring it because her students’ responses were “surface” and were “not done at optimal learning times” making her wonder, “Does it have a purpose?” Another argument against the use of technology was her perception that “this electronic stuff has extended deadlines. …I don’t want students to think they can use technology to send later papers. [So I have them] turn it in on paper. …They avoid you and that won’t work in education. We see people face-to-face everyday [in K-12 settings].” She went on to say,

> If I was more adept; if we could get our pre-service teachers to chat with teachers in the community, we could cut sixteen hours [of field experience] down to five and share lesson plans and learn to integrate through technology, go to the school's web site, the teacher's web site. But we are so reactive. We never talk long term. We have things nobody knows how to use.

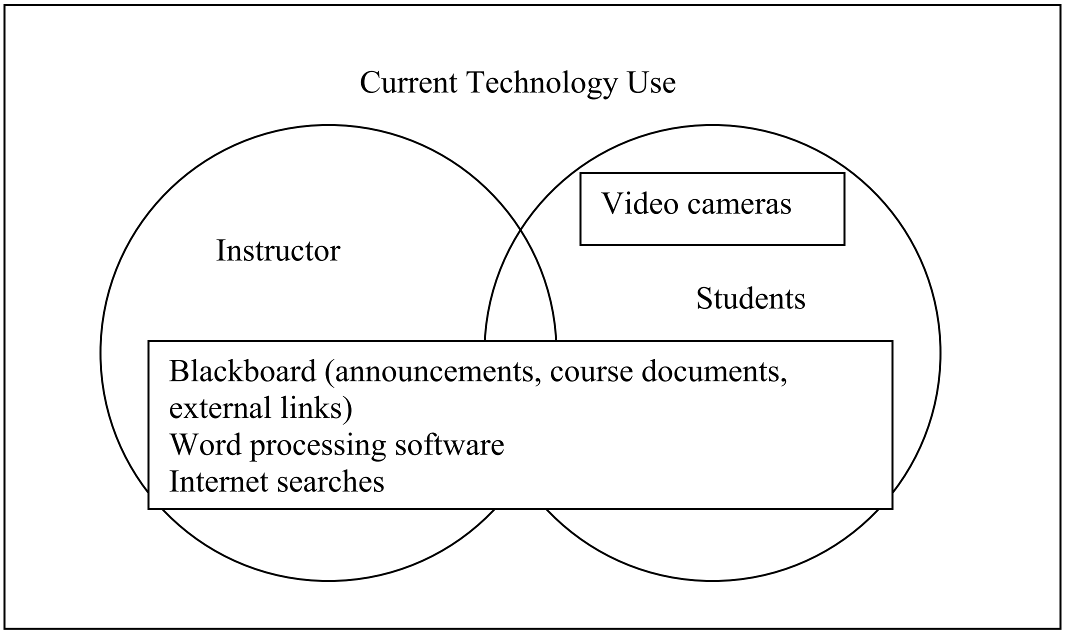
She had a vision of how technology might be useful to her students, but didn't have the means to begin using the tools she knew existed. So, as figure 20 indicates, the future technology use diagram for this instructor's course is very similar to the current technology use one, with two exceptions: Course D students should be able to chat with K-12 professionals via the Internet and they should use an electronic portfolio software package to capture their teacher preparation products.

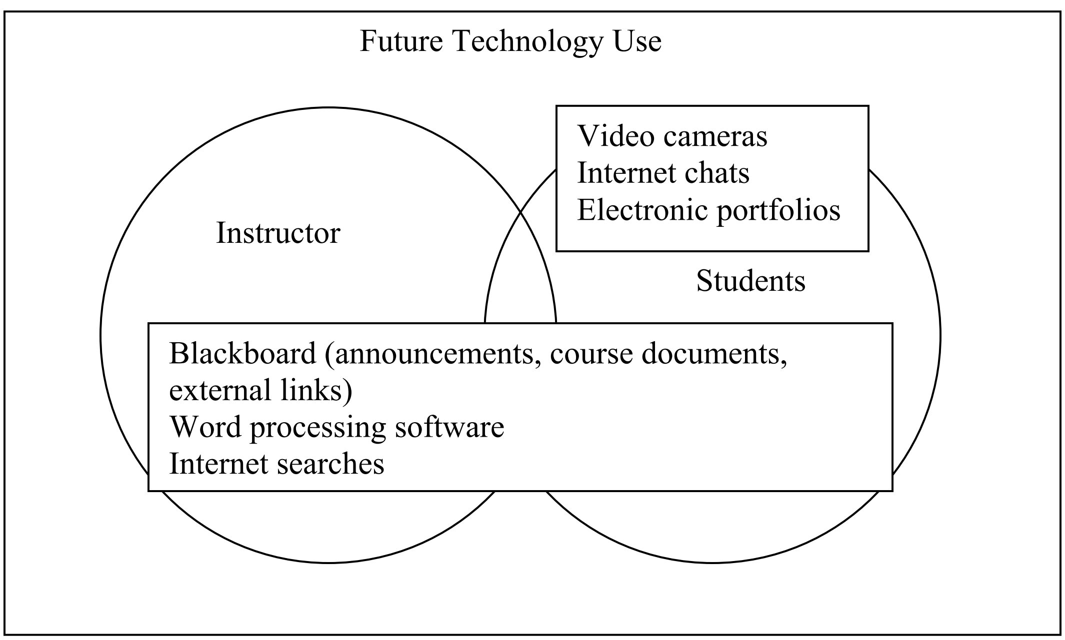
When asked about specific technology tools her students are required to use during this course, she replied, "Video cameras, word processors, accessing the Internet for problem-based learning; searching for and critiquing lessons they find on the Internet; data gathering from the DESE web site and the state assessment program." She said she reserved a room in the computer building to demo Internet access and then had the students work individually on computers while she was there. She said she tries to be with the students when they do technology activities to help them overcome their "learned helplessness", saying they don't know how to send an attachment to an email.

These comments correspond to statements she made regarding her use of technology tools in developing and conducting her classes:

> I don't always have access to a computer, so I don't use PowerPoint I use overhead transparencies or group presentations. I would prefer PowerPoint, but I can only get [a classroom with] a computer for one section of my course and not for the other. …[In class] I use the overhead projector and we watch a video occasionally. I would like to do virtual classroom visits (I don't know how to do it.). We videotape the students' microteaching lessons and they can

Figure 20: Current and Future Technology Use Diagram for Course D





> sit in a room and watch it. They're VHS not digital. If they were digital, the students could download [their lessons] to LiveText. How quickly it changes!

She went on to say that the students have no problem setting up the VHS camera once she shows them what to do. Then, while six students are taping at the same time, she can turn up the volume on one recording room and listen to the student. Furthermore, while some of her students may want to use PowerPoint in their microteaching sessions, "…if there isn't a room available [with the video camera and a computer and projector] they can't do it."

So, this course had a strong need for certain types of technology. However, the use of computer-based technology tools was not yet perceived as a necessity, only a desire. As long as the old methods are working, why change things? With respect to the need for electronic portfolios, she indicated that since "…only two or three students out of each class has LiveText" she didn't require it this semester. "The institution should say 'Do it!'. There is no training advertised. The university needs to take a view of technology." She felt that unless the university was willing to take a stand and tell students they needed to buy the electronic portfolio software to save artifacts throughout their preparation program and provide them with the training they need to use it, she shouldn't have to tell the students they need to buy it for her class.

She said she would "like to use LiveText, but the problem is I am bound to my computer and I can't access the Internet from outside of home or school like I can paper." So, having students submit work on paper and having paper portfolios to review makes it easier for her to grade assignments at any time, any place. This is particularly a problem for adjunct faculty since they do not have office space on campus and must prepare for class and grade assignments at home, at a child's soccer game, or while waiting for children on the school parking lot.

The instructor indicated that about "two to three students each semester do use PowerPoint" and "some students bring laptops and take notes in class; some tape lessons." She felt the majority of her students accessed technology either at the TLC or at home. But she went on to say, that many of them "have real problems with the [computer] lab." They'll tell her, "Everything's gone on my disk!" …and students know they need training to use technology tools, "they ask for it, especially how to do PowerPoint, and how to insert pictures in their papers." When asked what benefit her students derive from their use of technology in this course, she referenced the videotaping of the microteaching sessions, "They actually see a difference between writing a model and teaching a lesson."

Thus, there appears to be a diverse range of technology skills exhibited by her students. Since many of the level two students transfer into the program from other institutions, one cannot assume they have all been exposed to the technology integration described for the level one courses in the teacher preparation program at this university. Furthermore, there is a difference of opinion regarding what the students experience in their K-12 field experience opportunities. This instructor said that "most schools don't have technology in the classroom." Her view of what her students need to know with regard to educational technology and its integration with teaching methods is very different from that expressed by the level one instructors.

The Course D instructor made the point that "using [technology] is different from teaching someone else to use it." So, even though she uses her computer to create course materials, to conduct research, and to communicate with her students via Blackboard, she isn't comfortable teaching computer skills to her students. She believes most of them learn to use the technology tools as she did, "on their own." And that they would appreciate training opportunities that "were offered at convenient times. Like a 45 minute session rather than a 3 hour seminar. …If they had something between classes, they would do it; not on Saturdays." Furthermore, if the university is serious about students acquiring technology skills, they should "build technology courses into the schedule. The system doesn't want to change, so they 'push in' technology." So, she doesn't see the same level of commitment to reorganizing teacher preparation courses around technology skill sets that was presented by the level one instructors during their interviews. The instructor also indicated she believes the "full time faculty use technology a lot. But there are more adjuncts than full time faculty. If people work at home with other companies, they pay them for their training time." But, apparently, the university didn't offer that, in the case of technology preparation.

Literacy, Learning and Instruction

This level two course (E) is required for students enrolled in the Early Childhood, Elementary Education, and Special Education Bachelor of Science in Education degree programs. Every syllabus included in this study (fall semester 2001 to winter semester 2004) for this course included a reference to the use of technology in the course description. This appears in Table 13 in Appendix A as a technology course objective even though it wasn't stated as one of the enumerated objectives in the syllabi. In addition to this reference, every syllabus included student use of email or Blackboard for communication and all but one syllabus listed the instructor's email address. Other technology references that appear frequently in the syllabi for Course E include: students' reports must be typewritten (13 out of 16 syllabi files), students will conduct web searches (13 out of 16 syllabi files), students will observe the use of technology in the field schools visited (11 out of 16 syllabi files), and the use of web quests (9 out of 16 syllabi files).

One instructor is on record for having taught this course every fall and winter semester during the time of this study. In only one syllabus file from fall 2001 to winter 2004 was there a variation in the technology references. In the syllabus for one section of this course in fall 2002 there was no mention of web quests. However, in another section of this course in fall 2002, this instructor did make reference to students using web quests. Other instructors' syllabi files for this course most frequently omitted the use of web quests (6 out of 9 syllabi files) and the observation of technology use in the field schools students visited (5 out of 9 syllabi files). Once again this indicates that the consistency in the syllabi files for a particular course is heavily influenced by the lead instructor. Since one instructor taught the majority of course sections offered during this study period, there is little variation in the number of technology references from semester to semester. This again raises the question of whether or not the instructor's conduct of the class mirrors the content of the syllabus. It is also a reminder that changes in an instructor's course content and delivery may be quite rare.

Excerpt from Table 13: Technology Reference Averages for Course E

Sem	Year	No. of Inst	No. of Tech Ref's	Typed Rep'ts	Web Search	Tech Obj	E-mail BB	Tech Use – Field School	Inst'r Email	Elect P'folio	Web quest
F	2001	2	11	2	1	2	2	1	2	0	1
W	2002	3	19	2	3	3	3	2	3	0	3
S	2002	1	3	0	0	1	1	0	1	0	0
F	2002	3	18	3	3	3	3	3	2	0	1
W	2003	2	12	2	2	2	2	1	2	0	1
S	2003	1	6	1	1	1	1	1	1	0	0
F	2003	2	14	2	2	2	2	2	2	0	2
W	2004	2	11	1	1	2	2	1	2	1	1

Figure 21 compares the average number of technology references in Course E syllabi by semester from fall semester 2001 to winter semester 2004. The averages were obtained from the total number of technology references per semester divided by the number of syllabi on file for that semester. The semester totals represent the sum of the totals for each instructor's syllabus as recorded in a syllabi review table (see Sample Syllabus Coding Form in Appendix B for technology reference categories). As the figure 21 chart shows, the average number of technology references over this period of time varies between three and approximately eight, with six of the nine semesters having values near 6.0 (between 5.5 and 6.3). The highest value (7.0) occurs in winter 2004 and the lowest value (3.0) occurs in summer 2002. Interestingly though, this single instructor also has a syllabus on file for the prior semester (winter 2002) which contains double the number of technology references (6.0). The three references omitted from the winter syllabus in the summer syllabus are the use of web quests, conduct of web searches, and observation of technology use in field schools. Since this instructor has no other syllabi for this course on file

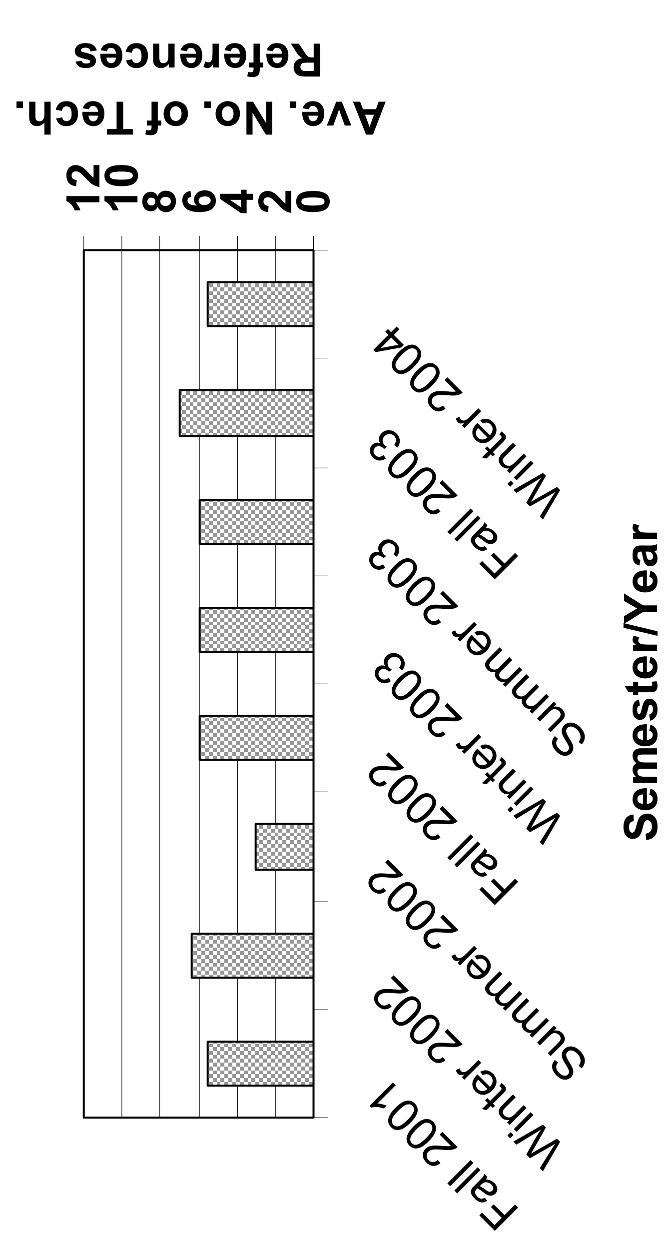


Figure 21: Technology Reference Averages for Course E

after the summer 2002 semester, it is unknown whether these omissions indicate a conscious restructuring of the course to exclude previously required student activities.

Unlike level two Course D, which had a decline in technology references over the period of this study, this level two course showed no net change from fall 2001 (5.5) to winter 2004 (5.5), (see Table 13 in Appendix A for Course E technology reference totals by semester). Thus, it appears that any changes made to this class occurred prior to the fall 2001 semester. Furthermore, it seems that there were few variations from instructor to instructor in the syllabi for this course. In comparison with Course D, the average number of technology references for Course E exceeds that for Course D in only one semester, winter 2004. Finally, in comparison with the level one courses, Course E exceeds Course B in four semesters (fall 2001, winter 2002, fall 2002, fall 2003) and it exceeds Course A in one semester (summer 2003), but it falls below Course C averages for all semesters.

Faculty Interviews and Observations

For this course, one classroom observation was conducted in January 2004. This class meets once a week, so one classroom observation was equivalent to two sessions in the other classes observed. The observed class was the second session of the semester. A follow-up interview was conducted later that month. There was no pre-observation interview with this instructor. However, the instructor agreed to participate in the study after reading an overview of the project which was sent to her via email. The classroom used for this course is the same one used for the observed sessions of Course D. So, the room had tables arranged in a “U-shape” with a teacher’s desk at the front of the room. There was a cart with a television and a video cassette recorder at the front of the room. The instructor brought in a cart with an overhead projector and pulled down the screen in front of the blackboard. There were 29 students in the class, 25 female and 4 male.

The instructor started the class by asking, “What did you read this weekend?” After several students responded, she said, “Last week we talked about the Goldilocks principle of reading: easy, just-right, and challenging levels. Apply that to yourself. Okay, who did easy reading this weekend?” Everyone raised their hand. She asked them to tell how they knew it was easy reading. Then she moved on to “just-right” reading and most students raised their hands. The discussion of what they read this time, led to the topic of reading the textbook for class and reading strategies (highlighting, sticky notes, underlining). She made the point that even first graders can learn to use sticky notes. She told the class, “So, I am asking you to use the same strategies we want to use with kids.”

Before discussing the assigned reading from the textbook, she had the students work on a reading activity in groups of five students each. She rearranged a couple of groups to achieve the size she wanted saying, “Last time we talked about building community…now you can get to know other people.” After introducing themselves to the other members of their group, the students began working on the activity as instructed. After they finished, she led them through a discussion of the activity. Then, while the groups were working a second part of the activity, she wrote a few notes on the blackboard. There was a mini-lecture about the notes on the board.

Her next topic centered on the students’ class folders. She used the folders as the means for students to submit their completed work and to return graded assignments to them. She interleaved classroom management issues with the night's lesson. They discussed that night's quiz and her expectations, "…as you were reading the textbook, what did you learn? …If you underline and highlight and take notes, then we won't have quizzes, …but if I feel some of you are not taking your reading seriously, I will impose quizzes and they will look like this. So tonight is round one, if you feel you weren't prepared, rethink your strategy and come next week better prepared to share and think." The next part of the lesson used the quiz to foster a deeper discussion of their reading, "So what I would like you to do with your quiz, is to go back through and with your highlighted book, go back and talk about what shocked you, what surprised you in what you read, …so this is where it should get really noisy." After the small group discussion session, the instructor brought the whole class back together to share their insights and to direct them to think about specific concepts she wanted them to connect together, "…it reminds me of the Baltimore story, do you remember that, what was it?"

Throughout the evening, the instructor used the blackboard at the front of the room to make notes and direct the students. In addition, typed notes, such as the quiz and components of their reading she wanted to emphasize, were presented via the overhead projector. However, as noted in my observation record, her principal mode of instruction was not lecture, it was interaction:

> The instructor's style is highly interactive, students must share ideas with each other, they are sharing their experiences and insights and discussing what they mean …it is not just her group strategy, but her question-posing method of instruction …not lecture so much as connecting the dots …full of energy, twisting and winding down a path, disclosing teaching tips along the way.

Thus, it is not surprising that the instructor emphasized, during her interview, the role of discussion in the conduct of her class. When asked if she used the discussion capabilities of Blackboard, she replied:

> It's all face-to-face. And I've been a big, a really big believer in that. So, …especially at the undergraduate level, I think sometimes graduate students can benefit from electronic discussions, but I think undergraduate, …I just think they really benefit from hearing out loud other peoples' perspectives and seeing other people face-to-face. I mean, I think that, you talked earlier about culture and I think that's all a part of the culture of this class. There's different ages, different sizes, different shapes, different colors, different dialects, different parts of the metro region, north, south, east, west, some are already teaching. I think some of that is lost electronically, which with graduate students, they're a little bit more experienced, but undergraduates I think it's really a benefit, so yes it's all face-to-face.

In fact, she indicated she rarely used the course management software. Her focus on technology use for this course was on students using word processing software to type their papers, with some references to web sites assisting students in creating lesson plans. Overall, the classroom observation was represented by 202 codes over 152 blocks of text. The most frequently occurring codes were from category 4 (teacher_directed) and category 5 (student_directed). 93 of the 202 total codes were from category 4 (6 for teacher_activity, 17 for lecture, 16 for directions, 2 for classroom_management, 22 for explanation_or_response, 9 for discussion, and 21 for questions). 41 of the 202 codes were from category 5 (5 for student_activity, 2 for student_initiated, 26 blocks for discussion, and 8 for questions). The educational_activity category was represented by 23 blocks (1 for classroom_work, 1 for field_experience, 1 for collaborative, 7 for small_groups, 1 for whole_class, and 1 for individual, 1 for research, 1 for writing_papers, 6 for reading, and 5 for tests_quizzes). These codes correspond to the timing of the observation, there were several activities mentioned during this lesson as indicators of future work. In addition, the distribution of category 2 codes indicates her emphasis on face-to-face discussion and small group activities. The next highest coded categories were category 10 (students) and category 12 (classroom). There were 17 blocks coded for category 10: (7 for number_of_students and 8 for behavior). There were 15 blocks coded for category 12: (8 for seating_arrangement, 4 for equipment, 1 for location, and 2 for physical_features). Again, these distributions correspond to her use of multiple student-group configurations throughout the course of the night's class. At times, she arranged the students in groups that accommodated a specific number, at other times she let them self-select small groups of varying sizes, and then there were whole-class discussions interspersed during the evening's proceedings. This instructor used technology (overhead transparencies) to guide her students in their analysis of their assigned readings. She used hands-on activities and small group discussion to help students explore key concepts and to model effective teaching techniques.

The students' need to witness effective teaching techniques was the one point of discussion in the instructor interview that led to a potential future use of technology. She indicated that,

> Many of them will find themselves in classrooms this semester where the teaching of reading is, is very ineffective. And I know, and I know that and you can hear from the discussion that night that many of them come from classrooms where reading instruction was very ineffective. So they need a model of what does, …they know what an ineffective one looks like, what does an effective one look like? And so I'll model…

This idea of modeling effective reading instruction led to a potential use of technology in the conduct of her class:

> I don't know if this relates…I think I would love to have, maybe do a video visit sometime to [a local] school district where they do readers' workshop very, very well. When I do daytime classes I think that would be really effective, to follow a classroom teacher as she does the reading [lesson] and then be able to talk with her afterwards, to debrief. It's the best, you know, where reading is really individualized for the kids and [the local] school district has really done a super job with that.

During the interview, she shared her definition of technology, "…oh all that useful stuff that could help or ought to help you access information more efficiently," and of educational technology, "I think the same but I might use the word education stuff. I use technology as a vehicle for access. Maybe that's not so much a definition as its most important role, as I see it." These definitions reveal her focus on technology as a tool to be used outside of the classroom by students and educators to help them complete assignments, prepare lessons and conduct research. In the classroom, her emphasis is on face-to-face expression of ideas.

Her response to question #3, "…how do you define technology integration?" was:

> I think it's been terrific the last, I would say three years, there's been a …it seems like a concerted, organized effort to integrate technology into the program in sensible ways. Which means I don't think it was very sensible or organized before that. …there seems to be a thoughtful energy in thinking about technology's practical benefits for our students as students and for our students as teachers. And I think that's really, honestly, really critical. Our students are students; they are not teachers yet. So they have a practical need to have access to technology to do some of the work we ask them to do and think about some of the things we ask them to think about. And then they need access to the technology in order to be excellent teachers; you know to become comfortable, to become confident, to become active users of the useful technology as teachers.

Then her response to question #4 "Do you use technology tools in the development of your classes?" was simply, "No." However, she later admitted she actually does use

Blackboard and MS Word in her preparation for classes. When asked if she uses technology tools to conduct her classes, she responded:

> No, not anymore. I used to actually more. I've really cut back the last three years, which is I know odd, but given that we have more support now, with the TLC and the great staff. Before, I had done some PowerPoints, and I was working to use video clips as parts of case studies. I used [an online] web quest design [tool] to model web quest design and that was an assignment in the class. And I don't do any of that anymore.

So, it seems that while she believes her students need to become comfortable with technology tools to be "excellent teachers", she thinks that need is being met elsewhere in the teacher preparation program. Furthermore, she doesn't see technology in the classroom as an important component in teaching reading, since she no longer models technology use in this course. Thus, her view of technology as a "vehicle for access" resounds with the concept of using the video visits to allow her students to see how "effective teachers" teach reading.

During the interview she shared the following insights: "…ten years ago very few students had a personal computer and I was shocked by that at that time and it was really cumbersome for students to have certain kinds of assignments. And now almost all students have a personal computer. And are far more savvy." She explains that when most students did not have access to personal computers she felt compelled to include technology instruction in her course, "…I stepped up my technology infusion realizing they had no personal experience. And now that more students, it's like they can all email without trouble, they can all attach; I don't have to teach how to email, I don't have to teach how to attach." But now that computer use is more widespread, she doesn't see the need to model technology use in the classroom: "…as they've just become more personally competent I've taken stuff like that out of my class, as a formal piece of my class. …I think they are doing some formal things in other classes and so it is giving me more time to do my reading stuff.” Once again, she indicates that technology in the classroom does not support teaching reading. This is a critical insight into an instructor’s conundrum, how do you balance the presentation of subject area concepts and other important aspects such as assessment, delivery techniques, and teaching tools? It seems this instructor sees time spent on modeling technology equates to time deducted from teaching reading.

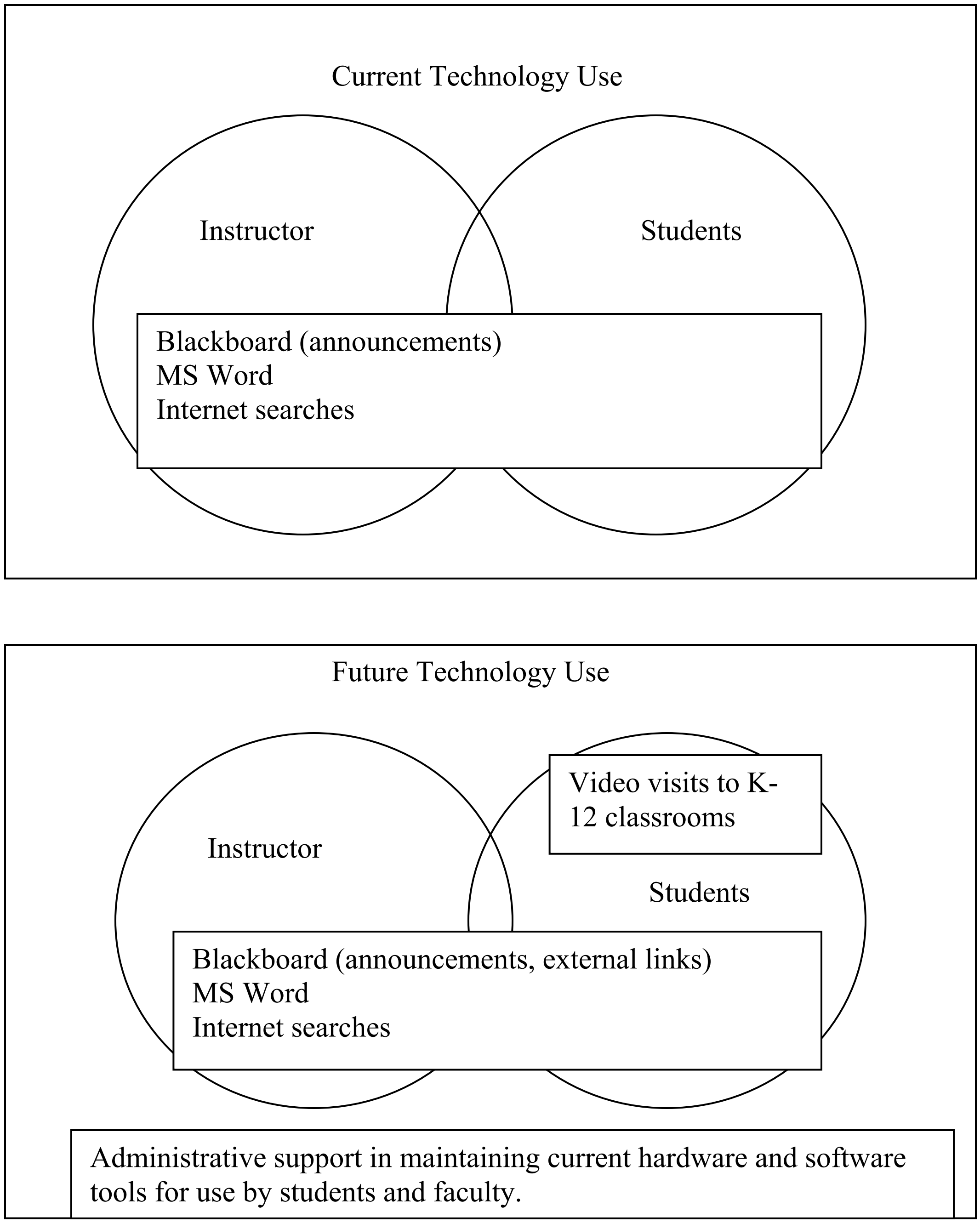
Other interesting comments which touch upon the role of time in the use of technology include: “Blackboard, well with this class, almost nothing besides assignments, [I mean] announcements. I don’t have my syllabus up, I don’t have any [assignments]. I did it one semester and I never moved it and it changed and I didn’t want to go through the trouble and so…It’s time consuming.” And: “I think I would like to actually think about using technology more and better but I also know that requires time which currently I don’t have. I’m so pleased with this course the way it is. I love it just as it is. I think it does just enough.” However, she goes on to say, “But I do think that if I were savvier and used technology, …thinking about if I brought them in here and had them pull up six different web sites on a topic and look at the reading levels, that that would be far more effective than me just talking about that and the students nod their heads and might say ‘sure that makes sense’. But I’m thinking well I could actually do that and that would probably be more effective.” And then she comes back full circle to, “But it wouldn’t surprise me that I’d have to find the time, work it in, find those web sites ahead of time. So …at this point I am not willing to give that time.”

When asked about benefits students derive from the use of technology, she replied, “My own computer work helps me get organized and plan, which helps them.” She said the most important benefit students derive from the technology component of the teacher preparation program was “Adaptability. Many students find themselves in [K-12] schools where technology isn’t supported; or there is a use but there are problems…the system goes down. [The technology component of this program] teaches them to be adaptable, flexible.” She went on to say that, “They can do PowerPoints, help kids find appropriate web sites. After on the job training, a couple of students were using a SMART Board without any trouble.” The bottom line is that students need to “find places where technology is suitable in their curriculum and how to adapt their class. They mimic what they’ve learned. They need to ask, ‘How is it different for different grade levels?’ Teachers struggle with balance.” While these comments regarding the benefits students derive from exposure to technology in their preparation to be teachers are insightful, they are also confusing in light of the lack of technology in their teaching methods courses. Why would students choose to use different methods, technology integrated techniques, to teach in their classrooms of the future if that wasn’t modeled in their methods courses?

Recognizing the fact that NCATE (National Council for Accreditation of Teacher Education) and DESE (Department of Elementary and Secondary Education) have outlined requirements for technology use by students in teacher preparation programs, does not mean higher education courses need to model those techniques. Instead, the instructor sees this as motivation for administration to get on board and provide the necessary infrastructure to support students’ in their individual quest for computer technology skill acquisition. This includes changes that have already occurred, such as the development of the TLC and the provision of staff to support users of the center's technology equipment. It also includes programs like PT3 (Preparing Tomorrow's Teachers to use Technology) which offer collegial support to faculty. And, it includes an ongoing commitment to providing current technology tools (hardware, software, and networking) to educators.

This instructor recognizes that "Technology can assist in creating a constructivist environment. It can provide efficient access for readers and teachers. Multiple sources help the teacher find those that are most meaningful for the individual student." However she finds that she uses technology less in her classroom based on her personal views, "Research in the reading field influenced [her] decisions for the course. How good and poor readers approach using technology; video games and stories on CD-ROM influence [me] daily." Additionally, she indicates less use of technology in this course is a reasonable position "because of the students' own growing knowledge of technology. It seems to be adequate for classrooms. If the [K-12] schools required different levels of knowledge and support, I would change my course." From her perspective, most of her students come from the college's own level one program, so they have already been introduced to technology in those courses, plus they have more personal experience with computers before they enter college. Thus, there is little need to allocate class time to technology. These views are illustrated in figure 22 below, which shows the potential for students to learn from exemplary reading teachers in the K-12 schools via video classroom visits. This future use model also indicates that while the instructor sees no need in changing her

Figure 22: Current and Future Technology Use Diagram for Course E



technology use as it relates to this class, she does believe that the college administration needs to continue to provide well-maintained and current technology tools for use by the students and the faculty.

Observations and Common Perspectives

Comparing the average number of technology references by course for these two level two courses showed that in four of the five semesters on record, the Course D average exceeds or equals the Course E average. However, the Course E averages (as shown in figure 21 on page 141) appeared to be near 6.0 for every semester except one of the eight included in the study period, whereas the averages for Course D decreased significantly over the period of the study. It is not just the number of references that were different, but also the type of technology references that appeared in the course syllabi. Common references for these two courses included: listing the instructor's email address, statement of a technology course objective, students typing reports, students conducting web searches, student use of email or the Blackboard system, and a student web quest activity. Aside from the web quest activity, the other technology references were reasonable and common to all of the courses studied. Student and instructor use of email, or at least posting email addresses, was a common practice during the period of the study. However, the frequently occurring references that appeared in only one or the other of these two courses were more curriculum-dependent. References common only to Course D syllabi were: students photocopying their assignments prior to submission and students video-taping practice teaching activities. There was one Course E only technology references: students will observe the use of technology in the field schools visited. Thus, the focus in Course D was on students practicing their teaching. They used technology to help them review and improve the content and delivery of their lessons. On the other hand, the focus in Course E was on students observing teachers and how they teach reading.

It is interesting that in the instructor interview, the Course E instructor indicated the web quest activity had been dropped from the course. However, this technology reference still appeared in one of the two syllabi files for that semester, as well as in both syllabi for the prior fall semester. (It was only omitted completely during the two summer session syllabi files of 2002 and 2003.) Since one instructor taught the majority of course sections offered during this study period, there is little variation in the number of technology references from semester to semester. Again, the syllabus does not tell the whole story about the conduct of the course. Faculty may reuse their syllabi from semester to semester, believing their course content is nearly constant. Or, adjunct faculty may use another faculty member’s syllabus as a template for their course offering. Thus, the syllabi files may reflect an instructor’s intent to use or not use technology in the classroom, but it does not convey what actually occurs. The classroom observations and instructor interviews, however, gave us insight into the role of technology in these courses.

There seems to be two common threads in these level two courses: the issue of the time requirement for technology integration, and the lack of need based on the “successful” technology integration in the level one courses. Thus, it appears there was not a systemic program change at this college. It is apparent that the changes made to the teacher preparation program occurred in the level one restructuring and redesign of courses. However, it seems that although changes were meant to occur in parallel at all three levels of the program, these changes were not made to the level two courses, at least as represented in this sample of two courses from that level. Furthermore, it appears that the intent of the level one courses was to introduce the skills, and technology tools, students would need to be effective teachers. If these skills, and tools, are not necessary to the level two, teaching methods, courses, then why would anyone believe they are required in a K-12 classroom, or a teacher preparation program? So, was there a need to integrate technology in the teacher preparation program? And, was there a measurable benefit to the students? Was there a benefit to teacher preparation instructors? It seems that quite different perspectives with regard to these questions were presented in the comparison of the level one and level two course offerings.

Level Three Course

Level three courses are taken during the final year of undergraduate studies in conjunction with student teaching. These courses are designed to help pre-service teachers "synthesize theory and practice in education", and are therefore directed toward the design and development of actual classroom activities. It is at this level that students are challenged to develop lesson plans for a particular topic within a subject area. These pre-service teachers have the opportunity to teach their lessons within an actual classroom setting, as well as practicing before their peers. Level three instruction may be the most critical in terms of faculty modeling of appropriate tools and techniques for teaching and learning.

Communication Arts Learning and Instruction

The level three course included in this study, Communication Arts Learning and Instruction (Course F) is a required course for the Bachelor of Science in Education: Early Childhood degree, Bachelor of Science in Education: Elementary Education degree, including Middle School Certification, and Bachelor of Science in Education: Special Education degree. This course, previously named Teaching Language Arts and Reading N-9, is a critical component for pre-secondary educators. The practices modeled and discussed in this course may have a significant impact on pre-service teachers as they step out into their own classrooms to teach children to read and write.

As figure 23 illustrates, the average number of technology references for Course F was at its highest (6.5) in the final semester of the study, winter 2004. The lowest value (3.0) occurred in both the summer 2002 and fall 2002 semesters. During these two semesters, all three sections of this course were taught by the same instructor. Thus, the three syllabi each contained three technology references: students' reports must be typed, all student work should be photocopied by the student, and the instructor's email address appeared on the syllabus. The second lowest value (3.5) occurred in the summer 2001 semester, which included two syllabi, one from the same instructor, with the same three technology references. These figures point out the impact of one instructor's syllabus on the overall course averages.

The net change in the average number of technology references for Course F from winter 2001 (5.0) to winter 2004 (6.5) is 1.5, or a 30% change. Four of the ten

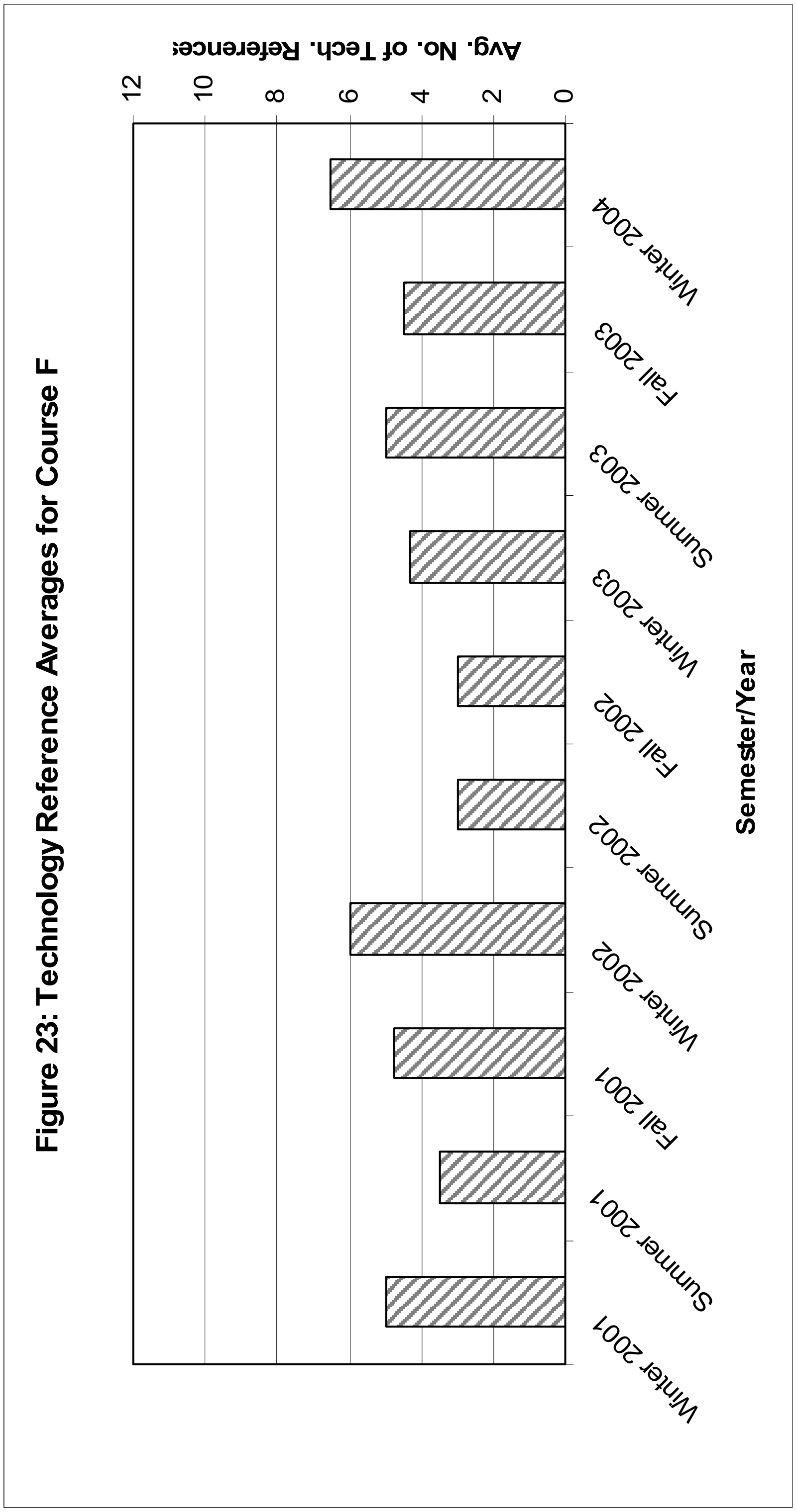


Figure 23: Technology Reference Averages for Course F

semesters studied had average values at or above the initial value of 5.0 average technology references. While the syllabi on file for this course date back to summer 1991 semester, the first semester in which syllabi contained any references to technology is fall 2000 (see Table 14 in Appendix A). The average number of technology references that semester was 4.0, indicating an intentional inclusion of technology objectives in this course prior to the restructuring of the teacher preparation program in 2001.

Excerpt from Table 14: Technology Reference Averages for Course F

Sem	Year	No. of Inst	No. of Tech Ref's	Typed Rep'ts	Photo-copy	Web Search	Tech Obj	E-mail BB	Use Comp Labs	Inst E-mail	Dis-cuss Board	Elect P'folio	Web quest
F	2000	2	8	2	1	0	2	1	0	2	0	0	0
W	2001	3	15	3	1	1	3	3	1	3	0	0	0
S	2001	2	7	1	2	0	1	1	0	2	0	0	0
F	2001	4	19	4	4	1	3	3	0	4	0	0	0
W	2002	1	6	1	1	0	1	1	0	1	1	0	0
S	2002	1	3	1	1	0	0	0	0	1	0	0	0
F	2002	2	6	2	2	0	0	0	0	2	0	0	0
W	2003	3	13	3	1	0	2	2	0	3	2	0	0
S	2003	1	5	1	0	0	1	1	0	1	1	0	0
F	2003	2	9	2	0	0	1	2	0	2	0	0	2
W	2004	2	13	2	0	0	2	2	1	2	0	2	2

For the syllabi on file from fall 2000 through winter 2004, every syllabus included the instructor's email address and all but one included a reference to students' typing their reports. Other references appearing in more than half of the syllabi for this course were: students should photocopy their work (13 out of 23), students shall use email and/or Blackboard (16 out of 23), and 16 out of 23 instructors included a technology reference in their list of course objectives. The four references to web quests appeared in the fall 2003 and winter 2004 syllabi and the electronic portfolio requirement was in the winter 2004 syllabi. Thus, this course is still undergoing some changes in design with respect to student use of technology. However, the greatest changes occurred just prior to the restructuring of the teacher preparation program, when the syllabi files went from zero technology references in summer 2000 to an average of 4.0 technology references in the fall 2000 semester.

Faculty Interviews and Observations

During the fall semester of 2002, two separate classroom observations were conducted in each of two different sections of this course. Both sections were taught by the same instructor. Then in the winter semester of 2004, after her interview, two separate classroom observations of the same instructor were conducted in one section of this course. Prior to observing the faculty member's teaching, a pre-observation interview was conducted in August 2002. The instructor explained that this level three course is the step before student internships and student teaching. Students in this course still participate in the field experience program. Thus, the student surveys for all students in the field experience program, include students from levels one, two, and three of the teacher preparation program.

Her prior K-12 classroom experience had an influence on her perspective with respect to the role of technology in education: "I found with my middle school students that if I put them at a computer they became better writers. Their frustration level went down. They had spell check." She also indicated that it was easier for her students to go from a rough draft to a final version of their work on the computer. However, middle school students didn't care about font style and size, so she learned to review their documents before letting them print, “One student had used size 72 and it took forever to print!” She also spoke of her personal use of the computer as a writing tool, “I am more active on the computer; more willing to revise my work.”

In her role as a level three instructor, she found she was using Blackboard more and more each semester. At first, she used it to post grades so students could verify their grades were recorded correctly. “The electronic grade book gives visibility to the students immediately. They can access it at any time.” She liked the ability to email everyone in a class, post announcements about upcoming events, give students directions regarding assignments, and provide external links to Internet sites she has chosen for them. The day we met she had just finished uploading the syllabus files for her fall classes and putting course assignments on the Blackboard calendar.

Another Blackboard feature she routinely used in her classes was the discussion board, “I put a prompt up and they get points for writing their response. They get additional points for a reply to another person’s response.” She started using the discussion board as an online replacement for the students’ writing chapter summaries to demonstrate they had completed the reading assignment. She stated her perspective with respect to online discussions, “When they’re sitting at the computer, they’re all equal. In face-to-face discussions you always have certain people who will dominate.” While she did not like the online quiz feature of Blackboard, she sated that using “the digital drop box this summer has helped a lot.”

With respect to other technology tools, she indicated that she did not do web quests, did not know PowerPoint and did not see a need to use them. She typically taught her classes in a “regular classroom” so she used overhead transparencies to share documents with students during class. However, she did take all of her classes to the TLC by the third class session so they knew where the center was located and that the students could access Blackboard from the computers at the facility.

The first classroom observations were conducted on the first day of class for each of the two sections of Course F she was teaching that semester. The second classroom observations were session #3, the second week for both sections. This second observation was the day she took the students to the TLC to verify their ability to login to Blackboard and complete a student technology survey. The first classroom observation for both sections was held in a traditional classroom: "The room is square with desks (a chair and attached desktop) arranged facing the front of the room. There is a green chalk board at the front. There is an overhead projector which [the instructor] is using for her review of rules (requirements/syllabus) and for completing the expectations chart with the class. There are about seven students sitting on the carpeted floor." There was a screen that pulled down over the chalk board. There were no other pieces of equipment, no television, no VCR, no computer.

The section #1 classroom observation consisted of 138 codes over 111 blocks of text (each block is roughly a sentence). The most frequently occurring code category was category 4 (teacher_directed), followed in number by category 5 (student_directed). 63 of the 138 total codes were from category 4 (7 for teacher_activity, 12 for directions, 3 for classroom_management, 14 for explanation_or_response, 5 for discussion, and 22 for questions). 27 of the 138 codes were from category 5 (2 for student_activity, 17 blocks for discussion, and 8 for questions). The educational_activity category was represented by 14 blocks (2 for classroom_work, 2 for field_experience, 1 for individual, 3 for writing_papers, 3 for presentations, 1 for reading, and 2 for tests_quizzes). These codes indicate that the first session involved the instructor's review of expected semester activities. In addition, there were 7 codes from category 1 (technology), due to the instructor's preparation of the students for outside of class work requiring the use of technology. The distribution of the 7 category 1 codes was as follows: 1 for technology_integration, 1 for hardware, 4 for Blackboard, 1 for Internet. It is also interesting to note that 7 codes were from category 10 (students). Of these 7 codes, 4 were for needs_interests, 2 for number_of, and 1 for behavior. The needs_interests items included references to the number of students on the class wait list, the pre-requisites for this course, comments regarding gender balance in a classroom, and field experience placements. These issues correspond to the fact that this is a level three course, one of the final stages complete prior to student teaching.

The first classroom observation in section #2 was very similar to that of section #1. There were 114 codes used over 91 blocks of text. As before, the most frequently occurring code category was category 4 (teacher-directed), with 32 codes from that category (4 for teacher_activity, 9 for directions, 3 for classroom_management, 4 for explanation_or_response, 5 for discussion, and 7 for questions). Again, this reflects the fact that this is the first class session. So, much of the class period was spent familiarizing the students with the course guides and instructor expectations. However, the last three code items (explanation_or_response, discussion, and questions) highlight the nature of her instructional style. During the classroom lesson portion of the first session, she read a story to the class and had them complete an expectations chart. While reading the story, she would ask the class what they expected to happen next, how old they thought the character was and how they thought the character felt, or what the character was thinking. Her style was very dialogic. “This is a good listening lesson. …many times when we go into schools we make judgments about what we see and hear. This story shows both sides of the story. Why does [the story book character] need to have the same restrictions as everyone else?” She seemed to enjoy watching the students as they became more actively engaged in listening and thinking about the story. “I tried to have you actively engaged by doing this activity, not just reading the story to you!” She also modeled the techniques the students were discussing in class: “I did a miniature closure. Closure is a recap. It is not, ‘Bring your permission slip tomorrow.’ Or, ‘Put away your English books’…”

In the section #2 first observation, there were more category 1 (technology), category 2 (educational_activity), and category 10 (students) coded blocks than in the observation notes from section #1. The 13 category 1 codes were distributed as follows: 2 for technology_integration, 1 for software, 1 for hardware, 7 for Blackboard, and 2 for Internet. While there was more emphasis on the technology components of the course in this observation, I don’t believe it indicates any difference in her method of instruction or intended use of technology. As previously stated, the number of occurrences does not necessarily indicate the amount of time or emphasis the instructor gave to a particular concept, issue or component, just that it was referred to more in the course of the conduct of the session. There were also 13 category 2 coded blocks: 5 for classroom_work, 2 for field_experience, 1 for small_groups, 3 for writing_papers, 2 for reading. The category 10 codes totaled 12 (2 for needs_interests, 3 for number_of and 7 for behavior). I think the increase in student behavior codes was actually a reflection of my increased attention to and awareness of the students because of my familiarity with the lesson, since I had already observed the instructor in the prior section. There were also more category 12 codes in the section #2 observation. Since these codes deal with the classroom setting, I believe the increase is attributable to my focus on observing the surroundings because of familiarity with the instructor's lesson.

The next week, I observed the same two classes as they visited the TLC. The number of codes was significantly reduced as were the number of blocks of text recorded. For section #1 there were 36 codes used to identify 17 blocks of text. During this session, only nine students met in the TLC to become familiar with the Blackboard software and to complete the student technology survey. Issues addressed included how to check student grades, the expected number of discussion board postings and how to reply to someone else's posting. Several of the students stayed in the TLC after the class session was concluded. They were typing their responses to the question posted for chapter two on the discussion board, completing the technology survey, and exploring the Blackboard course site. The most frequently occurring code category was 1 (technology): (2 for educational_technology, 2 for technology_integration, 3 for Blackboard, and 2 for Internet). This was not surprising since the purpose of this class session was for the students to become acclimated to the TLC and the technology tools required for this course.

The next most frequently used code category was 4 (teacher_directed). The codes for this category were: 2 for directions and 3 for explanation_or_response. However, there were three code categories that each had four codes: student_directed (1 for discussion and 3 for questions), students (1 for number_of and 3 for behavior), and technology_purpose (1 for classroom_management, 1 for teaching_instruction, and 2 for communication). Since this session was conducted in the TLC, each student was seated at a computer throughout the instructor-led portion of the class. Since there were so few students in attendance, the instructor could address individual's questions in such a way that the entire group could benefit from the explanation or response. She was also able to assist individuals who needed personal attention.

In the second observation of class section #2, there were 41 codes covering 15 text blocks. As for section #1, the most frequently occurring codes were in category 1 (technology): 2 for educational_technology, 1 for technology_integration, 5 for Blackboard, and 3 for Internet, totaling 11 technology codes. The second most frequently occurring code category was category 10 (students): 1 for needs_interests, 3 for number_of, and 5 for behavior. Finally, there were 6 category 14 codes (technology_purpose): 1 for classroom_management, 2 for teaching_instruction, and 3 for communication. In this section there were only 3 codes recorded for teacher_directed, all three were for directions. This session involved eleven student participants who listened to the instructor's directions and jumped right in, using the computers to complete the technology survey, to check their grades, and to visit the discussion board. All students were finished before the end of the session.

In the winter semester of 2004, one month after completing the instructor interview, I observed two class sessions for this course again. The first observation was the first day of class and the second observation was three months later, near the end of the semester. The first class session notes consisted of 111 codes across 82 blocks of text. Category 4 (teacher-directed) had the most frequently occurring codes (1 for teacher_activity, 8 for directions, 5 for classroom_management, 17 for explanation_or_response, 3 for discussion, and 4 for questions). The second most frequently occurring code category was 5 (student_directed): 3 for student_activity, 4 for discussion, and 8 for questions. This correlates well with the initial observations during the fall 2002 semester. The instructor again used a question and answer format to share information with her class. The two biggest variations from the prior first class session observations and this class session were: 1) there were significantly more technology codes used in this transcript and 2) the student activity was an expectation chart regarding their questions about this course, not about a story. The category 1 (technology) code distribution was: 3 for educational_technology, 3 for technology_integration, 3 for software, 3 for Blackboard, and 1 for Internet. While the only technology equipment in the classroom was an overhead projector, the instructor spent time discussing the roles that Blackboard and the electronic portfolio software would play in this course. She addressed questions the students had regarding purchasing, learning and using these tools to complete the course assignments.

The next two highest frequency code categories were category 2 (educational_activity) and category 12 (classroom). There were 12 total category 2 codes used (3 for classroom_work, 8 for field_experience, 1 for individual). Since the students and instructor were engaged in questions and answers regarding the syllabus and expectations, there was a large amount of time spent explaining the field experience component and how students would be assigned to schools. The classroom work portion of the session was based on the students completing and submitting their individual course expectations charts. My observation included notes about the classroom arrangement, equipment and seating. Thus the 11 category 12 codes were as follows: 2 for seating_arrangement, 5 for equipment, 1 for location, and 3 for physical features. As was mentioned previously, this room was not equipped with a computer. There was an overhead projector and a television and VCR on a mobile cart. The latter equipment is usually available in several classrooms on mobile carts so instructors may share them for video segments they wish to show in class. However, the computers are not transportable from room to room. So, for this instructor to show her students how to use Blackboard, or to demonstrate specific Internet resources, she would have to make arrangements for her class to meet in another location, such as an available classroom or the TLC. However, she did not mention the TLC in this session, nor did her schedule of class sessions include a visit to the TLC this semester.

The second classroom observation for this course occurred at the end of the semester. When I arrived in the classroom, twenty minutes prior to class time, there were already a couple of students there waiting for class to begin. As before, her instructional style was open and sharing. My notes included the observation that "[The instructor] uses stories frequently in her classes. They are a friendly way to get a point across to her students.” Each class session involves construction of new ideas from familiar concepts, as the following exchange illustrates.

> Instructor: “Today we are going to talk about elements of a story. What are some elements of a story?”
> Student1: “Character.”
> Instructor: “Another?”
> Student 2: “Setting.”
> Instructor: “Setting. One type is the place where it occurs. You can also have time setting. That’s why I mentioned [the state’s K-12 assessment initiative]. Don’t be upset with things changing, that’s the natural progression of things. Another element is plot. Like with winning the lottery, you have the problem of how to spend the money.”
> Students: “That’s not a problem.”
> Instructor: “Yes, that’s my point. A problem isn’t always negative. That’s why the plot is the problem. Do the characters resolve the problem? How do they do this?”

The students were suddenly thinking about the elements of a story in terms of their lives, their experience, and their dreams. Then she shifted gears as she moved the class into an activity. This activity involved the students in a collaborative writing adventure. As I noted, “This type of shared development seems to happen easily in this class. There are no issues with students being uncomfortable sharing what they have written with each other or letting someone else continue their work. Is that because they are sitting by people they know, or is it because they are used to [the instructor’s] style?” After the class session, we discussed this activity and the instructor told me, “I save this activity for the end of the semester because they know each other by now.” She also shared her method, “I listen to them during the activity and I pick the funniest one [story] to be presented last and then I start the group presentations at the opposite end [the more serious story].”

The instructor tied the activity to a teaching methods moment and referred the students to what they have already learned about the writing process: “I reviewed with you the elements of a story. I showed you the prints and had you think about the elements. Then you wrote a story. You have to do it step-by-step. Fortunately, we have learned, basically due to the writing assessment program that we have to do it in pieces." And she introduces them to the concept of technology integration: "We don't have time [today] to do the final draft. …My next step would have been to take the class to the computer lab and type the story in, making revisions as they go. One person would have created a visual representation of the story which we would hang in the room." Then she had the student groups share their stories with the class.

The transcript for this class observation consisted of 191 codes over 172 blocks of text. 62 of the 191 codes were from category 4 (teacher_directed). The distribution of these codes was: 1 for teacher_activity, 10 for lecture, 17 for directions, 2 for classroom_management, 20 for explanation_or_response, 3 for discussion, and 9 for questions. The next most frequently occurring code category was 2 (educational_activity), with 39 codes as follows: 3 for classroom_work, 4 for collaborative, 4 for small_groups, 1 for whole_class, 9 for individual, 1 for research, 6 for writing_papers, 1 for presentations, and 10 for reading. Category 5 (student_directed) was third with 35 of the 191 codes. The category 5 codes used were: 10 for student_activity, 4 for student_choice, 4 for student_initiated, 11 for discussion, and 6 for questions. These code distributions support the other observations. The instructor uses dialogue, primarily in a question and answer format to share concepts, methods, and instructions with her class. She has students interact with each other as well as with her. Their interaction is usually in the form of an activity, which may include individual tasks, small group work, and whole-class discussion.

During this class session, category 10 (students) and category 1 (technology) were the other frequently used code categories. Category 10 included: 1 for needs_interests, 12 for number_of, and 9 for behavior. These codes represent the movement of the students from whole-class to groups to individual work, and back again to whole-class in the classroom as the session unfolded. Since the students were involved in various discussions and individual reflection and writing, there were many different behaviors observed during the session. The technology codes represented in the text blocks were: 3 for educational_technology, 2 for technology_integration, 2 for software, and 5 for hardware. This is largely due to her stories about working with K-12 students and her indication of how she would proceed with this session's writing activity in a technology setting.

As is noted in each observation, this instructor does not use computer technology in the classroom. However, she speaks of how it can be integrated and she requires student use of technology tools in the completion of the course activities. These ideas are reinforced in the instructor interview, which was conducted in December of 2003. The first question posed was "How do you define technology?" Her response was, "Okay, my definition of technology, and this is a very basic, elementary definition, is basically anything that you plug into an outlet …and that really conveys information." Next, she shared her definition of educational technology:

> Educational technology is anything that plugs into an outlet that helps the classroom teacher provide information for the students. …it's sort of like

> when I was working with student teachers and they had to do a technology aspect and they would be in schools that had broken down overheads, had no computer access in the building. They would say, "How am I going to do, what am I going to use for my technology component? And so we agreed that when they went on the computer on the Internet and got lessons, that that was fulfilling their technology component.

So, even in the first couple of questions, the instructor provided insight into her belief that technology is an integral part of preparing to teach and teaching students. She also demonstrated her attitude toward her students, one of accommodation and respect for their needs. This carries forward as she looked at technology integration in her classes.

> After I model how we do the brainstorming, when we have to do the first draft [for their class project], I take them into the TLC and I show those students that don't know how to import graphics into their work. But the project is based on the writing process. And, it's just a natural progression that we use the computers.

Throughout our discussions, and during her classroom sessions, she would refer to her K-12 experiences. With respect to technology integration, she shared the following:

> …back when I taught Language Arts in middle school, what I loved with my students is they could save their draft on disk, revisit it, and they didn't have to type it all over again. You know, they could cut and paste. And I think that aspect of it has been marvelous for the advent of the writing process, because then people don't get bogged down. They're more willing to be creative because they don't have to go through the process of having to recreate everything. …therefore things that would slow them down in the past, like their spelling or their handwriting, …when you put them on a computer it becomes a nonevent. So for me technology has really enhanced education because it's taken away several of the stumbling blocks that we once had.

This concept of technology as a tool for instructors to use to enhance education hit at the core of this study. However, this instructor seemed to see computer technology use by her students as an activity that occurred in a computer lab, or in their homes, not an integral part of their college classrooms, since the classrooms she taught in were not equipped with a computer.

The instructor indicated that she used technology tools in developing her classes, "I use the word processing aspect. I go on the Internet and look for lesson plans, the latest research." She also said she used technology tools to conduct her classes, "I put my syllabus online, on Blackboard as soon as I can. I put my calendar on. I communicate with my students using Blackboard." The instructor also pointed out an interesting observation regarding the online discussion capability of technology:

> …For a couple of semesters I used the discussion board on Blackboard and I think I am going to go back to that because I did not do that this semester and I don't think students really read the book. The discussion board really helped people to connect because they would read something from a student that maybe they really never was aware that that person was in the room. And then when we had class and we did do group work and all, they became more aware of them and their thoughts.

This perspective is quite different from that expressed by the level two instructors in the study. While she made extensive use of face-to-face discussion in her classroom, this instructor believed the online discussion added a new dimension to the class culture. It provided an opportunity for students to know each other sooner, to seek out individuals with whom they shared a perspective that would have remained unknown to both parties without the online discussion component.

The ensuing discussion of the programmatic changes helped me to understand the impact this level could have on the teacher preparation students. She indicated that there was a major change in that there is now an internship program. "I think it is an awesome program. I really do. I bought into it early because as a former classroom teacher I can see value in it.” The new internship requirement is one day per week in a K-12 classroom. “You’re there when the kids come and you stay until after they leave.” This new program affected all students at level three. “This coming semester they all have to do internships. My interns that I just finished with this past Tuesday will be student teaching in the spring. So now the semester before they do their student teaching they do an internship.” The benefits included the opportunity to gradually assume some of the responsibilities of a classroom teacher prior to being observed as a student teacher. “And so my interns right now, the vast majority of my interns do not have that typical anxiety prior to student teaching.” So, there are many important activities competing for instructional time in a teacher preparation program course. It’s not just a matter of whether or not an instructor should introduce the use of technology as a component of an instructional methods course, it involves planning the individual pieces one will squeeze into an already full agenda.

With respect to the technology she required her students to use in this course, the instructor indicated that Blackboard was a critical tool. She also stated that “…everything they turn in has to be typed.” But, surprisingly she concluded that some students were not yet using computers to produce their typewritten work, “Not everybody, you can tell by the font if it’s been, because some people are still using a typewriter. That’s okay.” This was an interesting juxtaposition of ideas. On one hand students were expected to login to Blackboard to type responses to discussion questions about their assigned reading, yet the instructor believed some of these same students were unable to type a paper using a computer, either because of lack of familiarity with the software tools, or because of inaccessibility of computers.

The common thread throughout the interview was the instructor's use of the various features of Blackboard. "I like to use [Blackboard]. I have a tendency to change my calendar throughout the semester, …So, I'll post the new calendar on [Blackboard] but I'll keep the old one up there and I'll label the new one New Calendar." The instructor also addressed the fact that she required the students to use their university email account because that is the email address she sends items to via Blackboard. She commented on the students' use of the technology tools to prepare for class, such as items posted under course documents, "But I'm really impressed more and more each semester students come in and they've printed up the syllabus before they come to class." And she used Blackboard to create links to websites which she thought would be useful to her students.

When asked about tools that are optionally used by her students, the instructor spoke about PowerPoint being used for student presentations, "Well when we do presentations it is amazing those students who want to do a PowerPoint, since I have no idea how to do them. …and so when they ask I encourage …they're getting that before they come to me. And so when they ask me if they can do that, I say, 'Oh yeah.'" Once again, the instructor shared her flexibility and her desire to support her students as they acquire new skills to use in their future classrooms. She claimed she had no reservations with using technology in this course because she was accustomed to taking her middle school students to the computer lab for writing activities. She said, "I just saw it as a win-win thing. I really didn't have any reservations. When students will tell me they don't have a computer at home I tell them, 'Well you've got the TLC here. I was not into enabling them at all, about the use of the computer." Her references to the discussion board as a tool for shared reflections on the assigned readings addressed the use of email for partner-to-partner sharing prior to having the ability to do whole class or small group discussion via Blackboard. As she stated, “I guess it evolved, sharing their knowledge.” That seemed to sum up the entire technology perspective with respect to this course. It just evolved.

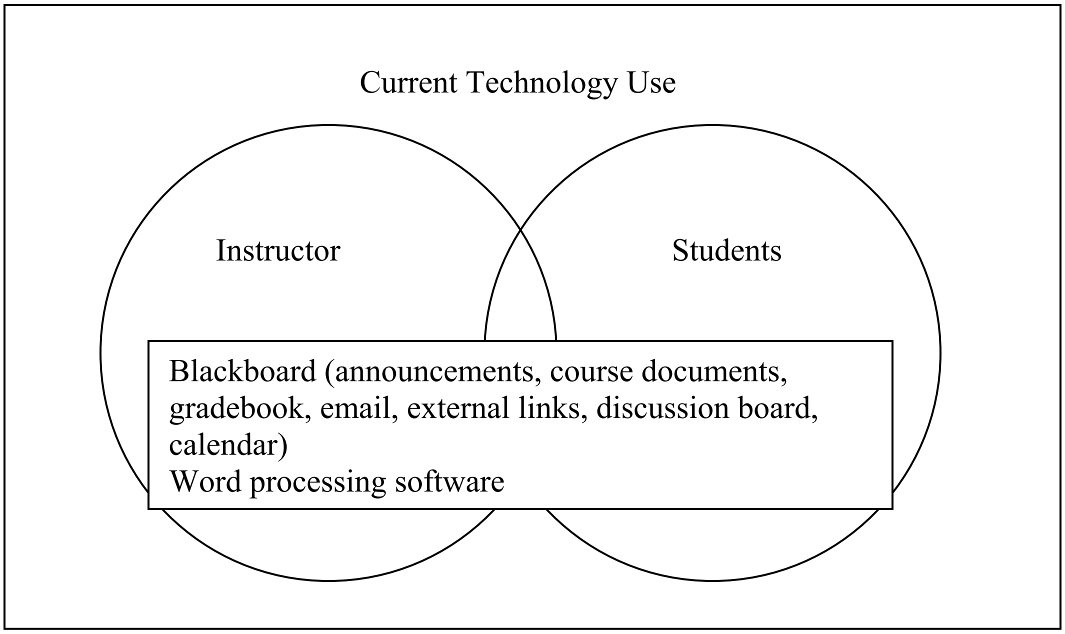
Although she said she had no reservations with respect to technology integration in this course, she did point out that she has observed more computers in the K-12 classrooms she and her students visit during their internships. “But when I go into classrooms I see computers, banks of computers. So, hopefully it’s just going to become a natural [thing].” She encouraged her students to use the Internet as a preparation tool by having them research locations they might take a class to for a field trip. “That’s another thing we do in the computer lab. They have to think of a place they would like to go on a field trip and then they get on the Internet and we search the web for information about that place.” As with other activities conducted in her class, she said it “…helps them develop their lesson and it helps with their [project] because the [project] has to be part of the unit. It’s not a random thing, there’s a connection.” Again, her instructional style is to lay the foundation, have them perform tasks, and then help them connect it all together. And, she felt that using the Internet to plan the field trips elevated the quality of the products the students produced. She stated that “…because they can do it using the Internet, they are more likely, instead of going to the zoo, maybe they’ll go someplace they hadn’t thought about. Or if they are going to go to the zoo, maybe they will do something more exotic than what they had originally thought about.” Even though this project had been used in this course before she required students to use the Internet, adding the technology piece has shown her an improvement in the products her students produce.

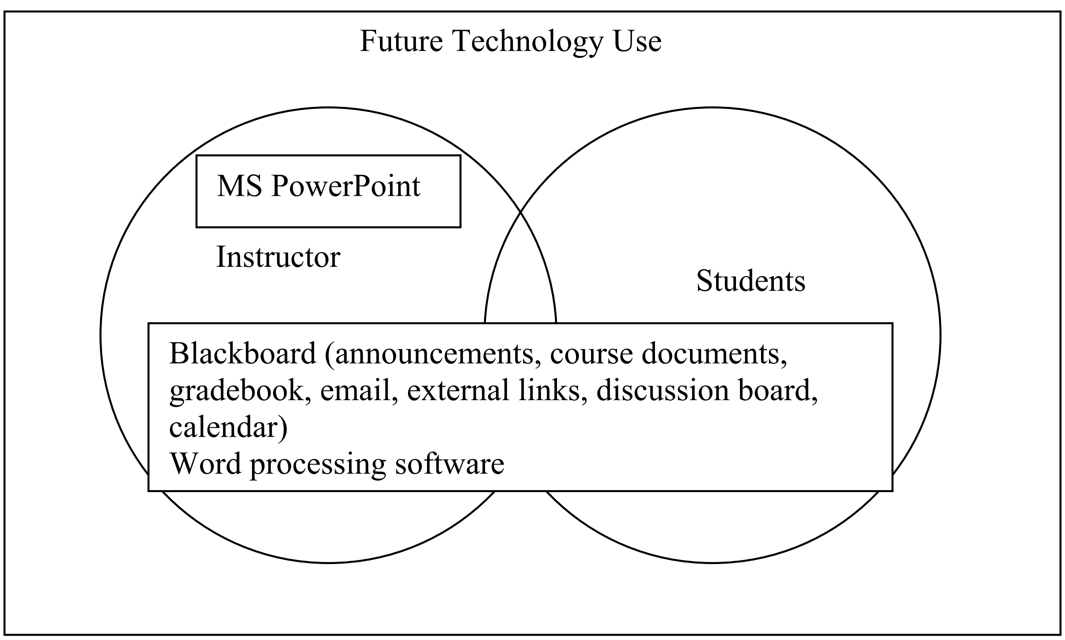
So, while she sees her students' use of technology as a means to better outcomes in terms of student assignments, student preparation for K-12 classrooms, and student-enhanced creativity, her vision for the future of her course is to continue what she is doing, using the Blackboard course management software and encouraging her students when they suggest trying something new. As is shown in figure 24 below, her one addition to her course would be to satisfy her desire to learn how to use MS PowerPoint to create notes which she can post on her Blackboard course site for her students.

Distinctions Among Levels

Figure 19 on page 128 is a comparison of technology references occurring in the syllabi for each of the six courses investigated. Although syllabi files were reviewed back to the fall semester of 1995, not all courses had syllabi available beyond the winter semester of 2001. Thus, this comparison chart covers syllabi from all six courses over the period from winter semester 2001 to winter semester 2004. Of note is the fact that every syllabus reviewed during the winter 2001 through winter 2004 study period had at least one technology reference. Thus, the four courses with no values on the chart for some semesters appear that way because there were no syllabi on file for those semesters for those particular courses: A (summer 2002), C (summer 2001), D (summer 2001, winter 2002, summer 2002, winter 2003, summer 2003) and E (winter 2001, summer 2001). However, prior to winter 2001 there were

Figure 24: Current and Future Technology Use Diagram for Course F





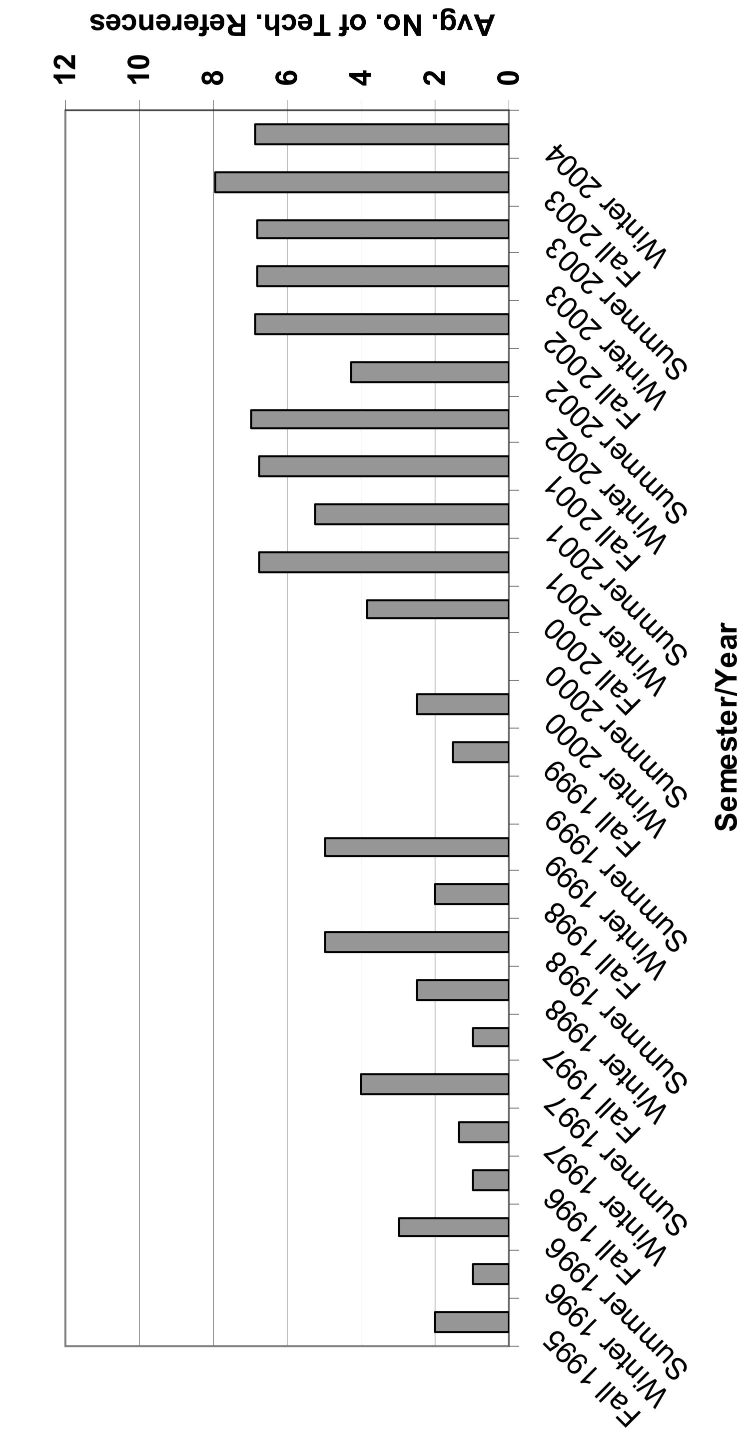
syllabi on file for two courses (B and F) that did not contain any technology references. Further, the average number of technology references for Course F exceeds only Course B (winter 2001, fall 2001, winter 2002, fall 2003, fall 2004) and Course D (fall 2003), having fewer technology references than all other courses for which there were syllabi each semester. It is also interesting to note that while their average technology reference values exceed all other courses in most semesters, Course A and Course C have values slightly below that of Course D in two semesters (winter 2001 and fall 2002). So, while Course D is the technology reference leader in the winter 2001 and fall 2002 semesters, it is the single course demonstrating an overall decline in technology references during the study period.

Figure 16 (see page 105) and figure 25 (below) illustrate the total technology reference averages for the level one courses combined and for all six courses combined, respectively. These two charts indicate a significant increase in the average number of technology references after the restructuring of the teacher preparation program. The type of technology references, as well as the quantity, changed in syllabi files during 2000, beginning just prior to the restructuring. There appears to be more emphasis on technology in the course objectives, the type of activities students are required to complete (web-based activities and use of specific software tools), as well as technology-based student-teacher communication (email/Blackboard).

Student Surveys

To further understand the students' perspectives with respect to the use of technology at the university's College of Education in the teacher preparation

Figure 25: Average Number of Technology References - All 6 Courses Combined



program and in the schools observed as part of the field experience requirement, student surveys were conducted. These surveys were taken over four semesters: the fall of 2002, spring of 2003, fall of 2003, and spring of 2004. The student populations invited to participate in the surveys were those enrolled in undergraduate teacher preparation courses requiring a field experience. These courses are: Introduction to Teaching (A), Introduction to Learners and Learning (C), Introduction to Instructional Methods (D), Literacy, Learning, and Instruction (E), Secondary Education Teaching Methods, and Teaching Reading in Secondary School Content. Thus the participant pool included those students in the courses studied during this research activity. Table 2 in Appendix A shows the total enrollment in courses requiring completion of a field experience component, the participant pool, for each of the semesters studied. Additional data in the table includes the total number of respondents and the participation percentage for each of the four semesters. As shown, in the fall of 2002, there were 707 students enrolled in courses requiring completion of a field experience component. Of these students, 144 responded to the online survey (20.4% participation). Similarly, in the spring of 2003, there were 170 respondents from the potential participant pool of 695 students (24.5% response). In the fall of 2003, the participation level dropped to 18.7%, with 137 responses from the 731 students enrolled in qualifying courses. And finally, in the spring of 2004, there were 109 students who participated in the survey, from a potential population of 444 students (24.5%). Some of the same students may have participated in multiple semesters, depending on their individual course schedules.

The first student survey, conducted in the fall semester of 2002, was developed with a focus on teacher and student use of technology in pre-service teacher education courses. There were four primary components addressed by the survey:

1) the use of Blackboard, an academic software system
2) student exposure to other software and technology tools as part of their course work
3) method(s) of skill acquisition, including use of the university's College of Education Technology and Learning Center (TLC)
4) student observation of technology in use in K-12 schools visited during their field experience

After the first two surveys were administered in fall 2002 and spring 2003, the survey form was expanded to include two open-ended questions, an additional set of Likert-scale questions, and a yes/no response question (see Student Online Survey Form – Fall 2002 and Student Online Survey Form – Fall 2003 in Appendix B). The intent of the additional questions was to determine the students' perspectives with respect to the role technology played in their learning and the impact, if any, of the availability of computers in the classroom for these courses. Thus, adding two more components to those listed above:

5) the contribution of technology use to the achievement of students' learning goals
6) the contribution of technology use to the establishment of a community of learners for the students' course

These surveys were created and administered online via flashlight, an online survey generator available through Washington State University. Students were provided links to each semester's survey through the participating university's academic software system, Blackboard. Every registrant is added to the online course site for each course on the student's schedule. The survey questions are available in Appendix B. Non-numeric response data for the fall 2003 and spring 2004 surveys are given in Table 4 and Table 5 of Appendix A. The responses have been arranged in categories with regard to the nature of the student's comments. The categories for question number 44 "What, if anything, have you learned regarding technology use that you can imagine implementing in your own teaching?" are: 1) positive responses – general technology, 2) positive responses – support system, 3) positive responses – application specific, and 4) negative responses. Similarly, the categories used for question number 46 "How did this [your class meeting in a room equipped/not equipped with student computers] impact your use of technology?" are: 1) positive impact, 2) no impact, 3) negative impact.

The open-ended questions prompted students to consider the role technology may play in their future teaching career. While there were many more positive responses (42) than negative (5) to question number 44 on the fall 2003 survey, the range of reflective insight varied widely, from "I would like to use it in the classroom." to "I understand how technology can enhance effective teaching skills. Eventually, I would like to teach a class without using a blackboard." Among the positive comments, were a few "common knowledge" remarks, such as "It is very important to stay up to date on the new things that continue to be developed in technology." There were also a few thoughtfully positive responses, "Tech will become an increasingly integral part of teaching."; and "Schools don't use near enough technology in the classroom." Finally, there were some thoughtfully cautionary remarks, "It can be both an aid or overused to the point of distraction." In addition to the 23 general technology positive responses, one student specifically identified the university's Technology and Learning Center as providing a positive support system for development of technology skills. The 18 application specific positive responses mentioned tools such as the Internet and web-based activities (7 references), email (4 references), PowerPoint (10 references), Excel (2 references), word processing (3 references), with online quizzes and HyperStudio each receiving one mention. The five negative responses included an observation about technology not being taught by the university faculty, a remark that Blackboard is an ineffective tool, and that PowerPoint is not needed in classrooms. Of the two remaining negative comments, one was directed at the field placement program, not at the role of technology in education and the last comment was quite telling, "I'm still too new to answer that intelligently." This response raises the question, "Why were there only 42 responses to the question of what technology use they could imagine implementing in their own teaching (question 44), when there were 130 responses to the question asking whether or not their class met in a classroom equipped with student computers (question 45)?" While the ratio of positive to negative responses, and the diversity of those positive responses indicate a more favorable view of technology as an educational tool, were the 68% who abstained from replying telling us they still don't know *how*, or even *if* they would use technology in their future classrooms?

The second open-ended question regarding how their class meeting in a room equipped, or not equipped with student computers impacted their use of technology (question 46) was added to try to get the students' impression of the impact of computer equipped classrooms on their learning community. Again, for the fall 2003 survey, there were more positive responses (20) than negative ones (8). However, there were also 18 respondents who indicated no impact, with only four of those 18 making reference to having had student computers available: "We didn't use them"; "We only occasionally used the computers as part of the classwork"; "We met only once in a classroom that had computers- no impact"; and "Not very much. We rarely used them in one class. We used PowerPoint and Excel in the other classes, but I knew how to use these already." Some of these responses echo the earlier comments of the instructor for Course E, with respect to students' knowledge of technology tools. Again, the issues we are trying to tease apart relate to the use of technology as a teaching and learning tool, not just as a general productivity tool. Possessing a specific skill set is quite different from being able to selectively apply those skills to the processes of teaching and learning. Furthermore, while 59% of those responding to question 45 indicated they did not meet in a classroom equipped with student computers, there were only seven respondents who said this lack of access to computers had a negative impact on their technology use, "Students did not have access to the technology."

Those students who reported a positive impact were enthusiastic about the possibilities the technology provided them: "It was awesome! We used them all the time. The computers in the classroom were very convenient"; "Immensely. Allowed me to view new possibilities"; "The more I use it, the better I become at finding resources to serve my needs"; "Made the class easier and more interesting"; and "To become a better teacher and coach when using the different levels of technology." These responses indicate 20 of the 53 students who had class in a computer-equipped classroom valued that experience, four felt the student computers in the classroom had no impact on their learning, and more than half had no comment. It is not possible to determine whether this is due to their ambivalence regarding the role of technology in education or a reaction to the survey itself ("Did the respondent understand the question?" or "Was the survey too long?").

Interestingly, the data indicates a slightly more negative set of responses for the spring 2004 survey, with 81% of the responses to "What, if anything, have you learned regarding technology use that you can imagine implementing in your own teaching?" (question 44) being categorized as positive (30 responses) and seven responses categorized as negative, compared to 89% positive responses for the fall 2003 survey. The positive comments mirror those from the fall 2003 survey: "Technology use is a must in the classroom to assist with research projects, learning activities and assignments. Children like learning on computers"; and "Technology should not be used just for the sake of saying you use technology. This is what I will avoid. However computers are wonderful word processors and for some students can be an outlet for creativity." As before, there are several references to PowerPoint (7), but only two comments regarding email, and no generic word processing, Internet or web-based activities comments at all. However, there are remarks regarding developing web pages (8), use of video streaming (1), digital cameras and scanners

(1), HyperStudio (1) and concept mapping/Inspiration (2). These comments may indicate that while the percentage of positive remarks was lower, the students responding positively to this question are engaging in more advanced uses of technology and are thinking of ways they can use these tools in their future classrooms.

Some of the negative remarks are also very telling: “I came to college knowing how to use technology and have found that many of the instructors do not know enough to implement technology in logical areas so a lot of instructional time has been wasted”; and “I was going to get the Live Text [electronic portfolio software] for my Portfolio but it has a huge glitch. Thank God I didn't waste all of my time this semester using it. I will try it in the fall or summer after all of the kinks have been worked out of it.” Thus, these comments indicate a level of expectation that is not being met by the university and its faculty. Students want to witness appropriate technology use in their teacher preparation, both as a model for them to follow and as a means to their successful completion of their coursework.

Similarly, for the spring 2004 survey, only 35% of the respondents to the open-ended question provided positive impact statements on item 46, regarding how their class meeting in a room equipped, or not equipped with student computers impacted their use of technology, compared to 43% positive impact responses for the fall 2003 survey. Some of the negative impact statements provide insight into the change in the students’ attitudes: “When required to do presentations we were forced to resort to more primitive resources. We couldn't do the PowerPoint presentations or video presentations that we wanted to do”; “It made it inconvenient, and required me to spend more time on campus"; and "If I had to use technology I had to do it outside of class at the TLC or complete my work at home." These comments point out the inconsistencies that arise when only a few classrooms are equipped with student computers. Students, and faculty, may come to expect the tools to be available to them each semester, and are disappointed and frustrated when they are not. On the other hand, some classes have undesired access to equipment, as is evidenced by this remark, "Most of the time it was simply in the way and needed to be moved."

Analysis of the student survey results included a look at the percentage of positive responses to questions regarding the use of Blackboard. Table 3 in Appendix A illustrates general trends in the responses to the educational technology surveys conducted. For the fall 2002 survey, 92% of the 144 respondents indicated they have had an instructor who required the use of Blackboard while in the spring 2003, fall 2003, and spring 2004 surveys, the results were 96% (of 170), 95% (of 137), and 95% (of 109), respectively. Further, as the data indicates, the most widely used instructor-directed components of the Blackboard software are those that allow the instructor to post announcements, course documents (including the syllabus section), and notify students of assignments. The most widely used student-directed task support tools in Blackboard are the email and discussion board components.

Furthermore, the data below suggests that while faculty are using the Blackboard software in the conduct of teacher preparation courses, this usage is neither consistent from instructor to instructor, nor is it promoting student-directed sharing of ideas and products. Aside from the use of the discussion board, which emulates class discussions however offering asynchronous responses to prior postings, students are seldom invited to share materials they have created and external resources they have located through the electronic course site. Tools such as the Blackboard software afford instructors the opportunity to allow students to take a more self-directed role in their learning and interactions with other students and the instructor. Without fully exploiting the components of this electronic course organizer, instructors are primarily creating a digital version of their pre-existing courses, rather than redesigning courses to integrate this educational technology toolset.

Comparing the percentage responses across semesters, we see consistent results with some fluctuation. However, it is worth noting that some instructor utilization areas demonstrated an overall increase of 5% or more:

Discussion Board from 59% to 76% (+ 17%)
External Links from 31% to 48% (+ 17%)
Group Pages from 15% to 32% (+ 17%)
Student Tools from 49% to 60% (+ 11%)
Calendar from 9% to 19% (+10%)
Gradebook from 58% to 67% (+ 9%)
Virtual Classroom from 10% to 19% (+ 9%)
Books from 10% to 18% (+ 8%)
Communication went from 70% in fall 2002 to 77% in spring 2004 (+ 7%)
Announcements went from 88% in fall 2002 to 93% in spring 2004 (+ 5%)

Although three areas (Discussion Board, External Links, and Group Pages) share the greatest percentage increase in usage across the study, the utilization of Group Pages more than doubled. This reflects the instructors' interest in creating opportunities for students to collaborate online. Another collaborative tool that realized nearly a doubling in utilization is Virtual Classroom. These two areas of Blackboard are ideally suited to student-to-student interaction via file sharing and online chat. Thus, it appears technology use as a tool for peer-to-peer teaching and learning, although still relatively small in percentage utilization, is gaining momentum.

Still, some areas indicate a significant (> 5%) decrease in utilization:

Online quizzes went from 62% in fall 2002 to 48% in spring 2004

This case is attributable, at least in part, to immediate frequent use of the online quiz feature by one particular faculty member involved in the study. Upon discovery of software problems effecting quiz outcomes, the faculty member discontinued use of the online quiz feature, resulting in an abrupt and significant drop in the use of this Blackboard feature between fall 2002 and fall 2003. However, there was an increase between fall 2003 and spring 2004, after the software issues were corrected.

Similarly, some student utilization areas of Blackboard showed increases of 5% or more:

Digital Drop Box from 6% to 29% (+ 23%)

Discussion Board went from 50% in fall 2002 to 68% in spring 2004 (+ 18%)

Send Email went from 76% in fall 2002 to 88% in spring 2004 (+ 8%)

And it is worth noting that the student response of “never” to the use of Blackboard to share student generated materials went down from 31% in fall 2002 to 16% in spring 2004. Also, the student response of “never” to the use of Blackboard to share student identified resources went down from 56% in fall 2002 to 41% in spring 2004. Thus, the indication is that during these four semesters, faculty members were beginning to use Blackboard to share student generated materials and student identified resources with other students in the same class.

Likewise, the "never" response to the use of Blackboard to share instructor identified resources went down from 24% in fall 2002 to 11% in spring 2004. At the same time, students observed faculty "occasionally" using Blackboard to share instructor identified resources at an increasing rate, up from 26% in fall 2002 to 40% in spring 2004. Finally, considering all materials posted on Blackboard, the percentage generated by instructor versus that generated by student was changing. Students responding that 100% of the material was generated by the instructor went down from 44% in fall 2002 to 37% in spring 2004. The percentage of students responding that 0% of the material was generated by students also went down during these four semesters from 47% in fall 2002 to 34% in spring 2004. This, then, is another indication that faculty use of Blackboard as a vehicle for information exchange, both instructor to student and student to student, was growing over these four semesters.

In addition to the above analysis of survey responses, a Pearson bivariate correlation analysis was conducted and all survey items achieving correlation coefficients >0.500 on a two-tail analysis with significance <0.01 were investigated. For instance, question 5 "Which of the following areas in Blackboard has your instructor(s) used this semester? (Check all that apply.)" had correlation coefficients of 0.540 for responses R910 & R911, and 0.696 for responses R910 and R913, where:

R910 = Announcements with 127 out of the 144 participants checking this item

R911 = Syllabus with 123 out of the 144 participants checking this item

R913 = Course Documents with 130 out of the 144 participants checking this item.

Thus, only 16 participants answered differently for R910 and R911. Out of the 127 respondents who checked R910, 117 also checked R911. Clearly, these two areas are highly correlated. Similarly, out of the 127 students who checked R910, 124 also checked R913. Therefore these three Blackboard features, Announcements, Syllabus, and Course Documents, are basic instructor tools.

Correlation analyses were conducted for items on the surveys conducted the following three semesters, as had been completed for the fall 2002 survey data. The results, which are summarized in Table 6 of Appendix A, indicate the significant correlations between pairs of variables from the surveys conducted in each of the four semesters. Both the original survey form, using data collected in the fall 2002 and spring 2003 semesters, and the expanded survey form, using data collected in the fall 2003 and spring 2004 semesters, were analyzed for bivariate correlations. The tables indicate those variables demonstrating a high correlation (correlation coefficient >0.500) at a significance level <0.01 in at least one of the four semesters of surveys. Some of the points of interest in these analyses are discussed below.

For the fall 2002 survey, it appears that clusters of commonly used Blackboard tools are highly correlated. This is evident in the questions regarding the instructor's use of the "Announcements, Syllabus, and Course Documents" areas of the Blackboard software system. Correlations between these components have coefficients of 0.540 to 0.696. While the corresponding correlation coefficients for two of the three common comparisons are less than 0.500 for the fall 2003 and spring 2004 surveys, and all three are less than 0.500 for the spring 2003 survey, the bivariate correlation analysis still indicates a significant correlation (at a significance level <0.01) for each of these three surveys. Thus it seems that many faculty who post announcements on their course Blackboard site, also post the course syllabus and other documents. Since these are typically viewed as integral components and since Blackboard affords instructors the opportunity to effectively use technology to share these types of course information with enrolled students, it is not surprising that they are often used in conjunction with one another. These areas of Blackboard are seen as entry-level components for instructor use of technology.

Other anticipated clusters include instructor use of Blackboard "Communication" and "Discussion Board" areas. In three out of the four surveys, the corresponding correlation coefficient for this comparison exceeds 0.500, with the fourth survey (fall 2003) showing a significant value at <0.01 (0.478). This is expected since the "Discussion Boards" associated with a particular Blackboard course site are accessible through both the top level course control buttons labeled "Communication" and "Discussion Board". Similarly, as expected instructor use of Blackboard "Discussion Board" is highly correlated with student use of Blackboard "Discussion Board" across all four surveys, with correlation coefficients ranging from 0.682 to 0.760.

And, finally, in assessing the correlations between usage of Blackboard areas, there is a high correlation demonstrated for instructor use of Blackboard areas "Calendar" and "Tasks", with three out of four surveys having correlation coefficients greater than 0.500. The fourth survey has a correlation coefficient of 0.338, which is still significant at the <0.01 level. Again, this is an expected relationship because faculty who use the "Calendar" feature are more likely to also use the "Task" area since there is a logical link between these two in that tasks are due at a given time which can be recorded on the calendar. Both of these areas are accessible through the top level course control button labeled “Tools”. However, it also appears that these two areas exhibit a high correlation because they are so rarely used. On the fall 2002 survey, only 13 students indicated instructor use of “Calendar” and only eight responded positively to the question regarding instructor use of “Tasks”. Thus, the fact that seven students responded positively to both questions, impacted the correlational analysis and seems to indicate that the occasional faculty member who would use one of these areas is likely to have also used the other.

Of particular interest are those items indicating a connection between the contributions of Blackboard use to learning goals. There were three questions in the modified version of the survey (fall 2003 and spring 2004) that asked students to identify how using Blackboard contributed to: 1) meeting the learning goals of the course (R740), 2) acquiring new technology skills (regardless of the goals of the course) (R741), and 3) their sense of being part of a community of learners (R742). The selection choices were: 1) not at all, 2) maybe/maybe not, and 3) definitely. These three questions were highly correlated with question 13, “How often has Blackboard been used in your course to share external resources identified by the instructor?” (R822). Question 8 (R740) was found to be highly correlated with question 11, “How often has Blackboard been used in your course to share instructor generated materials?” (R820). Question 10 (R742) was highly correlated with question 18, “As part of your coursework, how often have you engaged in…using email for course communication?" (R831). They were also highly correlated with each other.

A closer look at the actual response data, indicates that 69 of the 135 students (51%) who responded to question 8 (R740) selected "definitely" on the fall 2003 survey, 34 of that 69 (49%) also selected "frequently" or "throughout the course" to question 13 (R822) and 59 of that group of 69 students (86%) selected "frequently" or "throughout the course" to question 11 (R820). Similarly, of the 68 students who responded "definitely" to question 9 (R741), 40 (59%) also selected "frequently" or "throughout the course" to question 13 (R822). Finally, of the 47 students who responded "definitely" to question 10 (R742), 31 (66%) selected "frequently" or "throughout the course" to question 13 (R822), and 38 (81%) selected "frequently" or "throughout the course" to question 18 (R831). Therefore, the students who felt strongly that Blackboard contributed to their learning goals, their acquisition of technology skills and their sense of community, also felt their instructors made frequent use of Blackboard to share external resources with them. Likewise, the contribution of Blackboard to the students' achievement of the learning goals of the course is, at least in part, attributable to the instructor's sharing course materials via Blackboard. Thus, the previously identified high frequencies for instructor use of "Announcements", "Syllabus", and "Course Documents" (the basic tools) seems to support students' achievement of course learning goals. Finally, the role Blackboard played in creating a sense of community was related to its use for email communication as part of the students' coursework.

So, the identified high correlation between Blackboard contributing to the students' learning goals and each of the four other survey items, R741, R742, R820 and R822 seems to indicate that if a student sees the use of Blackboard as having contributed to their learning goals, it has also contributed to their technology skill acquisition, their sense of being part of a community of learners and their ability to share instructor generated materials and external resources with others.

The study of correlation coefficients over the four semesters showed consistent results except in the following cases:

"Developing Concept Maps" (R839) was highly correlated with "Use of Digital Still Camera" (R1012) and with "Use of Digital Video Camera" (R1013), yet there seems to be no logical reason why they should be highly correlated, except that students who are using concept mapping software (such as Inspiration or Kidspiration) may also be using graphic imaging and thus, capturing personal images via digital camera.

Similarly, R942 through R946, which deal with observations of technology use in K-12 schools and R1013 "Use of Digital Video Camera" were highly correlated. This may be an anomaly resulting from a misinterpretation of the survey questions regarding observed technology use "in schools", which was intended to mean in the K-12 settings of the students' field experience and not at the university.

On the other hand, there were some anticipated correlations that were observed. Specific items that were highly correlated (>0.500) for all four semesters (at the < 0.01 significance level) were: 1) R921 "Instructor Used Discussion Board" and R927 "Student used Discussion Board"; 2) R836 "Spreadsheets Used to Analyze

Data" and R835 "Spreadsheets Used for Tables", R838 "Statistical Data Analysis"; 3) R840 "Visited TLC" and R842 "Visited TLC with Study Group", R843 "Visited TLC with Others, Worked Alone", R844 "Visited TLC Alone"; 4) R1012 "Use of Digital Still Camera" and R1013 "Use of Digital Video Camera". In each of these cases, the items seem to logically fit with one another. For instance, you would expect that each of the specific ways students visited the TLC (alone, with others, with a study group) would be highly correlated with item R840 "Visited TLC". Likewise, it is reasonable to expect that students who use spreadsheet software will use it to create tables, analyze data and see it as a tool to conduct statistical data analysis. And finally, since several digital cameras in the marketplace have both still photo and video capabilities, those students who responded yes to having used a digital still camera are likely to have also responded yes to using a digital video camera. It is also interesting to note that there were many items that were highly correlated (> 0.500) for three out of the four semesters over which the surveys were conducted, as identified in Table 6.

Summary of Results

In this study, select courses from the teacher preparation program were analyzed via classroom observation, faculty interview, and syllabi review. In addition, student perspectives were examined in an effort to achieve triangulation. Thus, the students' views, the researcher's observations, and the faculty members' interpretations of the use and role of technology in these courses provide insight into the current level of technology integration in the teacher preparation program. Even though the list of potential faculty participants was generated based on the results of the syllabi review for the selected courses, faculty who seemed to have adopted technology requirements in their courses weren't all using technology in the conduct of those courses. Thus, the researcher was able to identify different levels of technology integration among the six courses studied.

It appeared that the administration was promoting the integration of technology in the teacher preparation program due to the investment made in the acquisition of hardware and the dedication of facilities, such as the Technology and Learning Center and the classrooms equipped with student computers, to support technology use by faculty and students. Furthermore, programs such as PT3 (Preparing Tomorrow's Teachers for Technology), offered faculty the opportunity to learn about technology tools appropriate for classroom use. In addition to these initiatives, the college undertook a re-organization of their teacher preparation program courses. While the three levels provided a clear organization of the program, they also served to create an opportunity for different objectives to be addressed at each level. Thus, there appeared to be a break-down in the implementation of technology objectives across the levels. At level one, the faculty outlined specific technology tools to be used by the students in the completion of their course requirements. There was also an intentional integration of technology in these courses by the faculty. However, this technology plan did not permeate the level two and three courses.

Faculty at all three levels of the program spoke about their students' needs in the development of technology skills. However, their perspectives on the roles they played in the acquisition of those skills and in the modeling of appropriate use of those skills in education were quite varied. Meanwhile, the majority of student responses to technology use in their teacher preparation courses indicated the students' desired to learn how to use computer technologies to teach their future K-12 students. The intent of this study was to identify common threads in the emergent theme of technology integration in higher education courses. These discoveries are discussed in the following chapter.

Chapter 5:

Conclusions

Introduction

Technology integration is a multivariate issue. The extent to which an instructor integrates technology in their educational programs is dependent on three principal factors: time, availability, and benefit (TAB). Although we can consider each of these components individually, their interrelatedness confounds the issue of degree of integration of technology by an educator. Likewise the key motivator for an educator to choose to integrate technology, or not to do so, is a temporal consideration, since it too is dependent on the three TAB factors. The discussion below reviews the impact of each of the TAB components as independent influencers; addresses the importance of motivation; and considers other factors associated with this issue of change management within the context of a teacher preparation program.

Time

Time is an essential ingredient in planning and preparing any course offering. Even if the course has been taught by the same individual in prior semesters, there is still a preparatory phase required before the course begins. If we add the element of change to this preparatory phase, the time investment increases. Examples of change include common and expected modifications, such as a new edition of the textbook, additional or modified ancillary materials, or instructor-selected alternative methods of presentation. Unexpected changes, such as the addition or removal of classroom equipment, installation of new versions of software, or modified course objectives, significantly increase the time spent planning and preparing a course. As the Course B instructor noted in the faculty interview:

> Also, we discussed the issue of becoming "a beginning student again" when we undertake a new learning initiative, like bringing Blackboard into our courses. It's "uncomfortable"; there's a "learning curve" we have to address; time has to be spent "figuring out what you are and aren't going to do [with it]"; but it makes us "more empathetic" to our students.

While student empathy may be a good outcome, it is still difficult to "roll with the punches" in an ever-changing environment. And, with respect to computer-based technologies, instructors face just such an environment. Investing the time required to become familiar with specific course management software or other applications, does not insure that task is complete. New versions of existing software, or entirely new software applications will require a continuous time investment in order for instructors to conduct their courses in a similar fashion each semester.

The time requirement goes beyond the individual instructor's time investment; the time requirement imposes an ongoing investment in terms of support resources. As the instructor for Course C pointed out in the faculty interview:

> I would meet with the [Course C] teachers and there were people who were fairly resistant or who weren't resistant but just didn't have tech skills. It was a really big hill for them. So kind of a problem control issue, which is still a concern. We have a lot of changeover and graduate assistants, and actually most of them are probably more techie than some of the faculty. But some of the adjuncts we had, I think were not, it was kind of a leap. So I really relied on the TLC's people a lot to be supportive to the groups and to the faculty and that created some issues. …There were some communication issues about an assumption that after the first time the instructors would take it over. And I was very clear that was never going to happen. That we needed ongoing support, that there were different players all the time. We don't keep up because it's not something we use all the time, we have other areas to keep up an expertise. For this to work, we needed support for the long haul.

This instructor also noted that she has been "…seeing people walk away because of the multitude of demands." Furthermore, "…even [for] people who agree it does enhance the quality of the program it's a difficult choice, because it's taking time away from other activities in terms of perception. So there are issues outside the course itself that impact it." This view is supported by the following comments from the Course E instructor interview:

> I think I would like to actually think about using technology more and better but I also know that requires time which currently I don't have. I'm so pleased with this [teaching] course the way it is. I love it just as it is. I think it does just enough. But I do think that if I were savvier and used technology, just in talking to you, thinking about if I, you know, brought them in here and had them pull up six different websites on a topic and look at the reading levels, that that would be far more effective than me just talking about that and the students nod their heads and might say sure that makes sense, but I'm thinking well I could actually do that and that would probably be more effective.

Thus, the time requirement, perceived as well as actual, has a significant influence on the instructor's level of technology integration in a course. Even when the instructor has the vision to incorporate technology components, and the desire to do so, the element of time may delay or completely inhibit that implementation. Add to that the ongoing support-interaction time required, and the motivation to integrate technology is further diluted.

Finally, due to the large number of adjunct faculty, and the aforementioned turnover in the adjunct instructor population, establishing and maintaining a technology-skilled workforce is a difficult proposition. The university's commitment to training and supporting adjunct faculty has a direct impact on the successful implementation of a technology integration plan. As the Course D instructor stated in the faculty interview: "…full time faculty use technology a lot. But there are more adjuncts than full time faculty. If people work at home with other companies, they pay them for their training time." So, compensation is a corollary issue the university may need to address, especially since training is an on-going activity for instructors who choose to integrate technology in their courses.

Availability

Having the necessary equipment, and the appropriate software tools has a significant impact on the integration of technology in education. Faculty, students, and technical support staff must all be able to access the necessary tools to successfully integrate technology in a course. This requires a considerable monetary investment on the part of the university. Typically, full time faculty members have computer equipment in their offices on campus which is supported by a university technology team. The university in this study established facilities designed to support the use of technology tools by their students. For students in the teacher preparation program, the Technology and Learning Center was developed to provide students access to educational software as well as generic productivity tools. In addition, the facility was designed to accommodate individual learners, small groups and classes. However, as its popularity grew, the availability of the center for class work diminished, making it more difficult for faculty to incorporate whole-class technology activities into their lessons.

The university provided instructor workstations in several classrooms on campus. However, three of the six courses involved in this study were conducted in traditional classrooms without any computer technology available in the room. There are even fewer rooms available with individual student computers. Thus, an instructor must be prepared to modify lessons to adapt to the assigned classroom. As the Course C instructor noted in the faculty interview:

> …if I knew the [Course C] teachers regularly had classrooms with computers some [technology] things would emerge. If I went back to not having [the student computers], I would have to do things differently. I can't imagine doing this course without at least a computer on-a-stick. Facilities is a big issue! An administrative assistant sets it up, puts in the request that [Course C] teachers need tech [technology-enhanced] classrooms.

Time and availability are tightly woven components. If computer availability changes, additional time is required to prepare for that change. For instance, if an instructor is accustomed to teaching in a "hands-on" environment, one equipped with student computers, and then must teach in a "stick classroom", one equipped with an instructor station and projector only, lessons and activities must be reworked to accommodate the change in technology availability.

For adjunct faculty, the issue of availability further restrains their ability to implement technology integration. Since adjunct faculty typically do not have an on-campus office space, they do not have university provided and supported computer tools either. As the instructor for Course D said in the faculty interview, she would "like to present [her] classes for adult learners with technology, if [she] had a classroom and 30 hours of training. But [at this time] it is up to [her] to use [her] own private personal [computer technology] things." She went on to say that she doesn't want to be left behind, but it is hard to keep up. "No one [else] was interested in using PowerPoint for microteaching. I don't know how to do it. …I [already] have my overheads made."

So there are still issues regarding the deployment of technology tools. While the university has supplied computers for fulltime faculty in their offices and for students by way of computer labs, there remain many constituents who do not have adequate access. It is still rare to see a student taking notes on his personal computer during class. As the Course D instructor indicated in her interview: "2-3 students each semester use PowerPoint [in their microteaching lessons]. Some bring laptops and takes notes in class. But what happens a lot is that students [audio] tape lessons." She went on to say that "…most of them use the TLC and [computers] at home. [But] they have real problems with the labs and saving their work – 'Everything's gone on my disk.'"

However, the university's investment in course management software such as Blackboard has made it possible for students to have 24x7 access to course information for those courses in which the instructor uses this tool. The six instructors involved in this research project have used Blackboard to post course information and announcements. Some use it more extensively than others. But all recognize the potential of the Internet-based software to allow students to view course documents according to their personal schedules, depending on their means of Internet access. In addition, the university provides each student with an email account for peer-to-peer and instructor communication. The Course F instructor noted that simply having email accounts for all faculty, staff, and students has changed communication on campus:

> I made a comment to somebody on the floor the other day about "What did we do before email?" because we are able to keep in touch. You know being at the university and people have classes and they come and go at different times, it's really hard to get a hold of somebody in person and you end up

> playing phone tag. …Sometimes students have a question and they think it is an earth-shattering question and it is so simple. They email it to me and they've learned that if they email me … I'll get back to them after the test and they know that. Therefore we spend less time in the classroom on goofy stuff that doesn't matter. Email resolves it quickly.

Thus, availability goes beyond providing computer lab facilities. It involves user support beyond the campus. Students and faculty need technology tools, such as hardware, software, server space, email accounts, etc. in order to appropriately use technology in teaching and learning. Access must be available on-campus and off. There must be technology support staff available to assist teachers and learners as they attempt to use new tools and as versions change. Support beyond the campus is a significant issue many universities are grappling with today.

Benefit

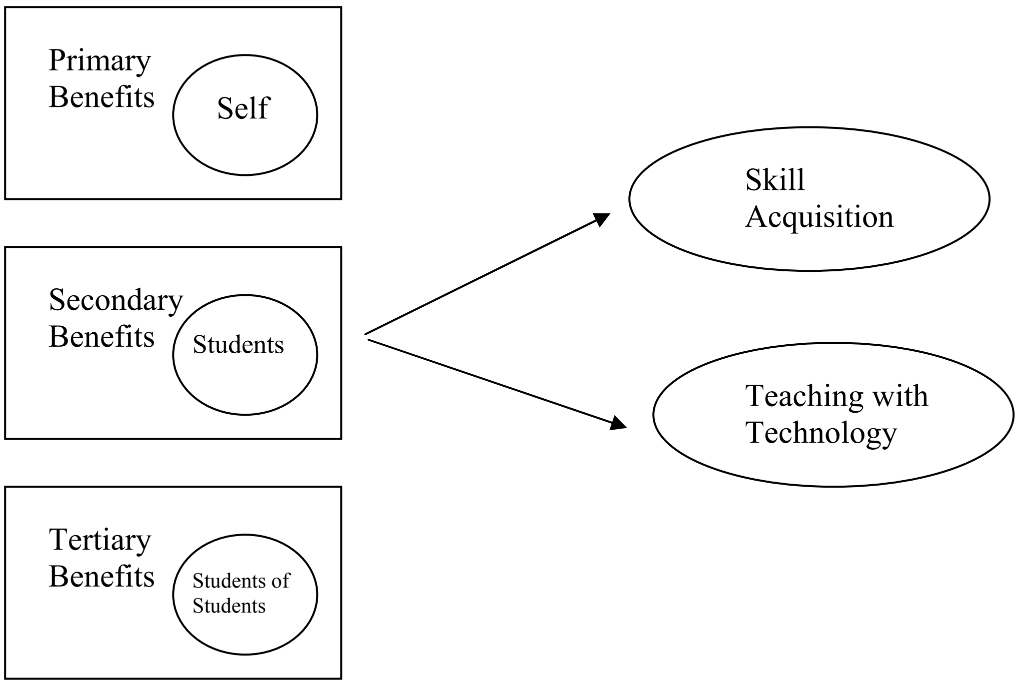
While all six of the instructor participants in this research project refer to their students' need to know technology, the impact of that benefit differed from one to another. In some cases, the instructors expressed concern for their students' ability to successfully complete their teacher preparation, as is indicated in the views expressed in the Course A interview:

> …I do think it's pretty critical they be able to use the Office package because when they go out into the schools in many cases they are viewed as the experts almost immediately. …when they go out into the schools you know some of those older teachers haven't used anything but overheads. So it is critical in that way because they're seen as value added right away. They're seen as experts right away. People look at them and say, "Oh you're a college student, can you help me with this technology?" That happens all the time…Yeah, so they just have to know how to do it. Some of them are asked right away to try to fix a broken computer or load software, all of that kind of stuff. And of course some can and some can't. But it just won't cut it if they say they don't do technology because then the school is just going to shut down on them right away.

And again, when the Course B instructor was asked to identify the benefits students derive from their use of technology in that course, the response was: “More in-depth coverage of the material. They control about 75% of their grade because of the way I use technology.” However, this instructor went on to say that “…Seven to ten years from now [technology] will make them more likely to interact with their students in a way the students want.” Thus, there was an indication of a longer range benefit to the students, a benefit that may impact the way they teach their courses in the future. It is this longer range view that requires teacher preparation instructors model the use of technology in teaching their courses. The immediate benefits expressed were more skill-based whereas the longer term benefits indicate an adaptation to the use of technology as a teaching instrument. In both cases, the instructors described secondary benefits, benefits their students derive from the instructor’s intentional use of and requirements for technology in the conduct of their courses.

The third level one participant’s response to the question regarding benefits to students in Course C was: “The main thing is the recognition that as teachers in the 21st century their textbooks will have online resources, parents will want to communicate via email, etc. Buy-in is the big thing, it commits them to acquiring [technology] skills.” Here again is the expression of concern for the students’ ability to teach in a technology-based society upon completion of their teacher preparation program. This future benefit perspective alludes to the tertiary benefits of technology integration in the teacher preparation program, the benefit to the students (and the parents of the students) these teachers-in-training will be teaching in the future. The three levels of benefits are illustrated in figure 26 below.

Figure 26: Classification of Benefits



The responses to the students' benefits question were quite different for the level two course instructors. With respect to the use of technology in Course D, the instructor spoke of the benefits the students realize when they video record themselves teaching a lesson: "They actually see the difference between writing a model and teaching. They write out their thoughts and defend their thoughts." Since this was the significant technology-based activity for this course, it was natural that the instructor focused on the video recording in response to the question posed. However, again, the response indicated a secondary benefit to the use of technology, a benefit derived by the students. The answer, however, does indicate how the technology is integrated in the course. Students must review their self-recorded teaching session, reflect upon what they observe, and write a response to their teaching that relates their lesson to the teaching model they studied. This describes a technology-use benefit to the students that impacts their learning about teaching methods rather than a skill acquisition benefit. So, even though there was far less technology integration in this course compared to the level one courses, the technology that was applied had a purpose directly related to the purpose of the course, teaching students methods of instruction, the ability to reflect upon, analyze and self-critique their performance in front of the camera.

The Course E instructor also indicated secondary benefits of technology use in this course:

> …Tech components [foster] adaptability. They may find themselves in schools where technology isn't supported; or there is a use, but there are problems (system down). They need to be adaptable, flexible. They need to do PowerPoint, help kids find websites. Often it is learned by on-the-job-training. A couple of my students were using a SMARTboard without trouble.

As before, the instructor addresses the students' need to acquire technology skills to adapt to the classrooms of the future. However, this instructor also identified primary benefits of technology use in preparing for this course, which she saw as contributing a secondary benefit to the students: "My own computer work helps me get organized and plan, which helps them." So computer tools provide a direct benefit to the instructor in terms of organization and planning. The secondary benefit to her students comes from the impact of the technology use on the quality of her lesson plans and her classroom presence. She went on to state that "[The challenge is] finding the place where technology is suitable in the curriculum and how to adapt. They mimic what they've learned." Although the instructor recognized that her students look to her to model teaching techniques, she did not use technology in the classroom. So, while speaking about her dilemma, she shifted into a situational analysis of the dilemma technology poses for K-12 instructors: "But how is it different for different grade levels? Teachers struggle with balance: When [to use technology]? How often? What [technologies] to use?" Again, this instructor chose not to use technology in the classroom, yet demonstrated her desire to help her students address the issues they will face in their future classrooms.

Finally, the Course F instructor responded to the question regarding the benefits derived from the use of technology by students in this course:

> It opens up a whole world for them. Like when we talk about doing things across the curriculum I'll say "You don't have to reinvent the wheel, let's just see what other people have done." And they'll think, "Oh well I'll just print this lesson plan off and use it." And I will look at lesson plans on the web, the Internet, and I will think they have some really good ideas, but if you really want to carry it out as it's written on paper it won't work. So, I think it's an excellent tool. But it's a tool, it's one of many tools.

This instructor identified both primary and secondary benefits from the use of technology in this course. Technology has aided the instructor in acquiring new ideas for lessons to use with her class. It also offers her students the opportunity to review what other educators are doing in their classrooms. However, the instructor made the point that she needs to adjust the thinking of her students so that they realize that much of what they will discover on the Internet needs to be refined for their purposes. Technology tools provide access to ideas and activities, but teachers need to adjust and modify them to derive quality lesson plans for their classroom instruction.

The instructors who realized primary benefits (benefits they derived) from the integration of technology in their courses, seemed more comfortable with the concept of using technology in their classrooms. For two of the instructors, this meant overcoming personal challenges with respect to technology. In the faculty interview, the Course C instructor said, “I had to learn things. I am still not overly facile with webpage development. [I] expand my repertoire and pick up things along the way. I can see the pitfalls. [Technology] is not a passion, but [I know] it is important to develop those skills. I spend a lot of hours with adjuncts, on the phone, in meetings, setting up their classes.” And the Course F instructor stated, “I had to learn, I had to expand my knowledge base. At the beginning I had students who had never touched a computer. I had to help them over that hump.” When asked how she overcame these challenges, she replied, “I undertook some self-education, because I could see how technology was going to be a benefit.”

On the other hand, instructors who exclusively cited secondary (student) benefits to the use of technology in the classroom, indicated less comfort with their role as technology users. For example, the instructor for Course A said the challenges she faced were: "(1) my own fears (they're a lot braver than me); (2) making sure I get in the classroom with the instructor station (it has to be there to fully utilize it); (3) several students did use SAMBA; I haven't done it yet; the machine in the classroom corrupted disks." Her first challenge was significant. She said she overcame her challenges by getting help, stating "I want to use a variety of teaching strategies, [I] want to be a better teacher." This again highlights her concern that her students experience technology integration so that they gain the necessary technology skills to be prepared for the technology challenges they may encounter in their field experience and beyond. The third item she identified as a technology challenge stemmed from problems the students had completing assigned activities because of disk failures or format mismatch issues when they brought their work to the classroom computer to share with the class. She encouraged her students to learn other ways to save their work to try to avoid problems in the classroom, however she was not yet ready to tackle that new technology herself.

Similarly, the Course B instructor cited "fear and time" as being the major challenges he had to overcome to successfully integrate the use of technology in his course. He said he did it "…because the students asked, 'Why aren't you on [Blackboard]?'" Furthermore, he stated that overcoming the challenges "forced me to be a beginning student again; it was uncomfortable." This perspective may have been part of the reason for the "stopping and starting" nature of his use of technology tools. As problems arose with certain features of Blackboard, he chose to omit those activities.

The instructors for Courses D and E cited secondary benefits their students derive from the use of technology in their courses. Although the Course E instructor alluded to a primary benefit, she posited in a manner that made it appear she regarded it as a student (or secondary) benefit, stating that her students benefit from her using technology to organize and plan. These two courses demonstrated the least amount of technology integration in the classroom observations. Yet, neither teacher seemed uncomfortable with using technology themselves. They both referred to the fact that students seemed to be getting technology training in other courses. However, this again points to the difference in perspective observed among the different instructors, some see technology training as helping students acquire a set of skills (using word processing software, creating spreadsheets, etc.) while others realize the potential for teachers teaching with technology to advance their students' learning. Interestingly, the Course E instructor has reduced the level of technology integration in her course. When asked if she uses technology tools to conduct her classes, she replied:

> "No. Not any more. I used to actually more. I've really cut back the last three years, which is, I know, odd, given that we have more support now, with the TLC and the great staff. Before, I had done some PowerPoints, and I was working to use video clips as parts of case studies. I used filamentality's webquest design to model webquest design and that was an assignment in the class. And I don't do any of that anymore."

With respect to her use of Blackboard, she said, "I don't have my syllabus up, I don't have any announcements. I did it one semester and I never moved it and it changed and I didn't want to go through the trouble and so…It's time consuming." So, even though she stated in her interview that she was "pleased that there seems to be a thoughtful energy in thinking about technology's practical benefits for our students as students and for our students as teachers." And that she thinks "that's really, honestly, really critical." She wasn't convinced that she needed to continue modeling technology integration in her teaching methods course.

Thus, it seems the instructors who expressed a primary benefit (to themselves) from the use of technology in their courses, were more willing to invest themselves in the process of change, in spite of the time and availability issues they faced. On the other hand, those instructors who spoke primarily of secondary (their students') and tertiary (future students' of their students) benefits were more apprehensive or had more difficulty overcoming the time and availability obstacles, as well as their own learning curve limitations.

Motivation

Another aspect of the time-availability-benefit conundrum is the impact it has on personal motivation. These three principal factors (time, availability, and benefit) each may have an influence on an instructor's motivation to make changes in their teaching. Some instructors were more motivated to face the challenges of technology integration. Each of the six educator participants in this research project shared their answer to the question, "What motivators have influenced you to integrate (or not to integrate) technology into this course?" during their final interviews. Below is a discussion of the responses the interviewer received.

The instructor for Course A answered:

> The key motivator is the helpful people in the TLC. Next are the PT3 goals, because I didn't want to be embarrassed. And because I feel it is so helpful to students to use Blackboard. …PT3 brought me into the lab and through the lab (sitting down with me) I learned [to use technology tools]. They never made me feel stupid.

This instructor referenced the students' need to know how to use technology [Blackboard] as one motivator (a secondary benefit). However, her key motivator was the availability of the non-critical, one-on-one support she received from technology staff as she strived to complete her project work as a PT3 participant. The assistance the Technology and Learning Center staff provided kept her from being embarrassed in a peer-group program. This primary benefit was a significant motivator for her learning to use and planning to integrate technology in her course. Her response also underscores the need for on-going faculty support as their skills improve and their needs change with respect to advancing their technology awareness.

Similarly the Course B instructor referred to his students' needs with respect to technology. However, his perspective was that technology aids him in meeting their educational needs, not just satisfying their need to develop technology skills. He also identified primary benefits in his response:

> [I] believe teaching is a performing art. I want to learn. I want to overcome my own frustration with my own public undergraduate and graduate education. Technology allows me to meet the needs of my class. Every child should be able to learn what they need to learn, taking artificial time out of the process. …I did it because students asked, 'Why aren't you on [Blackboard]?'…The learning curve in some areas is an essential use of time. [Some of the] more empathetic students helped me.

Striving to be a quality teacher and a life-long learner, this instructor saw technology as a means to accomplish his goals. He didn't want to be "left behind" or to be viewed as "not keeping up" in his profession. So, choosing to adopt technology integration practices in his course provided a forum for his own quest to learn and helped him achieve recognition as a contemporary instructor.

The instructor for Course C identified personal motivators that spurred her to integrate technology in her course and to influence other instructors to do so. She stated that her motivation came from:

> My philosophy of teaching and learning and my view of what 21st teachers need to do; my concern with the digital divide and the achievement gap. Teachers need to feel comfortable with tools to address these issues. Technology can jump start some of these things. …our students are learning from these middle school students [at one of the technology-enriched field experience school sites]. [Our students] are seeing technology in process. This is part of the …restructuring of the whole program. It is very exciting, being part of changing something not easy to change. We were ambitious and we did it. We are a lot further along than if we each tried to do it on our own.

Again, this instructor is motivated by primary benefits, her own growth, her ability to witness the outcomes affected by the changes she is influencing. She references the secondary benefit to the students in her course as they learn with technology and begin to realize its potential. And, finally, she refers to the tertiary benefits to be derived by the children her students teach as they adopt technology integration in K-12 settings and begin to close the gap on achievement. For this instructor, technology tools are an integral part of a teacher's toolkit because they empower learners as well as teachers.

Although the Course D instructor has not demonstrated a technology integration advocacy during this project, her response included both personal motivators and personal de-motivators. She replied:

> What motivates me is the access to learning that I didn't have in my training. I want them to have that exposure. It encourages me to be current and to cross-reference and not teach from just the author's perspective. I would like to present my classes for adult learners with technology. If I had [a technology-equipped] classroom and thirty hours of training I would sign up. [But] it's up to me to use my own private, personal things. I do a lot of my own reading and I don't want to be left behind. I had to know it when I was a principal and I want to keep up now. No one was interested in PowerPoint for

> microteaching. I don't know how to do it. I already have my overheads made. ..I've not been invited to use [the TLC]. Oh, I want to be trained. …[But there is] no incentive and no pay.

She indicated that she was interested in keeping her teaching current, using technology to find alternative perspectives, and advancing her own skill set. However, these personal motivators, while providing primary benefits, were offset by availability and time constraints. The issues she raised are legitimate and difficult for administration to address. While institutions of higher learning wish to support their faculty's endeavors to continue their development, their budgets are limited. This is especially true in the case of adjunct faculty members who typically receive no stipend for professional development. Once again, this issue is compounded by the realization that technology training is not a one-time proposition. As technology demands grow, technology tools change, and technology training becomes an on-going initiative.

The response from the Course E instructor further explained her choice to decrease the amount of technology exposure her students receive in her course:

> Research in the reading field influenced my decisions for the course (and personally and professionally). [Research on topics such as] how good and poor readers approach using technology; video games and stories on CD-ROM influence me daily. There are pros and cons [to these technologies]. I use less [technology] because the students' own growing knowledge seems adequate for K-12 classrooms. If schools required different levels of [technology] knowledge and support I would change (adaptability/flexibility). Most students come from our level one courses. I noticed right away a difference when we started the new leveling. Those courses [incorporate technology] and students have [more] personal experience before coming to college.

Although she identified a need for her students to acquire technology skills, she did not indicate that they need to use technology to teach K-12 learners. Thus, she felt their prior exposure to technology tools was adequate for their teacher preparation. Furthermore, she expressed concern that technology tools such as video games and stories on CD may have a negative impact on children who are learning to read. This potentially detrimental effect has had some influence in that she did not teach her students to use technology as a teaching tool.

As for the Course F instructor, the key motivators were both the training available to her and the recognition from her students for having current teaching skills:

> The workshops that were available, they said we're going to have these workshops and that really helped. Most of them were in the summer, and some I couldn't get to, I was teaching in the summer so those were hard for me to get to. If we could have more during the regular school year that would help me, you know during the typical school year. The motivator, okay this is kind of trite, but I noticed with my students when they knew I was using [Blackboard], posting my grades on Blackboard and putting things on Blackboard, I think they saw that I was in touch with reality and moving forward. Now most of the subjects are on Blackboard, but at the time when there weren't that many, I think the fact that I was … gave me more validity.

Thus, she referenced primary benefits as having provided the motivation needed for her to integrate technology in her course. As was previously stated, educators who seek to continuously improve their teaching may see the use of technology tools as a means to achieve this goal. Technology afforded her the opportunity to communicate with her students outside of the classroom, between class sessions, and at times that were convenient for the students. It also provided her an opportunity to extend her skill-set and to enhance her image.

<u>A Systemic Approach to Change Management</u>

Although changes in the use of technology occurred at this university, it is not clear that these changes represent a systemic approach. Considering the university as a system, as described earlier (see figure 3 on page 38), was too broad a perspective since the research focused on the teacher preparation program of the College of Education (see figure 4 on page 40). However, changes within the university did have an impact on changes at the college level, which in turn impacted changes to the teacher preparation program. For example, the university's decision to provide each student with an email account and an allocation of server space afforded the teacher preparation program faculty the opportunity to require students to use those tools in completing their coursework. The proposed system model for the College of Education was very similar to the university model (see figure 5 on page 41). However elements of the model, such as the output component, reflected objectives specific to the college, consisting of educated students, experienced faculty, and certified teachers. Similarly, the feedback component had included certification exams (the Praxis), new teacher evaluations conducted at the K-12 schools hiring them, and faculty feedback via post-graduate teacher preparation program evaluations. In addition, the control component was expanded to include K-12 schools, DESE (Department of Elementary and Secondary Education), and NCATE (National Council for the Accreditation of Teacher Education). Thus, changes at the college level, such as the addition of the technology requirement for teacher preparation programs within the state and the development of the Technology and Learning Center, impact the courses within the program. It is also important to consider the role of the controls, such as the K-12 schools hiring program graduates, in impacting change to the program. As several instructors indicated in their interviews, students in the teacher preparation program were expected to have a certain level of technology experience when they entered the K-12 schools to satisfy their field experience.

The model decomposition was carried down to the three levels within the teacher preparation program and on to the individual classes offered (see figure 6 on page 42). At the lowest level, the input components included students, faculty, and learning instruments such as textbooks, assignments, activities, electronic resources and facilities. The principal control at the course level was identified to be the instructor or the course lead faculty member (coordinator), thus giving individual faculty members the power to choose whether or not to change their course and how. Faculty choices included the selection of resources available to the students, the nature and quantity of methods used to conduct the course, the type of performance assessments conducted throughout the class as well as those conducted at the end. As the model indicated, changes in the teaching and learning process impact change in the output components. For example, requiring students to use electronic discussion boards will change the frequency as well as the content of peer-to-peer interaction. Thus, identifying differences in these components over time substantiates change occurrences in the conduct of the course.

In accordance with the information system model, the teaching and learning process is dependent upon the individual resources (inputs). These resources, both animate and inanimate, have attribute descriptors which have variable values. For instance, electronic (technology) resources, an input, have an attribute labeled availability. For any identified course offering there is a certain value for this attribute. A course taught in a classroom with a computer and projection system for the instructor will have a value of 1, while a course taught in a classroom equipped with 24 student computers and an instructor workstation will have an availability value of 25.

Similarly, students and faculty are critical resources required by the teaching and learning process. These inputs to the process have a benefits attribute, with associated values of primary and secondary. From the instructors' perspectives, benefits to themselves are primary benefits while benefits to their students are secondary benefits. Inversely, from the students' perspectives benefits to their instructor are secondary benefits to themselves. Thus, an individual may have many instances of a benefit, each with its own value.

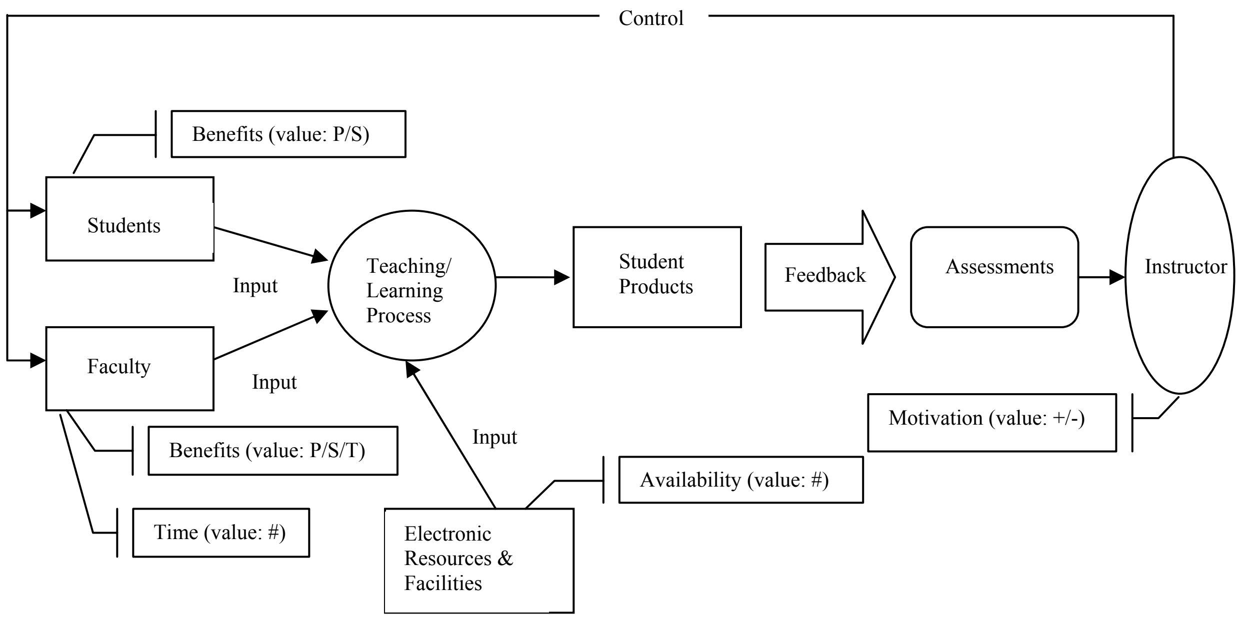
In some models, time is an independent resource (input) required by the process. However, in the context of the teaching and learning model, time is an attribute. For this study, time was identified as a faculty attribute, its associated value being the requisite time to complete a task, acquire a skill, plan a class, etc. While each faculty member will have different values associated with the time attribute, the value itself will vary for a single instructor as their skills and understanding change.

Thus, the time-availability-benefit factors create a framework for the inputs in the teaching and learning process of a single course. The outputs (student products) and feedback (assessments) impact the controls (administration, faculty, lead instructor, instructor, K-12 Teachers). Motivation is an attribute of the instructor control. For a specific course, the instructor's motivation will influence the weight bestowed upon the time-availability-benefit factors in making decisions regarding changes to the course. If an instructor is positively motivated to impact a change, he may focus more on the benefits derived from the change than on the time required to complete the transition to the new course plan. These concepts are illustrated in figure 27, which enhances components of the original teacher preparation program system model from figure 6 (on page 42) by adding attribute call-outs to the system inputs and control. Thus, in the conduct of this study, the initial system model was not tested, instead it was elaborated on and made more descriptively accurate for the setting of the study.

Technology integration changes did occur in four of the six courses observed in this study. Instructors in the level one courses discussed the intentional change of those courses to include educational technology. Similarly, the level three course instructor described technology changes in that course. There was no evidence of a change toward technology integration in the level two courses. Thus, at the course level, change was systemic. At the teacher preparation program level, it was not. That's not to say that the intent to change did not exist. It is simply an observation that at level one, technology integration for the three courses was planned and initiated at the time of this study. However, that was not true for the level two courses observed. The technology changes identified for the level three course were specific to that course and its instructor and not part of a comprehensive teacher preparation programmatic technology integration plan.

Thus, change management is a multi-level proposition. The university must establish policies that encourage and support change. The college must provide necessary resources and stimulus for programmatic change. The lead faculty must establish guidelines for changes within and between the levels of the program. The

Figure 27: The Teacher Preparation Program Modified System Model



individual instructors must be able to participate in the change management plan. However, even when all of these controls are in place within the system, there is still the variability of the individual instructor that will determine whether technology integration occurs within the course he teaches.

According to Rogers (1995), the adoption of innovations follows a logistic function curve, regardless of the innovation itself. The limiting value of the function is always about 90% adoption of the innovation. The exponential growth factor may vary, depending on the time at which take-off occurs. Thus, the adoption of an innovation follows a curve that is initially exponential, growing more and more rapidly until it reaches a point of diminishing returns (at about 45% adoption). At this time the rate of continued growth begins to decline. So the curve which was initially concave up, changes to a concave down curve asymptotically approaching the 90% limit. While all innovations follow this same logistic model, the exponential growth factor varies from innovation to innovation, depending on how much elapsed time occurs before the 90% level is realized. There will never be 100% adoption of the innovation. However, there will always be earlier adopters and later adopters, as was observed in this study. This is due in part to the fact that some may choose to never adopt the innovation. On the other hand, some of the earlier adopters may revert back to other practices, no longer utilizing the innovation.

Rogers (1995) described six main phases in the “Innovation-Development Process”, the last two of which were: 5) diffusion and adoption and 6) consequences. This study primarily focused on phase five, the diffusion and adoption of technology in a specific context. It is the sixth phase, however, that provides the feedback to the controls which influence the progression toward more technology integration, or the reversion to less technology integration in a course, a level, or an entire program. The first four phases are foundational in that they determine the need to adopt the innovation in the first place. Several instructors addressed these four phases in their interviews. Rogers refers to these phases as: 1) needs, 2) research, 3) development, and 4) commercialization. These align with the technology integration problem in the teacher preparation program in the following manner: 1) the problem of insufficient technology preparedness of graduates from the program identified the needs. 2) Faculty and administration outlined and investigated alternatives such as: requiring all students in the College of Education complete a separate technology training course; integrating technology training into the teacher education courses in a phased manner; leaving technology training to the individual student as a self-education requirement. Phase 3) development occurred when the level one program was restructured and technology tool assignments were made to each level one course. And 4) the commercialization phase involved the creation of the Technology and Learning Center, the development of course syllabi that included technology objectives, and the allocation of computers to classrooms.

Teaching Philosophy and Technology

During the instructor interviews, each participant was asked about his or her teaching style with respect to its student-directedness and whether or not the activities reflected a constructivist approach to teaching and learning. The instructors were then asked how that teaching style related to their use of technology in the course. The Course C instructor responded that her class was based on “dialogic inquiry” and that "there are many elements that reflect the constructivist philosophy and pieces of adult learning theory". She said that technology integration directly relates to her teaching style:

> In the arena of communication, it enhances the students' ability to dialogue one-on-one (over curriculum, issues, etc.). It allows us to broker our knowledge. It takes care of the business part of the class. It provides a place to communicate something, a change, etc. and send it to all and it's done and they get it when they can. We are pressed to get through the content, so now housekeeping is handled online.

And that this is tied to the constructivist philosophy because she views her role as "leading the discussion, ratcheting up the quality of the discourse. [The students] are all at different places. [I make them dig] deeper, push them to more complex thinking, more fleshed out concepts. We do that through dialogue." And, as was indicated above, that dialogue can continue outside of the classroom via the use of technology.

When asked about her teaching style, the Course F instructor responded that different classes take on a different persona. One of her classes she believed to be more student-directed, the other she said was more teacher-directed because the students' resisted taking on the responsibility, they were difficult to engage in discussion. The student-directed class she thought was more likely to incorporate technology in their work outside of the classroom than the other class because the teacher-directed class "…can't think outside the box…[they're not] creative." She said that there is a "link with technology and creativity. Creative people are more likely to look for stuff on the Internet, find a video, do a PowerPoint."

While the Course B instructor stated that he directed his course from the onset and that the syllabus is the instrument that guides the class, he did indicate that he “builds in a variety of options” and that his “students elect to do [different types of assessment] and [he] specifies the guidelines and requirements”. Furthermore, he stated that “the whole semester is constructivist. We start with where they come from.” During the course, as they study various educational philosophies, the students “construct their own philosophy”. He said that his teaching style was closely related to the use of technology in the conduct of this course because “[technology] allows you to construct your own knowledge in new and widely different ways.”

For the Course A instructor, the design of the course was described as being similar to that of Course B, "I have a plan, but it’s the overriding themes [that map the course]. I hope it’s more student-directed; …the book [report] and [creating the] PowerPoint (maybe) are examples of student-directed [activities].” But when asked about how, if at all, this related to the use of technology in this course she replied: “Probably not…the class [depends on] face-to-face intense interaction, we have to make it student-directed; I’m still skeptical about online discussion.” So, she isn’t relating what the students choose to do with technology in the completion of their activities to student-directed learning.

With respect to the constructivist philosophy of learning, she indicated that her course is based on this philosophy because “the themes are there, but they construct what they want to learn, adult learner model. They come up with the questions. And Vygotsky because within the group someone is further along and helps others.” However, once again she did not see a direct relation between the technology used in her course and the constructivist model of learning. She said, “Tech support of [the] constructivist approach? Probably if they [the students] did lit searches, …some may need stats on the school, …to form questions and … to find answers, [engage in] collegial discussion.” As was previously discussed, much of the technology used in her course is designed to introduce the students to tools they need to learn to use. The activities may be focused on students acquiring skills rather than students using technology as an educational tool.

The Course E instructor saw her course as being a continuum of teacher-directed to student-directed, with the shift to student-directed occurring throughout the semester. As with the Course F instructor, this instructor related technology use in the course to a student-directed teaching orientation, saying that “it’s far more effective with student-directed”. She also indicated that she “views [her]self as a constructivist. [The students] work through it.” Many of the activities she chooses to include are designed to make students reflect on who they are and how they see the world, both in class and outside of class. She stated that “technology can assist in creating a constructivist environment. [Technology provides] efficient access for readers and teachers [to] multiple sources. [One can] find those that are most meaningful for the individual.” However, she thought students came to her class adequately prepared to use technology, not in need of her demonstration of teaching with technology.

Course D was viewed by the instructor as being more teacher-directed, in that she “has clear learner outcomes in the curriculum.” However, she did not believe technology related to that teaching style:

> It’s a personal thing. I don’t think our profession is geared to teaching on computers. It’s a human-touch profession. The way I use it is for production, for research. I would like SMARTboard experience, and chatting with teachers. But virtual classroom visits is still teacher-directed.

On one-hand she expressed interest in learning new skills herself, but on the other-hand she doesn't see computer technologies as necessary educational tools, especially in a teacher-directed learning environment.

Thus, it seems that the instructors who view themselves as learning facilitators, operating in a student-directed environment based upon constructivist learning theory are more inclined to value technology integration as an important component of their instructional portfolio. Instructors who do not subscribe to the student-directed or constructivist approaches, tend to view technology integration as inconsequential to their students' learning. While the TAB components and motivation are significant influencers in an instructor's decision whether or not to integrate technology into their course, their teaching style and educational philosophy form their perspective with regard to its overall value for their course.

The Student Perspective

The students expressed their views regarding the use of technology in their teacher preparation courses via the student surveys. The two open-ended questions added to the fall 2003 and spring 2004 surveys relate the students' views with respect to the technology use in their classes and its impact on their learning. There were many more positive responses than negative responses for the question: "What, if anything, have you learned regarding technology use that you can imagine implementing in your own teaching?" Among the positive responses were remarks regarding the students' desire to use technology in their classrooms of the future; their desire to stay current with respect to new technology developments; and their understanding of how technology can enhance teaching and learning. Some students referred to specific areas in which they would use technology, such as conducting research projects, engaging students in learning activities and to complete assignments. There were also references to the fact that children seem to like using computers in a learning environment and that computers can bring out the creative nature of people. The university's Technology and Learning Center was identified as a positive support resource for students. Technology tools mentioned in these open-ended responses included: the Internet and web-based activities, email, PowerPoint, Excel, word processing, online quizzes, developing web pages, use of video streaming, digital cameras and scanners, HyperStudio and concept mapping/Inspiration. The latter tools were found in the spring 2004 responses, with fewer (or no) references to word processing, email, the Internet and web-based activities. This, as was previously discussed, may be an indicator that students are engaging in more advanced uses of technology and are thinking of ways they can use these tools to teach once they complete their preparation program.

The negative responses to the survey question included a statement that technology had not been taught by the university faculty; one response indicated that many of the instructors did not know how to appropriately integrate technology in the course, which was viewed as a waste of instructional time; references to the electronic portfolio software being problematic; and comments that Blackboard is an ineffective tool, and that PowerPoint is not needed in classrooms. It appears that these students who made negative comments had technology expectations that were not being met by the university and its faculty. The students in the teacher preparation program want to engage in appropriate technology use, both as a technology integration model for their future professional performance and as a means to their successful matriculation.

There were also more positive than negative responses to the second open-ended question regarding how their class meeting in a room equipped, or not equipped with student computers impacted their use of technology. This question was added to try to get the students' impression of the impact of computer equipped classrooms on their learning community. On the fall 2003 survey, the majority of respondents stated that they either did not have student computers in the classroom or that they did not use them during class time. However, the students who responded that they did meet in a classroom equipped with student computers and that they used them during class time offered positive impact responses, including: "It was awesome! We used them all the time. The computers in the classroom were very convenient"; "Immensely. Allowed me to view new possibilities"; "The more I use it, the better I become at finding resources to serve my needs"; "Made the class easier and more interesting"; and "To become a better teacher and coach when using the different levels of technology." The students who valued the opportunity to have had class in a computer-equipped classroom outnumbered those who felt the experience had no impact on their learning by 5 to 2.

While there was a 5% increase in the percentage of students who had class in a computer-equipped classroom from the fall 2003 to the spring 2004 survey, this was still fewer than half of the respondents. Among the responses to the spring 2004 survey were comments that indicated the student computers were a "distraction" and that they "had to move them" out of the way during class. However, as for the fall

2003 survey, the positive remarks, indicated students appreciated the opportunity to appropriately use technology in their courses: “There needs to be a requirement within the education certification that specifically deals with technology”; “…we were able to research and print important information right in class”; “It was a great way to implement additional information in the classroom”; “Very helpful with research, presentations, and class assignments”; and “I hate anytime that I have to write something by hand, then, retype it on a computer…So, I was grateful for the computers we had in the classrooms when we worked on writing projects.” However, some of the negative impact statements from students who met in classrooms without technology were very informative with respect to the students’ change in attitudes: “When required to do presentations we were forced to resort to more primitive resources. We couldn't do the PowerPoint presentations or video presentations that we wanted to do”; “It made it inconvenient, and required me to spend more time on campus”; and “If I had to use technology I had to do it outside of class at the TLC or complete my work at home.” As previously discussed, these student comments highlight the frustration they felt when there were inconsistencies in availability with respect to classroom computing. So, classes that could make use of the technology may not have had the opportunity because of the limited number of resources available, and, in some cases, classes that did not use the technology were scheduled in rooms equipped with student computers. Both cases resulted in a large percentage of students reporting that computers in the classroom, or the lack thereof, had “no impact” or a “negative impact” on their learning and their use of technology.

As students become more adept at using computing tools, they also become more dependent on those tools. Although more college students are acquiring their own personal computers, many of which are laptops, there are still many who cannot afford to do so. In addition, universities are struggling with issues of software incompatibility, insufficient power sources, and network security which restrict the use of personal computing devices in the classroom. The students' perspective reflected in the survey results is that appropriate technology use enhances their teacher preparation program and having individual computing resources available is a benefit, if the technology is utilized during the course.

Implications for Teacher Preparation Programs

The six instructor participants were each asked to share their vision for the future of technology integration in their classes. Their responses were quite varied. For Course A, the instructor's primary concern was that the course continued to address the key issues of diversity, socio-cultural awareness and the constructivist philosophy. She also indicated a desire to include the virtual classroom visits and using additional features of the Blackboard course management software. However, the Course B instructor painted a picture of a future classroom with seamless integration of various technologies: "Ubiquitous use of technology. I'm able to facilitate and discuss so when I get to my video clip it's there at a button push. Understanding that instruction is about building relationships. It is like having one long SMARTboard and not worrying about where it's stored, being able to make changes on the fly (spontaneity), creating in the classroom." So, these two instructors address the issues of keeping the content and the technology integration of their courses current with the issues and capabilities of society at large.

The Course C instructor expressed programmatic concerns: “Move toward across level one – level two skills integration. Move [students’ technology] skills along in an intentional, systematic way.” The instructor articulated the belief that student benefits will rise if the role of technology is addressed from a whole teacher preparation perspective, rather than being viewed as a collection of individual course plug-ins. The intentional use of technology as an instrument for teaching and learning goes beyond skill acquisition, although knowing how to use the tools is a fundamental component. Several students agreed with her view that technology integration, and effective modeling of the use of technology as a teaching tool, needs to be elevated to a programmatic thread, rather than treated as isolated incidents along the way. Students who were inspired by their exposure to classroom use of technology said they wanted more of it. They were eager to learn how to use tools to be more effective in their future roles as classroom teachers.

At level two, the instructors acknowledged little use of technology in the preparation and conduct of their courses. Yet, their visions for the future indicate their firm understanding of the potential technology affords their students as learners. The Course D instructor said, “If we used technology as an extension of the classroom, as a tool, as a textbook.” She also expressed an interest in having her students communicate electronically, via chat, with teachers in the K-12 schools. As she suggested, this use of technology could reduce the number of field experience hours required of the students without compromising their learning opportunity. Similarly, the Course E instructor said: “If I had limitless time and money? Video visits with [K-8] classrooms and teachers, definitely! I could expose all [of my students] to positive literary experiences.” So, both of the level two instructional methods faculty participants see added-value to the program in the form of virtual student visits with exemplary classroom teachers. The Course E instructor went on to say, “And video visits with librarians, too. I shouldn’t be the only model.” However, the Course D instructor raised the issue of student motivation with respect to changes in her course design, suggesting, “ …but they [students] don’t do it [self-directed work outside the classroom] unless you require them to.”

Interestingly, the level three, Course F, instructor has been revising and changing aspects of her course to encourage her students to use technology as a natural adjunct to their classroom experience. Although she has not adopted the use of technology within her class meetings, she has required her students to use the Blackboard course management software to communicate with her and their peers. Her vision for the future of her course referenced her own desire to acquire new technology skills to provide additional resources to her students. Again, this instructor is highly motivated by primary benefits. She wants to be able to keep up with her students technologically, and encourage them to try new things as well. Her comments in response to her future plans for Course F were: “Oh yeah, I would love to put some of my lectures, I hate to use that term because to me that has a bad connotation, but lectures on PowerPoint. … I would post the PowerPoints on Blackboard.” She went to say, “But as far as what the students do, I am comfortable with what they are doing. There is room for growth, there is definitely room for growth, and I encourage the use of technology in all aspects. But there is, I remember having a two party telephone and now I have a cell phone." It seems that she acknowledges the fact that technology is continuously changing and that people need to keep up by adopting new tools. Yet, that doesn't mean she needs to require her students to use particular tools in her course. Rather, her approach is to encourage them to desire to stay current for the personal benefits they will derive.

Each faculty participant was also asked to share their advice for other faculty members attempting to integrate technology in their courses. The responses were all positive. The Course A instructor said: "1) Jump in and do it, even if you are very afraid. 2) Blackboard is fabulous. … 3)…announcements, grades, email are the three easiest to start with. 4) Find a good mentor to help you." These tips support the earlier supposition that this instructor needed guided support to comfortably advance her own technology skill set. Thus, she also wanted technical support for her students and encouraged them to work with the Technology and Learning Center staff. She introduced her classes to that facility at the beginning of each semester, even when she met in a classroom equipped with student computers.

The Course B instructor took a very strong position, saying: "Do it or die! Not here as much because we're a research institution. But our customer base will eventually say, 'I can buy it online and have a good experience doing it (and get it done earlier).'" He expressed concern that universities and colleges are no longer competing locally for student enrollment and to keep up with the competition they need to focus on the demands of their target population. While there are still students who do not own their own personal computers, there are few who have no access to technology tools. Meeting students where they are means exploring the opportunities of cellular and wireless technologies. Cell phones are equipped with word processing capabilities, Internet access, and a variety of messaging formats. Face-to-face classroom instruction may not be disappearing, but as this instructor indicated, it must change to include student access to information from a variety of media sources, on a flexible schedule, taking advantage of the tools students have readily available.

Finally, the third level one instructor, the Course C instructor said: “Let go of control. Just do it. Ask for help and learn with the students. It’s part of our futures pillars [college objectives]; it’s going to happen.” Thus, the three level one instructors all stated that technology integration by teacher preparation faculty at this institution was a reality. The change process was initiated prior to this study and it would continue to grow. There are still concerns that must be addressed, however, as was previously discussed. These concerns include program-wide adoption of technology in courses; modeling technology integration in instructional methods courses; maintaining current hardware and software systems; and continuing to provide adequate technical support to faculty and students. In addition, the college needs to address the concerns of adjunct faculty and their coordinators. Providing training and financial support for the professional development of the entire workforce, including adjunct faculty may not be a college’s typical posture. However, without incentive there may be on-going resistance to change.

Interestingly, though, the faculty member who referred to the secondary role of adjunct instructors in terms of compensation for time spent pursuing training and development opportunities, shared this advice: “Let’s do it together! Alright, there’s power in numbers. I would piggyback on their interest and make it my priority. That would be fun! I would encourage somebody." Again, primary benefits are identified in this response. Faculty members want to have an impact on the learning of others; instructors derive satisfaction from collegial constructivism. This is echoed in these comments from the Course E instructor, "I would point them to the TLC and colleagues who are actively using it;" and the Course F instructor, "Go for it!" So, each participant provided advice that encourages faculty to acquire technology skills, and adopt technology integration practices in their courses. Even those who haven't yet decided to commit to that formula for change themselves.

Further Research

This study explored the experiences of a select group of faculty at a Midwestern university responsible for preparing students to become K-12 classroom teachers. While the researcher's observations may be similar to those experienced by persons at other higher education institutions, they are not presented as a generalization of instructors' technology integration perspectives and practices. However, acquiring a more global perspective by conduct of a comparative study would assist this university in measuring its technology preparedness in terms of its position with respect to other university teacher preparation programs. Questions to be included in this study are: What types of technologies are currently being used by faculty in the classroom and outside of the classroom? What technologies are students required to use? What technologies are students using in addition to those that are required? Do students feel the use of technology in their teacher preparation classes has an impact on their learning? Does it impact their intentions with regard to choosing to use technology in their future K-12 classrooms? What types of technology-equipped facilities are available to faculty and students? What type of technology training is available? How are new technology tools released and supported?

In addition to this comparative study, it would be worthwhile to address the current expectations of K-12 institutions in the community hiring students who have graduated from this university. Are graduates adequately prepared to use the technology tools available to them? Have they demonstrated a willingness to share their technology knowledge with their peers? Have they successfully integrated technology in their teaching and learning environments? Other issues the university may wish to pursue regarding their graduates' role in the workplace include, job satisfaction with respect to opportunities for technology utilization and ongoing skill development; teacher turnover rates and their relationship to technology availability; and demonstrated advances in K-12 student learning in technology-rich environments.

This study did not look at other influencers of technology integration by faculty categories beyond adjunct and full time. Thus, gender and or age biases toward the use of technology in higher education could not be addressed. This would not have been appropriate in this study due to the size of the faculty participant population. Furthermore, there was no assessment of the impact of technology integration on student grades. This external assessment of student learning may be an interesting area of investigation.

While the outcome of this study is a qualitative system description, future research could develop a mathematical model of the process of technology integration by faculty. In addition, ongoing student and faculty surveys can be used to explore the progress made in terms of skill acquisition, appropriate technology use in teaching and learning, and the impact technology adoption has had on student employment. In response to security concerns, universities such as this one should be investigating appropriate uses of technology to inform their student populations about current happenings on campus as well using these tools to communicate about educational topics. In order to adopt appropriate technology practices, institutions of higher education need to know what tools their constituents have available to them and how they can be utilized to advance the quality of teaching and learning programs.

Appendix A

Table 1: Student Survey Data Sample – Fall 2002

intRespKey	R900	R901	R902	R903	R910	R911	R912	R913	R914	R915	R916	R917
1	1	1	2		1	2	3	4	5		7	8
2	1	1	2			2		4	5		7	
3	1	2	1	1	1	2	3	4	5		7	
4	1	1	2		1	2		4	5		7	8
5	1	1	2		1	2		4	5		7	
6	2	1	2		1	2	3	4	5			
7	1	1	1	1	1	2	3	4	5		7	
8	1	1	2		1	2	3	4	5		7	
9	1	1	2		1	2		4	5		7	
10	1	1	2		1	2	3	4	5		7	
11	1	1	2		1	2	3	4	5			
12	1	1	2		1	2		4	5		7	
13	1	1	2		1	2	3	4	5	6	7	
14	1	1	2		1	2	3	4	5		7	
15	1	1	2		1	2		4	5			
16	1	1	2		1	2		4	5		7	
17	1	1	2		1	2		4	5		7	
18	1	1	2	2	1	2		4	5		7	8
19	1	1	2		1	2	3	4	5	6	7	
20	1	1	2		1		3	4	5	6		
21	1	1	2		1	2		4	5		7	
22	1	1	2		1	2		4	5			
23	1	1	2		1	2	3	4	5	6	7	8
24	1	2	2		1			4				
25	1	1	2	2	1	2	3		5		7	
26	1	1	2								7	
27	1		2		1	2		4	5		7	
28	1	1	2		1	2		4	5		7	
29	1	1	2		1	2		4	5	6		
30	1	1	2		1				5		7	
31	1	1	2		1				5			
32	1	1	2		1			4				
33	1		2	2	1	2		4	5	6		
34	1	1	2		1	2		4	5			
35	1	1	2	2	1	2		4	5		7	
36	1	1	2		1	2		4	5	6		
37	1	1	2		1	2	3	4	5		7	
38	1	1	2	2	1			4				
39	2	2	2									
40	1	1	2		1	2		4	5			
41	1	1	2		1						7	
42	1	1	1	1	1	2	3	4	5		7	

Table 2: Student Survey Participation Data

Student Survey Participation Data				
Semester	Fall 2002	Spring 2003	Fall 2003	Spring 2004
No. of Respondents	144	170	137	109
Enrollment in Courses with a Required Field Experience	707	695	731	444
% of Participation	20.4%	24.5%	18.7%	24.5%

Table 3: Comparison of Select Results of Student Surveys

University College of Education Survey					
Teacher Preparation Program - Field Experience Students					
		Fall 2002	Spring 2003	Fall 2003	Spring 2004
Number of Respondents		144	169	134	114
Blackboard Use Required This Semester		92%	96%	95%	95%
Survey Item	Response	Percentage	Percentage	Percentage	Percentage
Blackboard component utilization by instructor:	Course Documents	90%	82%	90%	91%
	Announcements	88%	93%	85%	93%
	Syllabus	85%	83%	88%	89%
	Assignments	85%	89%	82%	86%
	Communication	70%	63%	57%	77%
	Online Quizzes	62%	53%	44%	48%
	Discussion Board	59%	59%	54%	76%
	Grade Book	58%	48%	51%	67%
	Student Tools	49%	38%	54%	60%
	External Links	31%	34%	38%	48%
	Staff Information	26%	30%	26%	29%
	Group Pages	15%	15%	16%	32%
	Books	10%	11%	18%	18%
	Virtual Classroom	10%	11%	16%	19%
	Calendar	9%	12%	13%	19%
	Tasks	6%	11%	4%	10%
Blackboard component utilization by student to share ideas with instructor and/or other students:	Send E-mail	76%	85%	78%	88%
	Discussion Board	50%	54%	46%	68%
	Group Discussion Board	24%	22%	22%	22%
	Digital Drop Box	6%	15%	18%	29%
	Virtual Classroom	3%	5%	9%	6%
	File Exchange	3%	1%	6%	4%
	Edit Your Homepage	3%	3%	7%	6%
	Electric Blackboard	2%	2%	2%	2%
Blackboard has been used this semester to share:					
Instructor generated materials	throughout the course	32%	24%	40%	33%
	frequently	32%	30%	29%	35%
Student generated materials	occasionally	42%	34%	29%	37%
	never	31%	34%	30%	16%
Instructor identified resources	occasionally	26%	34%	26%	40%
	never	24%	22%	21%	11%
Student identified resources	occasionally	27%	27%	20%	29%
	never	56%	57%	48%	41%
Percent of material generated by the instructor was:	100%	44%	43%	44%	37%
	75%	40%	37%	34%	50%
Percent of material generated by students was:	25%	41%	38%	37%	47%
	0%	47%	47%	46%	34%

Table 4: Non-numeric Survey Data – Fall 2003

44. What, if anything, have you learned regarding technology use that you can imagine implementing in your own teaching?

Positive Responses – General Technology

Using technology to create presentations for class.

Found a lot of websites that will be helpful in teaching.

It is a resource that can be and is used by students.

createing lesson plans, email faculty and students about any up coming plans or evens.

Needs to be incorporated into weekly assignments that require different skills to build competance and efficiency of use.

There is a lot more to learn.

I want to portray that technology is not as intimidating as some think.

There is a lot out there, it's important to take advantage of it.

i would like to use it in the classroom.

I understand how technology can enhance effective teaching skills. Eventually, I would like to teach a class without using a Blackboard.

allowing students to search specific sites for information to share will give the student a sense of ownership and build the community in the classroom. also, allowing students to use word for papers can possibly aid in the quality of their revisions.

It is very important to stay up to date on on the new things that continue to be developed in technology.

It can be both an aid or overused to the point of distraction.

The children I know are far more knowledgeable than I will ever be. For the most part they are glad to help teach me any computer technology I'll need.

Last school year I had to create a web page I think that would be neat to do so the parents of the students in my classroom know what is going on inside and outside of the classroom.

Well, I will be teaching 1st graders so I will defintely use computers alone with fun educational cd roms. I will show my students how to get on the internet and go to web sites like nickjr.com. I will also use dvd players and vcrs to show educational movies. I will use digital cameras to take student pictures and also use digital cameras to support me in teaching science and making animal collages.

Technology is vastly growing as a means of education, so I need to expose myself to as many forms of technology as possible in order to stay on top of the pack.

I believe that communication between other students will enhance their learning experience.

Very valuable

schools dont use near enough technology in the classroom.

I've learned the different ways technology can help you advance on to help others like future students.

Organization and the use of technology in and out of the classroom.

Tech will become an increasingly integral part of teaching.

Positive Responses – Support System

TLC staff helped who build my own webpage and taught me how to use different programs, that I needed. They were very patient and willing to help me.

Positive Responses – Application Specific

I plan to use the internet, email ,word processing in my classroom. I will also use camera (photography) I am an english major.

email system would be established for students missing classes so that they would be able to know what work and important deadlines to meet. Email would also be available for students having questions for me as an instructor and to communicate with other students to discuss class material.

I learned how to use PowerPoint effectively

How to use things such as PowerPoint to prepare a lesson and how to use Excel to keep a gradebook.

powerpoint, excel

I can implement PowerPoint presentations as a way of suplementing my lectures.

power point web based sites & resources

powerpoint

Internet skills, wordprocessing

Internet research and Powerpoint presentations

I love using the powerpoint.

I would use word processing on the students for reports.

Web based quizes for students, and web based report forms.

How to use Hyperstudio.

PowerPoint presentations.

I think I know how to implement a webquest, using emails, and definitely using the web has become easier for me.

power point, internet and how to search better, cut and pasting images

I would use email and web based material.

Negative Responses

I don't see a need for powerpoint in the classroom.

I didnt visit a high school it was only k-8 which I did not like.

I'm still too new to answer that intelligently.

[Blackboard] is ineffective.

The technology I know of was not taught by [university] instructors.

45. Did your class meet in a classroom equipped with student computers?

[53] Yes

[77] No

46. How did this impact your use of technology?

Positive Impact

I was able to email my professor about a concern I had for my college class.

I learned how to use Mac computers in SSB

Quizes on line for students to make grading faster and no copies or paper required.

very helpful keeping current with the class

Made the class easier and more interesting.

The more I use it, the better I become at finding resources to serve my needs.

let me know more about technology

It was awesome! We used them all the time. The computers in the classroom were very convenient.

Helped

i thought that was awesome to have a computer for every student in the classroom that i was in.

One class only-we did Hyperstudio.

allowed us to folloew along with the instructor which made eme more knowledgable of the technology.

This was great--I loved being able to type notes instead of writing them!!

I truly learned more about computersin this semester than I have in my past years in college.

Immensely. Allowed me to view new possibilities.

some what, but I did not do my observation in a highschool like I am going into.

I Greatly enjoyed having the use of computers at my fingertips at all times.

It would be great if every teacher used [Blackboard] I loved it-made learning fun and convienent

classes met with classroom equiped with one computer. Helped when teacher gave powerpoint presentations. (and students also gave powerpoint presentations.)

To become a better teacher and coach when using the different levels of technology.

No Impact

The teacher had one computer in nearly every room. This did not effect me either way.

Not very much. We rarely used them in one class. We used Powerpoint and Excel in the other classes, but I knew how to use these already.

We only occasionally used the computers as part of the classwork.

did not impact

not at all

It was never used except by the teacher!

not much

We didn't use them.

None at all.

It didn't.

Computer Technology plays a bigger role in schools today than when I was in school. I should keep up with technology.

Did not use technology in my student teaching.

not

not very

0

Not at all really.

we met only once in a classroom that had computers- no impact.

teachers relied heavily on it as lecture tool, but it did not substantially add to the lesson.

Negative Impact

Students did not have access to the technology

We didn't have computers in the class but the teacher would sometimes take them to the library for research.

My use of technology was always done outside the classroom, unless the class was meeting in the computer lab.

School H had no computer lab, no computers in the class I was in and no computers in the Library accept for the one the Librian uses to check out books. No impact on technology was granted.

If we did have computers in the classes that I attended this semester, there would have probably would have discussed and analyzed our thoughts as much.

I ended up using the TLC lab. We had difficulty locating some things on [Blackboard] for class because there was no computer in class for the teacher to show us where the information was being stored.

not very much at all because their were not enough for everyone to even share let alone having one to themselves

I hate computers.

Table 5: Non-numeric Survey Data – Spring 2004

44. What, if anything, have you learned regarding technology use that you can imagine implementing in your own teaching?

Positive Responses – General Technology

What I learned was at one of my observations. I learned how the smart board works and all the great benefits and activities a teacher can use in his/her classroom.

Structure outline of notes, lesson plans, and integration of materials to enhance student learning of technology in the world.

I would use the web to find ideas about methods for teaching a class and how to get students involved in the classroom.

Technology and information found on the web is invalauble to learning in the 21st century.

I have learned a lot on my own and would use it extensively. I would use web pages, everything.

Technology use is a must in the classroom to assist with research projects, learning activities and assignments.Children like learning on computers.

It is a very necessary and advantageous tool. If used correctly it can be very helpful in developing and enhancing classroom instruction and can be used as an aid in career development.

I would like to have information similar to [Blackboard] available to my students and their parents. Information such as resources, external links, assignments, course documents, and announcements.

It can be a great tool, and a great headache if not used properly or for lack of knowledge.

Technology should not be used just for the sake of saying you use technology. This is what I will avoid. However computers are wonderful word processors and for some students can be an outlet for creativity.

Positive Responses – Support System

TLC staff very helpful.

Positive Responses – Application Specific

hyperstudio spreadsheets

Web page designing. MOst was already known, because of previous college experiences.

How to use power point and create web pages effectively.

research, discussion boards, online quizzes, e-mail, WebQuests

the usage of power point presentations

I am strong in technology and will use it to teach my student spreadsheets, powerpoints, web pages etc.

Power point

A video streaming presentation using CSD materials was great.

I learned a lot about power point presentations so I think I would use that a lot translating the material to my students.

I learned how to construct a basic website, and this could certainly be valuable.

How to design a web page.

Technology is definately becomming more abundant in the classroom. I have learned to conduct a website and develop a power point presentation.

How to use netscape composer.

A professor taught us to use Inspiration last term and I was not too impressed, but then it came in handy for a project I had to do this semester and now I have fallen in love with that program! However, none of the classrooms that I have been in yet as part of my field experience has been well equipped technologically. Although they all had a row of computers at one end of the classroom, they were often broken and they were never used by the students.

learned a little bit about microsoft excell and powerpoint

creating a webpage, using a digital camera and a scanner

I have learned how to make concepts maps so you can organize the information you are wanting to teach to students. I have also learned how to create scoring guides.

how to send e-mail

Negative Responses

I may take my masters in ed. tech here-maybe-but I am aprehensive. I was going to go the Live Text for my Portfolio but it has a huge glitch. Thank God I didn't waste all of my time this semester using it. I will try it in the fall or summer after all of the kinks have been worked out of it.

nothing

Power Point can be totally overused & some teachers rely on it rather than actually teaching.

i need more training in this area for it to be more useful.

I was a graphic designer before entering the education field. I already knew many of the skills mentioned. Also, because of my previous experience, I'm used to jumping on a computer and figuring out different software on the fly and by the seat of my pants. So, it's almost second nature to me to be constantly learning new software independently as I bumble through life.

Can't say yet.

Watching University students and professionals struggle with typing I realize that keyboarding is an important skill for adults to have to survive in the workplace. I came to college knowing how to use technology and have found that many of the instructors do not know enough to implement technology in logical areas so a lot of instructional time has been wasted.

45. Did your class meet in a classroom equipped with student computers?

- [47] Yes
- [55] No

46. How did this impact your use of technology?

Positive Impact

Research done in the classroom.

I have worled on lab tops before, but not continually throughout a course. This semester I have two out of four courses that require an extensive amount of technology use. I enjoyed it very mcuh. It was challenging!

it helped.

increased it considerably, yet I am still computer poor.

Don't be afraid to ask questions. There needs to be a requirement within the education certification that specifically deals with technology--this would be very helpful.

My class meet twice in classroom with technology. It helped to guide the students where to find pertinent information for the completion of certain assignments.

During this time it was helpfull because we were able to research and print important information right in class.

It was a great way to implement additional information in the classroom.

Very helpful with research, presentations, and class assignments.

I got a lot of work done.

I hate any time that I have to write something by hand, then, retype it on a computer; it seems like a waste of time. So, I was grateful for the computers we had in the classrooms when we worked on writing projects.

We had one computer in the classroom that was frequently used by the teacher. Websites and instruction were viewed on the computer.

No Impact

Some classes have computers, some do not.

Not at all.

it didn't.

None.

I was in an art room that had 2 computers, but they were not a primary aspect of the lesson plans.

I do all of my technology work at home or on my personal laptop. So this did not bother me.

not bad

None.

None.

Had there been student computers, I would have been distracted by the internet.

There wasn't any.

We only met once this semester. The assignment we did was a web search that I had done before at home. So there was little impact.

Barely, the children were only allowed to use the computers if the teacher felt they were behaved for the day.

Negative Impact

We occassional met in a computer room to specifically go over and complete an assignment.

It was distracting.

Most of the time it was simply in the way and needed to be moved.

When required to do presentations we were forced to resort to more primitve resources. We couldn't do the PowerPoint presentations or video presentations that we wanted to do.

I brought all of my computer skills to school. The school has taught nothing and does a poor job of using the technology that is available.

no much, i need more training.

We had to go out on our own and use the technology.

If I had to use technology I had to do it outside of class at the TLC or complete my work at home.

It made it inconvenient, and required me to spend more time on campus.

Table 6: Student Survey Correlation Analysis

Comparison of Fall 2002, Spring 2003, Fall 2003, and Spring 2004 Student Surveys

Correlation Analysis (Correlation Coefficient > 0.500, Sig. Of Two-Tail Analysis < 0.01)

Question 1			Question 2			Coefficient			
Variable	No.	Description	Variable	No.	Description	Fall '02	Spring '03	Fall '03	Spring '04
R900	1	Instructor required BB	R901	4	BB required any course this semester	0.452	0.462	0.505	0.579
R910	5	Instructor used BB Announcements	R911	5	Instructor used BB Syllabus	0.540	0.363	0.268	0.463
R910	5	Instructor used BB Announcements	R913	5	Instructor used BB Course documents	0.696	0.286	0.303	0.555
R911	5	Instructor used BB Syllabus	R913	5	Instructor used BB Course documents	0.551	0.474	0.576	0.427
R916	5	Instructor used BB Communication	R921	6	Instructor used BB Discussion board	0.542	0.524	0.478	0.576
R916	5	Instructor used BB Communication	R927	7	Student used BB Discussion board	0.505	0.493	0.517	0.431
R916	5	Instructor used BB Communication	R821	12	BB for student generated materials	0.296	0.252	0.500	0.427
R921	6	Instructor used BB Discussion board	R927	7	Student used BB Discussion board	0.694	0.718	0.760	0.682
R921	6	Instructor used BB Discussion board	R821	12	BB for student generated materials	0.403	0.376	0.529	0.401
R924	6	Instructor used BB Calendar	R925	6	Instructor used BB Tasks	0.559	0.586	0.338	0.506
R740	8	BB contributed, learning goals	R741	9	BB contributed, new tech skills	*	*	0.536	0.612
R740	8	BB contributed, learning goals	R742	10	BB contributed, commun of learners	*	*	0.570	0.728
R740	8	BB contributed, learning goals	R820	11	BB for instructor generated materials	*	*	0.630	0.567
R740	8	BB contributed, learning goals	R822	13	BB for instructor identified ext'l resource	*	*	0.521	0.510
R741	9	BB contributed, new tech skills	R742	10	BB contributed, commun of learners	*	*	0.636	0.652
R741	9	BB contributed, new tech skills	R822	13	BB for instructor identified ext'l resource	*	*	0.543	0.436
R742	10	BB contributed, commun of learners	R822	13	BB for instructor identified ext'l resource	*	*	0.501	0.426
R742	10	BB contributed, commun of learners	R831	18	Email	*	*	0.582	0.461
R781	33	Skills taught by peers	R783	35	Skills taught by experts, i.e. TLC staff	0.465	0.441	0.508	0.666
R782	31	Skills taught by instructor	R783	32	Skills taught by experts, i.e. TLC staff	0.528	0.469	0.623	0.738
R820	11	BB for instructor generated materials	R822	13	BB for instructor identified ext'l resource	0.430	0.548	0.544	0.534

R820	11	BB for instructor generated materials	R850	15	% BB material by instructor	(-)0.345	(-)0.216	0.608	0.385
R821	12	BB for student generated materials	R822	13	BB for instructor identified ext'l resource	0.320	0.365	0.578	0.567
R821	12	BB for student generated materials	R823	14	BB for student identified ext'l resources	0.461	0.619	0.723	0.735
R821	12	BB for student generated materials	R851	16	% BB material by students	(-)0.250	(-).331	0.536	0.670
R822	13	BB for instructor identified ext'l resource	R823	14	BB for student identified ext'l resources	0.503	0.454	0.641	0.587
R823	14	BB for student identified ext'l resources	R851	16	% BB material by students	(-)0.203	(-)0.280	0.545	0.705
R830	17	Web research	R831	18	Email	0.476	0.334	0.675	0.619
R830	17	Web research	R833	20	Web for teacher resources	0.476	0.396	0.570	0.487
R830	17	Web research	R834	21	Typing papers	0.465	0.449	0.590	0.521
R831	18	Email	R832	19	Web for self instruction	0.408	0.207	0.510	0.447
R831	18	Email	R833	20	Web for teacher resources	0.552	0.298	0.542	0.509
R831	18	Email	R837	24	Creating presentations	0.414	0.164	0.582	0.528
R832	19	Web for self instruction	R833	20	Web research for teacher resources	0.356	0.269	0.534	0.514
R835	22	Spreadsheets for tables	R836	23	Spreadsheets to analyze data	0.742	0.783	0.893	0.878
R835	22	Spreadsheets for tables	R837	24	Creating presentations	0.496	0.442	0.552	0.430
R835	22	Spreadsheets for tables	R838	25	Statistical data analysis	0.511	0.490	0.670	0.744
R835	22	Spreadsheets for tables	R839	26	Developing Concept maps	0.378	0.321	0.643	0.493
R835	22	Spreadsheets for tables	R1010	27	Use of Subject specific software	0.342	0.460	0.553	0.239
R835	22	Spreadsheets for tables	R1013	30	Use of Digital video camera	0.217	0.280	0.551	0.229
R836	20	Spreadsheets to analyze data	R837	21	Creating presentations	0.534	0.399	0.489	0.479
R836	23	Spreadsheets to analyze data	R838	25	Statistical data analysis	0.574	0.504	0.713	0.713
R836	23	Spreadsheets to analyze data	R839	26	Developing Concept maps	0.369	0.274	0.666	0.562
R836	23	Spreadsheets to analyze data	R1010	27	Use of Subject specific software	0.362	0.514	0.594	0.270
R836	23	Spreadsheets to analyze data	R1011	28	Developing web pages	0.198	0.314	0.526	0.186^
R836	23	Spreadsheets to analyze data	R1012	29	Use of Digital still camera	0.155^	0.334	0.535	0.206
R836	23	Spreadsheets to analyze data	R1013	30	Use of Digital video camera	0.202	0.379	0.571	0.269
R837	24	Creating presentations	R839	26	Developing Concept maps	0.457	0.296	0.505	0.377
R838	25	Statistical data analysis	R839	26	Developing Concept maps	0.605	0.299	0.711	0.518
R838	25	Statistical data analysis	R1010	27	Use of Subject specific software	0.599	0.550	0.598	0.386
R838	25	Statistical data analysis	R1011	28	Developing web pages	0.358	0.324	0.568	0.201
R838	25	Statistical data analysis	R1013	30	Use of Digital video camera	0.480	0.507	0.537	0.211
R839	26	Developing Concept maps	R1010	27	Use of Subject specific software	0.508	0.456	0.763	0.571

R839	26	Developing Concept maps	R1012	29	Use of Digital still camera	0.409	0.273	0.503	0.150^
R839	26	Developing Concept maps	R1013	30	Use of Digital video camera	0.438	0.375	0.603	0.234
R840	38	Visited TLC	R841	39	Visited TLC with class	0.732	0.571	0.560	0.470
R840	38	Visited TLC	R842	40	Visited TLC with study group, work with	0.533	0.576	0.531	0.630
R840	38	Visited TLC	R843	41	Visited TLC with others, worked alone	0.610	0.601	0.582	0.541
R840	38	Visited TLC	R844	42	Visited TLC alone	0.849	0.875	0.871	0.930
R841	36	Visited TLC with class	R843	38	Visited TLC with others, worked alone	0.501	0.363	0.383	0.426
R841	36	Visited TLC with class	R844	39	Visited TLC alone	0.538	0.377	0.320	0.365
R842	40	Visited TLC with study group, work with	R843	41	Visited TLC with others, worked alone	0.456	0.582	0.543	0.733
R842	40	Visited TLC with study group, work with	R844	42	Visited TLC alone	0.450	0.429	0.501	0.577
R842	40	Visited TLC with study group, work with	R845	43	Visited TLC to seek specific help from staff	0.329	0.531	0.506	0.427
R843	41	Visited TLC with others, worked alone	R844	42	Visited TLC alone	0.588	0.541	0.532	0.495
R934	36	In schools: Web research	R936	36	In schools: Web based teacher resources	0.355	0.344	0.537	0.488
R934	33	In schools: Web research	R937	33	In schools: Email	0.522	0.343	0.330	0.461
R934	33	In schools: Web research	R938	33	In schools: Word Processing	0.516	0.408	0.384	0.381
R935	36	In schools: Web based tutorials	R936	36	In schools: Web based teacher resources	0.343	0.475	0.517	0.336
R939	33	In schools: Electronic spreadsheets	R940	33	In schools: Electronic presentations	0.666	0.533	0.423	0.317
R940	36	In schools: Electronic presentations	R941	36	In schools: Statistical data analysis	0.311	0.273	0.507	0.330
R940	36	In schools: Electronic presentations	R947	37	In schools: Scanners	0.379	0.329	0.600	0.377
R942	34	In schools: Electronic concept mapping	R1013	27	Use of Digital video camera	0.535	(-)0.075	0.203	0.245
R944	34	In schools: Web page development	R1011	25	Developing web pages	0.673	0.347	0.098^	0.062^
R945	34	In schools: Digital still camera	R1011	25	Developing web pages	0.543	0.097^	(-)0.070^	0.019^
R945	34	In schools: Digital still camera	R1012	26	Use of Digital still camera	0.502	0.267	(-)0.090^	0.201
R946	34	In schools: Digital video cameras	R1013	27	Use of Digital video camera	0.510	0.205	0.106^	0.180^
R1010	27	Use of Subject specific software	R1011	28	Developing web pages	0.323	0.374	0.645	0.401
R1010	27	Use of Subject specific software	R1012	29	Use of Digital still camera	0.459	0.374	0.644	0.268
R1010	27	Use of Subject specific software	R1013	30	Use of Digital video camera	0.533	0.458	0.719	0.425
R1010	27	Use of Subject specific software	R1014	31	Use of scanner	0.328	0.409	0.601	0.323
R1011	28	Developing web pages	R1012	29	Use of Digital still camera	0.599	0.321	0.773	0.522

R1011	28	Developing web pages	R1013	30	Use of Digital video camera	0.509	0.368	0.753	0.453
R1011	28	Developing web pages	R1014	31	Use of scanner	0.297	0.211	0.708	0.274
R1012	29	Use of Digital still camera	R1013	30	Use of Digital video camera	0.835	0.658	0.740	0.656
R1012	29	Use of Digital still camera	R1014	31	Use of scanner	0.537	0.546	0.701	0.487
R1013	30	Use of Digital video camera	R1014	31	Use of scanner	0.525	0.457	0.707	0.654

Key:	BB => Blackboard
	All four semester correlation coefficients were >0.500 and significant at <0.01
	Three out of four semester correlation coefficients were >0.500 and significant at <0.01
	At least one semester correlation coefficient was not significant at either <0.01 or <0.05
	This correlation coefficient was an expected negative value due to a change in the order of response choices
	This correlation coefficient was an unexpected negative value

Table 7: Technology Reference Averages for Course A

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Winter	2001	3	19	3	0	0	0	3	3	1	2	1
Summer	2001	1	10	1	0	1	0	1	0	0	1	1
Fall	2001	2	17	2	0	1	0	1	0	0	2	2
Winter	2002	2	15	2	0	2	0	0	0	0	1	2
Fall	2002	2	16	2	0	1	0	1	0	0	1	2
Winter	2003	4	35	4	0	3	0	0	0	0	4	4
Summer	2003	1	5	1	0	0	0	0	0	0	0	1
Fall	2003	3	32	3	0	3	0	0	0	0	3	3
Winter	2004	3	23	3	0	1	0	0	0	1	2	3

Semester	Year	Email/ Blackboard	Excel	Online Quizzes	Use Computer Labs	Technology Use - Field School	Digital Drop Box	Instructor Email Address	Discussion Board	Blackboard Instructions Attch	Electronic Portfolio
Winter	2001	1	0	0	2	2	0	1	0	0	0
Summer	2001	2	1	0	1	0	0	1	0	0	0
Fall	2001	1	2	0	2	2	0	2	0	0	0
Winter	2002	0	2	0	1	2	0	2	0	1	0
Fall	2002	2	2	0	1	1	0	2	0	1	0
Winter	2003	2	4	1	4	3	1	4	1	0	0
Summer	2003	0	1	0	1	0	0	1	0	0	0
Fall	2003	3	3	3	3	3	2	3	0	0	0
Winter	2004	2	2	1	3	1	1	3	0	0	0

Table 8: Technology Reference Averages for Course B

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Winter	2001	3	10	1	0	0	0	3	0	0	2	0
Summer	2001	1	4	1	0	0	0	0	0	0	1	0
Fall	2001	2	7	1	0	0	0	2	0	0	2	0
Winter	2002	2	7	1	0	0	0	2	0	0	2	0
Summer	2002	1	5	1	0	1	0	1	0	0	1	0
Fall	2002	1	5	1	0	1	0	1	0	0	1	0
Winter	2003	2	13	2	0	1	0	2	0	0	2	0
Summer	2003	1	7	1	0	1	0	1	0	0	1	0
Fall	2003	2	8	0	0	0	0	1	0	0	2	0
Winter	2004	3	19	3	0	0	0	3	0	0	2	0

Semester	Year	Email/ Blackboard	Excel	Online Quizzes	Use Computer Labs	Technology Use - Field School	Digital Drop Box	Instructor Email Address	Discussion Board	Blackboard Instructions Attch	Electronic Portfolio
Winter	2001	0	0	0	3	0	0	1	0	0	0
Summer	2001	1	0	0	0	0	0	1	0	0	0
Fall	2001	1	0	0	0	0	0	1	0	0	0
Winter	2002	0	0	0	0	0	0	2	0	0	0
Summer	2002	0	0	0	0	0	0	1	0	0	0
Fall	2002	0	0	0	0	0	0	1	0	0	0
Winter	2003	2	0	2	0	0	0	2	0	0	0
Summer	2003	1	0	1	0	0	0	1	0	0	0
Fall	2003	2	0	1	0	0	0	1	0	0	1
Winter	2004	3	0	3	1	0	0	2	0	0	2

Table 9: Technology Reference Averages for Course A/B Precursor

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Winter	1996	1	1	1	0	0	0	0	0	0	0	0
Winter	1997	2	2	2	0	0	0	0	0	0	0	0
Fall	1997	2	2	2	0	0	0	0	0	0	0	0
Winter	1998	3	6	3	0	0	0	1	1	1	0	0
Fall	1998	3	3	3	0	0	0	0	0	0	0	0
Winter	1999	2	8	2	0	1	0	1	2	2	0	0
Fall	1999	4	14	4	1	1	1	2	3	2	0	0
Winter	2000	2	10	2	2	2	1	0	2	1	0	0
Fall	2000	3	13	2	1	1	1	1	2	1	1	1

Semester	Year	Email/ Blackboard	Excel	Online Quizzes	Use Computer Labs	Technology Use - Field School	Digital Drop Box	Instructor Email Address	Discussion Board	Blackboard Instructions Attch	Electronic Portfolio
Fall	2000	1	0	0	1	0	0	0	0	0	0

Table 10: Technology Reference Averages for Course C

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Winter	2001	4	38	2	2	3	0	4	3	3	3	1
Fall	2001	4	37	4	3	3	0	3	1	2	4	0
Winter	2002	4	37	4	3	4	0	4	2	1	4	0
Summer	2002	1	6	1	0	1	0	1	1	0	1	0
Fall	2002	3	26	2	2	3	0	2	2	1	3	0
Winter	2003	5	36	4	2	3	0	3	2	2	4	0
Summer	2003	1	11	1	1	1	0	1	1	0	1	0
Fall	2003	4	41	4	2	4	1	3	1	2	2	4
Winter	2004	5	49	5	3	5	2	3	2	1	3	3

Semester	Year	Email/ Black board	Excel	Online Quiz	Use Comp Labs	Technology Use – Field School	Digital Drop Box	Instruct Email Address	Discuss Board	Blackboard Instructions Attch	Elect P'folio	Audio/ Tran-scribe	Web Page	TV/ Game
Winter	2001	3	0	3	3	0	0	4	0	0	0	0	4	0
Fall	2001	4	0	2	4	0	0	4	0	0	0	0	3	0
Winter	2002	3	0	2	2	0	0	4	0	0	0	0	3	1
Summer	2002	0	0	0	0	0	0	1	0	0	0	0	0	0
Fall	2002	3	0	0	3	0	0	3	0	0	0	0	2	0
Winter	2003	5	0	1	3	0	0	4	0	0	0	0	3	0
Summer	2003	1	0	1	1	0	0	1	0	0	0	0	1	0
Fall	2003	3	0	0	3	0	0	3	2	0	1	1	3	2
Winter	2004	5	0	1	2	0	2	5	0	0	1	0	3	3

Table 11: Technology Reference Averages for Course C Precursor

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Fall	1995	1	2	0	0	1	0	0	0	0	0	0
Winter	1996	1	2	0	0	1	0	0	0	0	0	0
Summer	1996	1	3	1	0	1	0	0	0	0	0	0
Fall	1996	1	4	1	0	1	1	0	0	0	0	0
Winter	1997	1	4	1	0	1	1	0	0	0	0	0
Summer	1997	1	4	1	0	1	1	0	0	0	0	0
Fall	1997	2	5	2	0	2	0	0	0	0	0	0
Winter	1998	1	5	1	0	1	1	0	0	0	0	0
Summer	1998	1	5	1	0	1	1	0	0	0	0	0
Fall	1998	2	8	2	0	2	1	0	0	0	0	0
Winter	1999	1	5	1	0	1	0	0	0	0	0	0
Fall	1999	2	6	1	0	1	1	0	0	0	0	0
Winter	2000	2	15	1	1	1	0	2	1	1	1	0
Fall	2000	1	4	0	0	0	0	0	0	0	0	0

Table 11: Technology Reference Averages for Course C Precursor (continued)

Semester	Year	Email/ Black board	Excel	Online Quiz	Use Comp Labs	Technology Use – Field School	Digital Drop Box	Instruct Email Address	Discuss Board	Blackboard Instructions Attch	Elect P'folio	Audio/ Tran-scribe	Web Page	TV/ Game
Fall	1995	0	0	0	0	0	0	1	0	0	0	0	0	0
Winter	1996	0	0	0	0	0	0	1	0	0	0	0	0	0
Summer	1996	0	0	0	0	0	0	1	0	0	0	0	0	0
Fall	1996	0	0	0	0	0	0	1	0	0	0	0	0	0
Winter	1997	0	0	0	0	0	0	1	0	0	0	0	0	0
Summer	1997	0	0	0	0	0	0	1	0	0	0	0	0	0
Fall	1997	0	0	0	0	0	0	1	0	0	0	0	0	0
Winter	1998	0	0	0	0	0	0	1	0	0	0	1	0	0
Summer	1998	0	0	0	0	0	0	1	0	0	0	1	0	0
Fall	1998	0	0	0	0	0	0	2	0	0	0	1	0	0
Winter	1999	0	0	0	0	0	0	1	1	0	0	1	0	0
Fall	1999	0	0	0	0	0	0	2	0	0	0	1	0	0
Winter	2000	1	0	1	1	1	0	2	0	0	0	1	1	0
Fall	2000	1	0	0	1	0	0	1	0	0	0	0	1	0

Table 12: Technology Reference Averages for Course D

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Winter	2001	1	10	1	1	1	0	1	0	0	1	0
Fall	2001	3	24	3	3	3	0	0	0	0	3	0
Fall	2002	2	18	2	2	2	0	2	0	0	2	1
Fall	2003	1	7	1	1	1	0	1	0	0	1	0
Winter	2004	4	15	1	1	1	0	3	0	0	2	0

Semester	Year	Email/ Black board	Excel	Online Quiz	Use Comp Labs	Technology Use – Field School	Digital Drop Box	Instruct Email Address	Discuss Board	Blackboard Instructions Attch	Elect P'folio	Webquest
Winter	2001	1	1	0	0	0	0	1	1	0	0	1
Fall	2001	3	0	0	0	0	0	3	3	0	0	3
Fall	2002	1	0	0	1	0	0	2	1	0	1	1
Fall	2003	0	0	1	0	0	0	1	0	0	0	0
Winter	2004	2	0	1	0	0	0	4	0	0	0	0

Table 13: Technology Reference Averages for Course E

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Fall	2001	2	11	2	0	0	0	1	0	0	2	0
Winter	2002	3	19	2	0	0	0	3	0	0	3	0
Summer	2002	1	3	0	0	0	0	0	0	0	1	0
Fall	2002	3	18	3	0	0	0	3	0	0	3	0
Winter	2003	2	12	2	0	0	0	2	0	0	2	0
Summer	2003	1	6	1	0	0	0	1	0	0	1	0
Fall	2003	2	14	2	0	0	0	2	0	0	2	0
Winter	2004	2	11	1	0	0	0	1	0	0	2	0

Semester	Year	Email/ Black board	Excel	Online Quiz	Use Comp Labs	Technology Use – Field School	Digital Drop Box	Instruct Email Address	Discuss Board	Blackboard Instructions Attch	Elect P'folio	Webquest
Fall	2001	2	0	0	0	1	0	2	0	0	0	1
Winter	2002	3	0	0	0	2	0	3	0	0	0	3
Summer	2002	1	0	0	0	0	0	1	0	0	0	0
Fall	2002	3	0	0	0	3	0	2	0	0	0	1
Winter	2003	2	0	0	0	1	0	2	0	0	0	1
Summer	2003	1	0	0	0	1	0	1	0	0	0	0
Fall	2003	2	0	0	0	2	0	2	0	0	0	2
Winter	2004	2	0	0	0	1	0	2	0	0	1	1

Table 14: Technology Reference Averages for Course F

Semester	Year	Number of Instructors	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid	Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point
Fall	2000	2	8	2	1	0	0	0	0	0	2	0
Winter	2001	3	15	3	1	0	0	1	0	0	3	0
Summer	2001	2	7	1	2	0	0	0	0	0	1	0
Fall	2001	4	19	4	4	0	0	1	0	0	3	0
Winter	2002	1	6	1	1	0	0	0	0	0	1	0
Summer	2002	1	3	1	1	0	0	0	0	0	0	0
Fall	2002	2	6	2	2	0	0	0	0	0	0	0
Winter	2003	3	13	3	1	0	0	0	0	0	2	0
Summer	2003	1	5	1	0	0	0	0	0	0	1	0
Fall	2003	2	9	2	0	0	0	0	0	0	1	0
Winter	2004	2	13	2	0	0	0	0	0	0	2	0

Semester	Year	Email/ Black board	Excel	Online Quiz	Use Comp Labs	Technology Use – Field School	Digital Drop Box	Instruct Email Address	Discuss Board	Blackboard Instructions Attch	Elect P'folio	Webquest
Fall	2000	1	0	0	0	0	0	2	0	0	0	0
Winter	2001	3	0	0	1	0	0	3	0	0	0	0
Summer	2001	1	0	0	0	0	0	2	0	0	0	0
Fall	2001	3	0	0	0	0	0	4	0	0	0	0
Winter	2002	1	0	0	0	0	0	1	1	0	0	0
Summer	2002	0	0	0	0	0	0	1	0	0	0	0
Fall	2002	0	0	0	0	0	0	2	0	0	0	0
Winter	2003	2	0	0	0	0	0	3	2	0	0	0
Summer	2003	1	0	0	0	0	0	1	1	0	0	0
Fall	2003	2	0	0	0	0	0	2	0	0	0	2
Winter	2004	2	0	0	1	0	0	2	0	0	2	2

Table 15: Document Coding Scheme

Category Code Number	Sub-category Code Number	Category Name
1		Technology
	1.1	Educational technology
	1.2	Technology integration
	1.3	Software
	1.4	Hardware
	1.5	Blackboard
	1.6	Internet_Email
2		Educational activity
	2.1	Classroom work
	2.2	Field experience
	2.3	Constructivist
	2.4	Collaborative
	2.5	Small group or partners
	2.6	Whole class
	2.7	Individual
	2.8	Research
	2.9	Writing papers
	2.10	Presentations
	2.11	Reading
	2.12	Tests or quizzes
3		Constructivism
4		Teacher-directed
	4.1	Teacher activity
	4.2	Lecture
	4.3	Directions
	4.4	Classroom management
	4.5	Explanation or response
	4.6	Discussion
	4.7	Questions
5		Student-directed
	5.1	Student activity
	5.2	Student choice
	5.3	Student initiated
	5.4	Discussion
	5.5	Questions
6		Date
	6.1	Year
	6.2	Semester
	6.3	Month

Table 15: Document Coding Scheme (continued)

Category Code Number	Sub-category Code Number	Category Name
7		Participant
	7.1	Course A
	7.2	Course B
	7.3	Not utilized
	7.4	Course F
	7.5	Not utilized
	7.6	Course E
	7.7	Course C
	7.8	Course D
8		Document type
	8.1	Interview
	8.2	Observation
9		Course Number
	9.1	Course A
	9.2	Course B
	9.3	Course C
	9.4	Course D
	9.5	Course E
	9.6	Course F
10		Students
	10.1	Needs_interests
	10.2	Number of
	10.3	Behavior
11		Technology level
	11.1	Use level
	11.2	Comfort level
12		Classroom
	12.1	Seating arrangement
	12.2	Equipment
	12.3	Location
	12.4	Physical features
13		TLC
14		Technology purpose
	14.1	Classroom management
	14.2	Teaching_instruction
	14.3	Product development
	14.4	Communication
15		Time

Appendix B

Sample Syllabus Coding Form

No. Copies	Semester	Year	Instructor	Number of Tech References	Typed Reports	Photocopy	Video-tape	Computer-Gen. Vis. Aid

Web Search	Technology Report	Technology Standards Referenced	Technology Course Objective	Power Point	Email/ Blackboard	Excel	Online Quizzes

Use Computer Labs	Technology Use - Field School	Digital Drop Box	Instructor Email Address	Discussion Board	Blackboard Instructions Attch	Electronic Portfolio	Template

Interview Outline

1. How do you define technology?
2. What is educational technology?
3. With respect to the Teacher Education xxx classes you teach, how do you define technology integration?
4. Do you use technology tools in the development of your classes? What tools do you use? How do you use them?
5. Do you use technology tools to conduct your classes? What tools do you use? How do you use them?
6. Do you require the use of technology by your students in Teacher Education xxx? Why?
7. When did you start requiring students to use technology in this course? Why?
8. Are there specific technology tools your students must use during this course? What tools are required?
9. Are there other technology tools that are optionally used by your students? What technology tools are optional?
10. If we looked at the teaching and learning process with respect to your class, activities are represented in this process?
11. How, if at all, does technology apply to each of these activities?
12. Can you put these activities in order from first to last with regard to the time at which technology became applicable to the activity?
13. Can you put these activities in order from greatest need to least need for technology?

14. Can you put these activities in order from most technology integration completed to least technology integration completed?
15. Can you put these activities in order from least effort to most effort with respect to the amount of planning and design for technology integration still to be accomplished?
16. Have any of these activities been introduced in your course because of technology? Which one(s)? Why?
17. What benefit(s) do your students derive from their use of technology in your course?
18. Can you put these benefits in order from most important to their teacher preparation to least important to their teacher preparation?
19. Do your students have access to technology tools during class? Since when?
20. Do your students use technology tools during class? Individually? As part of a small group? As a whole class activity?
21. Which tools do your student use during class?
22. Where do your students typically access the technology required for your class?
23. Do your students need training to become adequately prepared to use the technology required?
24. How do they acquire this training/preparation?
25. What challenges did you have to overcome to successfully integrate the use of technology in this course?
26. How did you overcome these challenges?

27. What challenges still remain?
28. How would you define teacher-directed learning? Student-directed learning?
29. Can you put the activities from question #10 in order from most teacher-directed to least teacher-directed? From most student-directed to least student-directed?
30. Would you say your class is more teacher-directed or more student-directed? Why, what makes it more teacher-directed or more student-directed?*
31. What is your vision for the future of technology integration in your class?
32. What advice would you give to other faculty members attempting to integrate technology in their courses?
33. What motivators have influenced you to integrate (or not to integrate) technology into this course?
34. Which motivator has been most influential in your decision to integrate (or not to integrate) technology into this course?
35. What were your reservations regarding the use of technology in this course?
36. What are your reservations now?
37. *How, if at all, does that teaching style relate to the use of technology in this course? (This question refers to question #30.)
38. Which, if any, of the activities listed in #10 would you say are based on a constructivist philosophy?
39. How, if at all, does this philosophy relate to the use of technology in this course?

Faculty Participant Permission and Release

Dear Faculty Member:
You are invited to participate in a research study of the experiences of teacher educators in the development of practices that integrate technology into their courses conducted by Patricia A. Suess, Ph.D candidate, from the College of Education at this University. You have been asked to participate in the research because of your efforts at technology integration. We ask that you read this form and ask any questions you may have before agreeing to be in the research.

Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

What is the purpose of this research?
The purpose of this research is to better understand how teachers learn and use technology for teaching and preparing educators. This understanding will be used as a basis for the researcher's doctoral dissertation. It may be used to inform the design and conduct of professional development efforts at the University, as well as other means of fostering more effective teaching and learning practices with computer technologies (e.g., presentations and publications).

What procedures are involved?
If you agree to be in this research, we would ask you to do the following things:

- Participate in an initial interview with Patricia Suess (which may be audio recorded).
- Supply copies of course materials which convey the essence of the conduct of the course.
- Select, with the researcher, 2 to 3 class sessions which the researcher will observe.
- Participate in a follow-up interview with the researcher (which may be audio recorded).
- If mutually agreed upon with the researcher, participate in further interviews, surveys and/or site visits by the researcher during the fall semester.

What are the potential risks and discomforts?
There are no potential risks or discomforts of this research, beyond those of daily life.

Are there benefits to taking part in the research?
The primary benefit to participation in the research is contribution to improvement of professional development opportunities, and a better understanding of how people learn and teach with computer technology. You will not be paid for your participation in this research.

What other options are there?
You may choose to not participate in the research with no negative repercussions.

What about privacy and confidentiality?
The only people who will know that you are a research subject are members of the research team. No information about you, or provided by you during the research, will be disclosed to others without your written permission, except:
- if necessary to protect your rights or welfare (for example, if you are injured and need emergency care or when the University Institutional Review Board monitors the research or consent process); or
- if required by law.

When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity, unless requested by you. If photographs, videos or audiotape recordings of you will be used for educational or research purposes, your identity will be protected or disguised to the extent possible, unless requested by you. Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Personal data, audiotapes and responses to surveys will be kept in locked files at the University, and electronic files made from them will not contain your name.

What if I am injured as a result of my participation?
If you suffer an injury in the presence of the investigator, the investigator will assist you in seeking emergency services. If you suffer an injury in the absence of the investigator, you are responsible for seeking emergency services. You or your third party payer, if any, will be responsible for payment of treatment.

What are the costs for participating in this research?
There are no additional costs for participating in this research.

Will I be paid for my participation in this research?
You will not be paid for participating in this research.

Can I withdraw or be removed from the study?
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you do not want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

Who should I contact if I have questions?
The researcher conducting this study is Patricia A. Suess. The faculty sponsor for this research is Dr. Joseph Polman. You may ask any questions you have now. If you have questions later, you may contact the researchers at:

Patricia A. Suess: 314-412-8681, or email at s3i@ix.netcom.com
Dr. Joseph Polman: 314-516-4804, or email at polman@umsl.edu.

What are my rights as a research subject?
If you have any questions about your rights as a research subject, you may call the Chairperson of the Institutional Review Board at (314) 516-5897.

Remember: Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship. You will be given a copy of this form for your information and to keep for your records.

I have read the above statement and have been able to express my concerns, which have been satisfactorily responded to by the investigator. I believe I understand the purpose of the study as well as the potential benefits and risks that are involved. I hereby give my informed and free consent to be a participant in this study.

Signature of Participant or Legally Authorized Representative

Signature of Participant	Date
Printed Name of Participant	
Signature of Researcher	Date (must be same as participant's)

Student Participant Permission and Release

University

Consent for Participation in Research

"Patterns and Purposes of Use of the
[University] Technology & Learning Center"

Purpose:
You are being asked to be a subject in a research study about the patterns and purposes of use of the [University] Technology & Learning Center conducted by Dr. Joe Polman and Pat Suess, Division of Teaching and Learning at the University. We ask that you read this form and ask any questions you may have before agreeing to be in the research.

Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University.

The purpose of this research is to gather information about users of the [University] Technology & Learning Center to help us better identify equipment that is being used, and how it is being used. The method for data collection will be an online survey. If you agree to be in this research, we would ask you to answer a series of questions regarding your use of the services available in the center.

Risks:
There are no risks or benefits available to you as a participant. Your participation in this study will be anonymous. The only persons who will view your responses are members of the research team. When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity.

Costs/Compensation:
There are no costs to you associated with your participation in this survey, and you will be offered no compensation or reimbursement for your participation. Your participation in this research is VOLUNTARY. If you choose not to participate, that will not affect your relationship with UM-St. Louis. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time.

The researcher responsible for the conduct of this study is Dr. Joe Polman. If you have questions, you may contact the researcher at: (314) 516-4804. If you have any questions about your rights as a research subject, you may call the Office of Research Administration at (314) 516-5897.

Remember: Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship. You may print a copy of this form for your information and to keep for your records.

Signature of Subject or Legally Authorized Representative

I have read (or someone has read to me) the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction. I have been given a copy of this form.

Signature	Date
Printed Name	
Signature of Researcher	Date
Data of Approval of Consent Form Approval	Date of Expiration of Consent Form

Note:
In lieu of signing and returning this form, consent is established as follows:
By submitting your survey responses you will have indicated your acceptance of the terms of participation as outlined above.

Student Online Survey Form – Fall 2002

TLC Client Survey
Thank you for completing this survey. By submitting your responses to this survey, you accept the terms of the participant release form which can be found at http://jinx.umsl.edu:8181/View/Collection-25. It is called "TLC Client Survey Permission Form". Use the "Back" arrow of your browser to return to this survey after reading the participant release form.Please select the best response to each of the following questions.

1. Have any of your instructors required the use of Blackboard?
   - ☐ Yes
   - ☐ No

2. Have you ever taken an online course through this university? (If no skip to Question #4.)
   - ☐ Yes
   - ☐ No

3. Did your instructor use Blackboard to conduct the online course?
   - ☐ Yes
   - ☐ No

4. Have you been required to use Blackboard in any courses this semester?
   - ☐ Yes
   - ☐ No

5. Which of the following areas in Blackboard has your instructor(s) used this semester? (Check all that apply.)
   - ☐ Announcements
   - ☐ Syllabus
   - ☐ Staff Information
   - ☐ Course Documents

- ☐ Assignments
- ☐ Books
- ☐ Communication
- ☐ Virtual Classroom

6. (Question #5 continued)

- ☐ External Links
- ☐ Student Tools
- ☐ Online Quizzes
- ☐ Discussion Board
- ☐ Group Pages
- ☐ Grade Book
- ☐ Calendar
- ☐ Tasks

7. Which of the following areas in Blackboard have you used to share your ideas or products with other students or the instructor this semester? (Check all that apply.)

- ☐ Send E-mail
- ☐ Discussion Board
- ☐ Virtual Classroom
- ☐ Group Discussion Board
- ☐ File Exchange
- ☐ Digital Drop Box
- ☐ Edit Your Homepage
- ☐ Electric Blackboard

How often has Blackboard been used in your course to:	Never	Occasionally	About 50%	Frequently	Throughout Course

8.	Share instructor generated materials					
9.	Share student generated materials					
10.	Share external resources identified by the instructor					
11.	Share external resources identified by students					

Considering all materials posted on Blackboard for your course:		100%	75%	50%	25%	0%
12.	How much of this material is generated by the instructor?					
13.	How much of this material is generated by students?					

As part of your coursework, how often have you engaged in these activities:		Never	Occasionally	About 50%	Frequently	Throughout Course
14.	Using the Web to conduct research					
15.	Using E-mail for course communication					
16.	Using the Web for self instruction (online tutorials, etc.)					
17.	Using the Web to find or use teacher resources (lesson plans, quiz generators, puzzle makers, etc.)					
18.	Typing papers					
19.	Generating spreadsheets to make tables					
20.	Generating spreadsheets to analyze data					
21.	Creating presentations					
22.	Conducting statistical data analysis					
23.	Developing concept maps (e.g., Inspiration)					

24.	Using subject specific software or Web modules (e.g., Math Tutor, Social Studies Timeline, etc.)	☐	☐	☐	☐	☐
25.	Developing Web pages	☐	☐	☐	☐	☐
26.	Using a digital still camera	☐	☐	☐	☐	☐
27.	Using a digital video camera	☐	☐	☐	☐	☐
28.	Using a scanner	☐	☐	☐	☐	☐

		Completely	Mostly	Somewhat	Not at All
How are you primarily learning the technology skills required?					
29.	These skills have been self-taught	☐	☐	☐	☐
30.	These skills have been taught to me by my peers.	☐	☐	☐	☐
31.	These skills have been taught to me by my instructor.	☐	☐	☐	☐
32.	These skills have been taught to me by other experts, such as TLC staff, etc.	☐	☐	☐	☐

33. Which of the following technologies have you seen teachers and/or students using in the schools? (Check all that apply.)

- ☐ Web research
- ☐ Web-based tutorials
- ☐ Web-based teacher resources
- ☐ E-mail
- ☐ Word processing
- ☐ Electronic spreadsheets
- ☐ Electronic presentations
- ☐ Statistical data analysis

34. (Question #33 continued)

- ☐ Electronic concept mapping

- ☐ Subject specific software
- ☐ Web page development
- ☐ Digital still cameras
- ☐ Digital video cameras
- ☐ Scanners

How many times have you ever:		Never	Once	2-5 times	6-14 times	15 times or more
35.	Visited the TLC (total number of visits)	☐	☐	☐	☐	☐
36.	Visited the TLC with a class	☐	☐	☐	☐	☐
37.	Visited the TLC with a project or study group to work together on assignments	☐	☐	☐	☐	☐
38.	Visited the TLC with colleagues or friends but worked independently	☐	☐	☐	☐	☐
39.	Visited the TLC alone	☐	☐	☐	☐	☐
40.	Visited the TLC to seek assistance from TLC staff on a specific matter	☐	☐	☐	☐	☐

Student Online Survey Form – Fall 2003

TLC Client Survey - Fall 2003
Thank you for completing this survey. By submitting your responses to this survey, you accept the terms of the participant release form which can be found at http://jinx.umsl.edu:8181/View/Collection-25. It is called "TLC Client Survey Permission Form" and is near the bottom of the directory listing. Use the "Back" arrow of your browser to return to this survey after reading the participant release form. Please select the best response to each of the following questions.

1. Have any of your instructors required the use of Blackboard?

   - Yes
   - No

2. Have you ever taken an online course through this university? (If no skip to Question #4.)

   - Yes
   - No

3. Did your instructor use Blackboard to conduct the online course?

   - Yes
   - No

4. Have you been required to use Blackboard in any courses this semester?

   - Yes
   - No

5. Which of the following areas in Blackboard has your instructor(s) used this semester? (Check all that apply.)

   - [ ] Announcements
   - [ ] Syllabus
   - [ ] Staff Information
   - [ ] Course Documents

- ☐ Assignments
- ☐ Books
- ☐ Communication
- ☐ Virtual Classroom

6. (Question #5 continued)

- ☐ External Links
- ☐ Student Tools
- ☐ Online Quizzes
- ☐ Discussion Board
- ☐ Group Pages
- ☐ Grade Book
- ☐ Calendar
- ☐ Tasks

7. Which of the following areas in Blackboard have you used to share your ideas or products with other students or the instructor this semester? (Check all that apply.)

- ☐ Send E-mail
- ☐ Discussion Board
- ☐ Virtual Classroom
- ☐ Group Discussion Board
- ☐ File Exchange
- ☐ Digital Drop Box
- ☐ Edit Your Homepage
- ☐ Electric Blackboard

Using Blackboard:	Not at all	Maybe/Maybe Not	Definitely

8.	contributed to my meeting the learning goals of the course.	☐	☐	☐
9.	contributed to my acquiring new technology skills (regardless of the goals of the course).	☐	☐	☐
10.	contributed to my sense of being part of a community of learners.	☐	☐	☐

How often has Blackboard been used in your course to:		Never	Occasionally	About 50%	Frequently	Throughout Course
11.	Share instructor generated materials	☐	☐	☐	☐	☐
12.	Share student generated materials	☐	☐	☐	☐	☐
13.	Share external resources identified by the instructor	☐	☐	☐	☐	☐
14.	Share external resources identified by students	☐	☐	☐	☐	☐

Considering all materials posted on Blackboard for your course:		0%	25%	50%	75%	100%
15.	How much of this material is generated by the instructor?	☐	☐	☐	☐	☐
16.	How much of this material is generated by students?	☐	☐	☐	☐	☐

As part of your coursework, how often have you engaged in these activities:		Never	Occasionally	About 50%	Frequently	Throughout Course
17.	Using the Web to conduct research	☐	☐	☐	☐	☐
18.	Using E-mail for course communication	☐	☐	☐	☐	☐
19.	Using the Web for self instruction (online tutorials, etc.)	☐	☐	☐	☐	☐
20.	Using the Web to find or use teacher resources (lesson plans, quiz generators, puzzle makers, etc.)	☐	☐	☐	☐	☐

21.	Typing papers	◘	◘	◘	◘	◘
22.	Generating spreadsheets to make tables	◘	◘	◘	◘	◘
23.	Generating spreadsheets to analyze data	◘	◘	◘	◘	◘
24.	Creating presentations	◘	◘	◘	◘	◘
25.	Conducting statistical data analysis	◘	◘	◘	◘	◘
26.	Developing concept maps (e.g., Inspiration)	◘	◘	◘	◘	◘
27.	Using subject specific software or Web modules (e.g., Math Tutor, Social Studies Timeline, etc.)	◘	◘	◘	◘	◘
28.	Developing Web pages	◘	◘	◘	◘	◘
29.	Using a digital still camera	◘	◘	◘	◘	◘
30.	Using a digital video camera	◘	◘	◘	◘	◘
31.	Using a scanner	◘	◘	◘	◘	◘

How are you primarily learning the technology skills required?		Completely	Mostly	Somewhat	Not at All
32.	These skills have been self-taught.	◘	◘	◘	◘
33.	These skills have been taught to me by my peers.	◘	◘	◘	◘
34.	These skills have been taught to me by my instructor.	◘	◘	◘	◘
35.	These skills have been taught to me by other experts, such as TLC staff, etc.	◘	◘	◘	◘

36. In K-12 schools you have visited as part of your field experience, which of the following technologies have you seen teachers and/or students use? (Check all that apply.)

- ☐ Web-based research tools
- ☐ Web-based tutorials
- ☐ Web-based teacher resources

- ☐ E-mail
- ☐ Word processing
- ☐ Electronic spreadsheets
- ☐ Electronic presentations
- ☐ Statistical data analysis

37. (Question #33 continued)

- ☐ Electronic concept mapping
- ☐ Subject specific software
- ☐ Web page development
- ☐ Digital still cameras
- ☐ Digital video cameras
- ☐ Scanners

	How many times have you ever:	Never	Once	2-5 times	6-14 times	15 times or more
38.	Visited the TLC (total number of visits)	○	○	○	○	○
39.	Visited the TLC with a class	○	○	○	○	○
40.	Visited the TLC with a project or study group to work together on assignments	○	○	○	○	○
41.	Visited the TLC with colleagues or friends but worked independently	○	○	○	○	○
42.	Visited the TLC alone	○	○	○	○	○
43.	Visited the TLC to seek assistance from TLC staff on a specific matter	○	○	○	○	○

44. What, if anything, have you learned regarding technology use that you can imagine implementing in your own teaching?

45. Did your class meet in a classroom equipped with student computers?

- Yes
- No

46. How did this impact your use of technology?

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