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ASSESSING THE IMPACT OF THE INTERNET ON A GROUP OF EDUCATION FACULTY MEMBERS: A QUALITATIVE STUDY

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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The Ohio State University

1997

Dissertation Committee:  
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Thomas Stanley Woods-Tucker

1997
ABSTRACT

This study was designed to assess the impact of the Internet on a group of education faculty. The purpose of the study was to describe and delineate the personal and educational experiences of a group of faculty members who had direct and unrestricted access to the Internet from their office computers. Based on the naturalistic paradigm and modeled after Gallo's (1993) study, the present study explored the barriers these faculty encountered when using the Internet, the ways they utilized the Internet, the impact the Internet had on their attitudes toward computer technology, and their preferences for connecting to the Internet. Respondents were 10 full-time faculty members who represented the four departments and one school of the College of Education. Data sources for this study included participation in two types of interviews (Patton, 1990), ongoing e-mail correspondence between the respondents and the researcher, completion of a grounded survey, and the respondents' personal reflections in the form of a journal.

The findings of the study revealed that these faculty members' experiences with the Internet were consistent with many of the reported findings involving the use of computer-mediated communication in higher education, the results of
telecommunications studies involving preservice teachers during early field experiences, and the results of emerging studies involving librarians and the Internet. Problems of comprehension, time constraints, access, and inadequate administrative support emerged as barriers to faculty members' use of the Internet. Respondents viewed the Internet in different ways. Some faculty members thought that the Internet was exciting and powerful, while others thought it was frustrating and created a system of "haves" and "have-nots." All faculty members preferred direct access to the Internet over a dial-up/terminal host connection. Respondents overwhelmingly used Eudora (for e-mail) more than any other Internet-related application.
Dedication

in memory of my father and best friend ...

Lee Roy Woods
ACKNOWLEDGMENTS

There are many people to whom I owe my deepest gratitude for their friendship and support throughout my doctoral program. Specifically, I would like to extend my appreciation to my dissertation committee, Suzanne Damarin, Daryl Siedentop, and Stephen Acker, for their encouragement and confidence in me. Suzanne, you are the greatest! I would also like to thank Michael Gallo of the Florida Institute of Technology for his support and whose dissertation, “Assessing the Effect on High School Teachers of Direct and Unrestricted Access to the Internet: A Case Study of an East Central Florida High School” (Gallo, 1993), served as a model for mine.

I am also indebted to those faculty members who willingly agreed to participate in this study. Thank you, Cal, Rena, Chuck, Ruby, Lee, Monique, Moses, Alexis, Andy, and Mac. A special word of thanks to my dissertation editor, Sharon Bierman.

I could not have completed my doctoral studies without the support of my wife, Robin, my daughter, J’Quaysha, and other members of my family who always supported and helped me to reach my goals. And finally, I would like to thank all of my friends and most especially, Lee Mapp and Yahna Pryer, who exemplify the true meaning of friendship.
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CHAPTER 1

INTRODUCTION

In the broadest sense, technology extends our abilities to change the world: to cut, shape, or put together materials; to move things from one place to another; to reach farther with our hands, voices, and senses. (American Association for the Advancement of Science, 1989, p. 39)

The microcomputer or personal computer (commonly known as a PC) has opened up many opportunities for improving education. During the 1980s, much was said and written to promote and develop applications of personal computers as tools of research (Barry, 1986; Gilbert & Green, 1986; Hawisher, 1988; Marenghi, 1982), instruction (Cotter, 1988; Finn, 1989; Kepner, 1986; "New magazine," 1983; Orndorff, 1987; Reid & Rushton, 1985; Taylor, 1980; Vockel & Rivers, 1984; Williams & Williams, 1984), and management (Avener, 1984; Billing, Corbin, & Moore, 1987; Kisser, 1989; Lukesh, 1986; Ragone, 1985). Today, much is being said and written about another application of personal computers that can also make a large contribution to the improvement of educational practice and transform the infrastructure of the university (Andrew W. Mellon Foundation, 1992; Arms, 1992; Clausen, 1991; Ford, 1994; Jones, Kirkup, & Kirkwood, 1993; Sproul & Keisler, 1991; Ward, 1994).
One of the most profound and revolutionary aspects of computing is the advent of networking and interconnecting computers.

Networking has provided PC users with access to more than half a million computers internationally for sending mail, transferring documents, and even logging into and operating many of these distant computers (Comer, 1995). A recent review of the literature reveals that most leading universities have campus networks, but they are frequently not universal, reaching only those departments which can afford to pay for connections. Usually, science and engineering departments have good computing and network facilities, justifying the cost by direct productivity gains and often paying for them through research grants or other external support (Arms, 1992). For most humanities and social science departments, the benefits are not so obvious, even if most faculty have computers on their desks for word processing. It is apparent that, without budgetary support from the central administration, there will be "haves" and "have-nots" within educational institutions, and networks will not reach enough of the academic community for the institution to take full advantage of the instantaneous method of communication that technology offers (Arms, 1992).

Nevertheless, pioneering institutions in computing and followers alike share a general vision of the academic computing environment of the future where individuals have access to a variety of computing and information resources via a network which is global in scope and connects machines throughout the institution and the world. In this vision, every individual, whether student, faculty, or administrative staff, has a personal
computer attached to a campuswide network which reaches offices, laboratories, classrooms, and dormitories, extends off-campus into faculty homes and student housing. Not only are central computing resources (e.g., the old "computer center") and central library resources accessible over that network, but so are resources staffed by departments, project teams, and other entities within the university. For access to resources beyond the university, the campus network is connected to a national network, which has international links around the world. Access to these resources is consistent and convenient, and information derived from a variety of remote sources can be seamlessly integrated into the individual's own work patterns (Arms, 1992).

The national network of this vision already exists; what is required to realize the full vision is access at the local, departmental office, and personal levels. The "Global Internet" is a collection of approximately 60,000 interconnected networks in 130 nations. This network consists of more than 30 million users (and numbers are increasing daily), all of whom are able to share information with one another in near real time (Gallo & Horton, 1994). The primary component or "backbone" of this global network is the National Science Foundation's funded network, NSFNET, which is the nation's largest research and education network. The design of NSFNET was for a high-speed backbone network to which regional networks could establish connections. Campus networks would connect to the regional networks, thus providing direct access to resources around the country to individual personal computers. With the passage of the High Performance Computing Act of 1991 (U.S. Congress, 1991), NSFNET was
expected to evolve into the National Research and Education Network (NREN), which is expected to link not only academics to other academics but also academics to corporate research groups, such as Bell Laboratories at Lucent Technologies (formerly AT&T). With the passage of the National Information Infrastructure Act of 1993 (NII) (Executive Summary, 1993), which supports Internet connections for libraries, schools, and medical facilities to new high-speed computers, the future of an NREN looks imminent. NREN is a “real” network currently being built; subsequent references to Internet should be understood to include NSFNET and NREN.

The National Information Infrastructure Act (NII) (Executive Summary, 1993) is a large and relatively abstract, complex proposal for nationwide networking. As envisioned by the White House, the NII will be “a seamless web of communications networks, computers, databases and consumer electronics that will put vast amounts of information at the users fingertips (Executive Summary, 1993). On the other hand, the National Information Infrastructure could just be considered a long-term plan for the NREN; the fact is, at the time of this writing, no one really knows (Kroll, 1994). Nevertheless, NII enthusiasts in government, industry, and several policy analysis institutions maintain that the infrastructure will revolutionize the way simple functions are completed, from communicating and entertaining to collaborating across time and space, will bring economic prosperity and an improved quality of life for all, and will provide the nation with a global competitive edge. Roberts (1992, 1994) and Bakshi (1994) suggested some benefit has been promised to practically every segment of the
economy and polity — education (distance education and prospects of lifelong learning and collaboration), health care (on-line medical records and immediate, affordable consultation with top-notch doctors), entertainment (access to distant museums, digital laboratories, and electronic cafes), shopping (browsing through auto dealers' databases for just the right car at the right price), manufacturing (simulations of designs that can cut time and money costs), telecommunication (no more lunch boxes or baby sitter worries), and increased political participation through electronic democracy (President Clinton's and Ross Perot's electronic town meetings). Not surprisingly, various stakeholders in education, government, industry, user communities, and public interest groups have joined the NII debate, each advancing its own vision of the NII as each jostles to place itself in an advantageous position with respect to the infrastructure being contemplated. It is very apparent that the NII will have a major impact on networking in the United States, particularly in higher education, but until the "smoke clears," no one will know exactly what that impact is (O'Connor, 1994). In the interim, it is important to examine the use of global networks now in existence. This dissertation begins such an examination in higher education.

The Internet has and is changing higher education. It started quietly enough with the origins of the Internet in supporting defense-related research on campus but now has become much more influential throughout academe; the potential for use by college faculty is enormous (Oblinger, 1992). Therefore, it becomes essential to evaluate the impact that an Internet connection has on the university community, especially its impact
on faculty. Faculty and administrators must address such questions as, "What problems or barriers do faculty encounter when using the Internet?" "What are faculty members' attitudes toward the Internet?" "What types of Internet connections do faculty members prefer (e.g., direct or dial-up)?" and "What Internet-related applications do faculty members find most useful?" This dissertation will explore these questions and more.

**Purpose of the Study**

The purpose of this research is to examine and delineate the personal and educational experiences of a group of university faculty who have direct and unrestricted access from their desktop workstations to the Internet. The specific questions guiding the study were derived from the research on "Invisible Colleges," from research on academic uses of computer-mediated communication, from studies involving special librarians and the Internet, and from the emerging research literature involving the use of telecommunications among preservice teachers during early field experiences.

**Research Questions**

The following questions, derived from a review of the literature and refined during the progress of the study, guided the investigation reported for this dissertation.

1. What barriers do these faculty members encounter when accessing the Internet?

2. How do these faculty members utilize the Internet?
3. How does the Internet impact the faculty members' attitudes toward computer technology?

4. What type of Internet connection do faculty members prefer (e.g., Sonnet/direct or Sonngate/indirect)?

**Nature and Significance of the Study**

The academy has been at the center of the development and support of the Internet; at the same time, the Internet has not truly permeated the entire academy, colleges of education in particular. Early in the development of the Internet, it was the domain of the hard sciences and computer sciences and remained virtually unexplored by other disciplines. Even at the time of this writing, scholars and administrators on many campuses still have to "show cause" why they should be connected to the network (Arms, 1992; Ellsworth, 1995). For example, the College of Education at the target university has only had its direct connection to the Internet (e.g., Sonnet connection) for a year and a half, while other segments of the university have been hard wired for at least four years (i.e., hard sciences, computer sciences, and the Department of Communication). According to Monique, one of the primary group respondents, the College had to "fight" for its Sonnet connection. [Note that, to preserve anonymity, pseudonyms for the participants have been used throughout this study.]

Many colleges and universities are not yet fully connected to the Internet, and on many connected campuses, faculty, students, and administrators can gain only limited (i.e., restricted) Internet access (Ellsworth, 1995; Newman, 1993). In other cases, only
those faculty in the hard sciences and computer science can gain access. System administrators and support personnel have been, in some cases, of limited vision regarding the usefulness of Internet access to faculty and students (Damarin, personal communication, April 11, 1995). However, that appears to be changing. Currently, almost all major universities have some form of network access, but despite the current publicity about the network, many other campuses are not in any way connected to the network (Arms, 1988). Some campuses have hard-wired high-speed connections to all offices and dormitories, while some people who want access must purchase their own modems.

The Internet is exciting, stimulating, and offers untold opportunities for faculty administrators and students when they gain access. Virtually all segments of the university community are using the Internet. Faculty in particular are using the Internet in each of the traditional roles of academe, teaching/learning, research, and service (Ellsworth, 1995; McClure, 1994).

The present study helps to answer whether or not the Internet is a "nightmare or paradise" in higher education by extending our understanding of the impact Internet access has on university faculty. Valuable insights from the perception of faculty members who have either experienced or are experiencing the Internet phenomenon are presented. Current and future faculty, regardless of academic discipline, might benefit from the lessons learned when debating the usefulness of the Internet or type of Internet connection. In the United States, it is becoming the general recognition that access to
the Internet on campus is no longer an optional extra, but an essential (Hafner & Tanaka, 1995).

Such a study might also assist administrators in knowing what support services are needed by faculty to help them work cooperatively with students and other faculty. Because of the integral role university administrators play in the creation and building of "community," administrators must understand that, as with any new tool, faculties need to learn how to use the Internet in their curricula and they need time to develop these uses (Becker, 1993).

In addition to making faculty and university administrators more cognizant of the ramifications of the Internet, the study provides useful information for influential educators and educational reform groups (e.g., Holmes Partnership and Carnegie Task Force) who are involved in restructuring or designing the nation's teacher education programs to meet the challenges of the 21st Century. This study also provides important information about the changing role of teacher education programs and can help assess the contribution the Internet can make in the design of a new and effective educational system that can be implemented on a nationwide scale. Teacher education programs, which prepare tomorrow's teachers, must produce citizens who are adept at using technology to acquire information.

**Definition of Terms**

An understanding of the following terms is essential to this study:
**Bulletin Board System (BBS)**. A system that lets people read each other's messages and post new ones. The Usenet system of newsgroups is in effect the world's largest distributed BBS (Levine & Boroudi, 1993).

**Client**. Software that allows users to access and browse the World Wide Web (see World Wide Web). Unofficially termed "browsers,” clients can display web pages in their desired format. The most popular web browsers are NCSA Mosaic, Cello, Amiga Mosaic, Netscape, and Lynx.

**Computer-Mediated Communication (CMC)**. Any system where the computer is used to mediate communications between and among humans as individuals or as groups.

**Dial-up**. A connection to a computer made by calling the computer using a telephone and modem.

**Direct Internet Access**. Access to the Internet that does not rely on an intermediate machine (e.g., modem or telephone lines) for its connection to the Internet (see Ethernet).

**E-mail (electronic mail)**. Messages, usually text, that exist in an electronic form and are sent and received electronically using computer communication systems.

**Ethernet**. A very common method of networking computers. Ethernet will handle approximately 10,000,000 bits-per-second and can be used with almost any kind of computer.
**File Transfer Protocol** (FTP). A protocol which allows a user of one computer to access and transfer files to and from another computer over a network. FTP is usually the name of the program the user invokes to execute the protocol.

**General Interview Guide.** A semi-structured interview approach that involves outlining a set of issues that are to be explored with each respondent or in a group setting before interviewing begins. The guide serves as a checklist to ensure all the topics are covered during an interview (Patton, 1990).

**HomeNet.** A set of software that enables the user to connect to the Internet from home via Sonnet, the target university’s campus network.

**Internet Applications.** Software that provides users with the tools to interact with the Internet and its resources. Examples include Eudora (for electronic mail), Fetch or Archie (for file transfers), Trumphet (for reading and posting network news articles), and Gopher (for disseminating or discovering resources on the Internet through a menu interface).

**Internet Resources.** Data that can be extracted from an Internet site using a particular Internet application. Examples include text, graphics, sound files, public domain software, electronic mail messages, and others.

**Listserv.** A listserv is the most common kind of mail list; a software system that automatically (without human intervention) handles various administrative tasks related to an electronic discussion group. Some of the tasks performed include maintaining a group’s subscription list, providing help information, and providing copies of archival
messages. At the target university, coefaclist is a Listserv for faculty in the College of Education. Articles posted to the listserv group by the Associate Dean are electronically mailed to all faculty subscribers on the list (Siedentop, personal communication, March 4, 1995).

**Local Area Network (LAN).** A local system (typically within a building) connecting computers and peripheral devices into a network. May give access to external networks.

**Modem.** A device connected to a computer and to a phone line that allows the computer to communicate with other computers through the phone system.

**Network News.** A globally-distributed electronic bulletin board where users can read, post, or reply to messages. Network News is also referred to as Usenet News.

**Quick Time Movies.** Interactive, electronically-storable and transferable video files that are built around a mathematical model of a real-world event or process.

**Resnet.** A set of software tools that enable students who live in campus dormitories of the target university to connect to the Internet via Sonnet.

**Sonnet.** The target university's campus-wide network. It enables the target university community to share information (e.g., notes, messages, and files) with each other, as well as with people in other universities, companies, and even countries. Sonnet is connected to several national and international networks, such as NSFNET and the Internet, which, in turn, are connected to other networks. Anyone using a system
connected to Sonnet can communicate with any other user or system on one of these networks.

**Sonngate.** The target university’s campuswide network that utilizes a terminal-host connection to the Internet. Until Sonnet became available, campus users utilized Sonngate.

**Telecommunications.** Telecommunications is an overarching term that describes electronic point-to-point connections between individuals and groups. It includes connections that utilize existing telephone lines, dedicated lines, and satellite transmission.

**Telnet.** The command and program used to log-in from one Internet site to another.

**Terminal-Host Internet Connection.** A connection to the Internet that involves an intermediate computer; a terminal-based machine first establishes a connection to an intermediate computer, which in turn establishes a connection to the Internet. A terminal-host connection can involve a computer terminal connected directly to the intermediate machine or personal computer and modem that uses a dial-up line to connect to the intermediate machine.

**Unrestricted Internet Access.** Access that is not limited by human or machine imposed limitations. Users with unrestricted Internet access are capable of accessing any publicly available Internet resource from any Internet information source.

**Usenet News.** See Network News.
World Wide Web (WWW)  (1) Loosely used, the whole constellation of resources that can be accessed using Gopher, FTP, Telnet, Usenet, and some other tools. (2) The universe of hypertext servers which allow text, graphics, sound files, etc., to be mixed together.

Overview

In Chapter 2, the literature on “invisible colleges,” electronic telecommunication networks in higher education, and computer conference systems is reviewed. Emerging literature involving special librarians and the Internet is also presented. This chapter concludes with studies involving the use of telecommunications among preservice teachers during early field experiences. In Chapter 3, the methodology of the study is discussed, along with a full and complete disclosure of the data collection procedures used to support the research questions and a thorough description of steps to increase the trustworthiness of the study. In Chapter 4, an analysis of the collected data is given. This chapter includes a thorough description of the context within which the inquiry occurred and of the participants observed in that context relevant to the inquiry, a discussion of the research questions and corresponding hypotheses that were generated from the investigation, the results of a grounded survey framed in the “lived” experiences of the respondents, a summary of the types of e-mail messages that were sent by the participants in a 6-week period, and the respondents’ personal reflections regarding a training session. In Chapter 5, a summary of findings and implications is presented.
CHAPTER 2

REVIEW OF LITERATURE

Learning is not something that requires time out from being engaged in productive activity; learning is at the heart of productive activity. To put it simply, learning is the new form of labor. (Zuboff, 1988, p. 395)

Introduction

Although academe has a long history with the Internet (beginning in the early 1970s), a recent review of the educational research related to the Internet reveals many articles that consist more of authors' personal opinions than results of systematic studies. Educational research involving higher education faculty and the Internet is very limited. Completed studies include research on scholarly communication networks known as "invisible colleges," case studies describing the development of electronic telecommunication networks in higher education, research on academic uses of computer conferencing, and research on the Internet and librarians. There are also several studies involving the use of telecommunications among preservice teachers during early field experiences. These studies provide an understanding of how the Internet and other telecommunication networks can be used to supplement or improve teacher education. This review of literature begins with descriptions of how faculties are using the Internet
to support the traditional roles of academe: teaching/learning, research, and service. These reports provide insight to how the Internet might impact university faculties.

**Teaching/Learning**

Faculty members have used the Internet to support a variety of courses and teaching functions, and entire courses have been offered via the Internet. One of the most valuable pedagogical contributions that the Internet and information technology have provided is through dynamic simulations called “quick time movies.” These interactive, electronically storable and transferable video files can replace exercises that involve animals or dangerous materials. Some Quick Time Movies are built around a mathematical model of a real-world event or process, such as a lab technique, a nuclear or a chemical reaction, or even the changing ecology of a pond and its inhabitants. Intermediate or advanced students can manipulate the values of variables in the model and display the resulting behavior of the system (Baker & Gloster, 1994). Students can be given experimental exercises in non-scientific disciplines, such as economics. They can experience directly the “guns and butter” dilemma or the interaction between prices, demand, and supply (Arms, 1992). Baker and Gloster (1994) stated, that through manipulation, the student is more than a spectator; he or she is invited to take on the role of experimenter or scientist, investigating the result of making changes to particular variables. Because these movies have been so successful, some faculty members offer them through file transfer protocol so that any colleague or student who has Internet access and the proper equipment may access them.
Second, the Internet can support the faculty member directly in the classroom. If a classroom is equipped with a computer, a network connection, and projection equipment or multiple monitors, a lecturer can integrate quick time movies or analysis of real data into classes. Professors teaching large courses sometimes find it useful to post questions or information onto an electronic bulletin board on the Internet to provide a review of important topics that students do not understand (Hudspeth, 1990; Landberg, 1986). By utilizing the Internet and other computer-based tools which can be used in presenting a topic difficult for some students to understand, an instructor can avoid taking lecture time to review the topic for the benefit of a few students.

A third important area in which faculties can utilize the Internet to support teaching is through distance education. Advances in technology and the growth in the Internet have propelled distance education to the fore in higher education. For more than a decade, televised classes (distance learning) have been used for continuing education and to teach in remote areas of the country.

In a survey of 11 higher education institutions which use Computer-Mediated Communication (CMC) via the Internet to support distance education, 91% of the participants were from rural settings (Pultorak et al., 1990). This was considered the development of the “virtual classroom” (Hiltz, 1986; Bull, Harris, Lloyd, & Short, 1989).

Hiltz’s (1986) computer conferencing study involved 114 university participants over a period of 2 years. When the higher education students in Hiltz’s study used
CMC, variables such as typing skills, previous experience with interactive computer systems, grade in the course, and time on-line showed no relationship with the effectiveness of the conferencing experience. According to Burpee and Wilson (1991) students believed that studying at a distance could be intensely personal and, when utilized as a form of learner-centered education, very rewarding. This study documented a distance education, professional development program taught at McGill University. Over a 5-year period, enrollment increased from 5 the first year to 320 by the fifth year. Instructors perceived that students asked more challenging questions, and they in turn believed that their electronic responses were of a higher quality than their usually “off-the-cuff” remarks in the classroom (Gregory, 1991).

Furthermore, traditional education has been seen as a triangular relationship among teacher, students, and subject matter. In distance education, the interaction between teacher and students has often been limited. The teacher’s role has been that of author and examiner rather than of a tutor (Winders, 1988). However, the introduction of the Internet and other new information technologies has changed these relationships. Desktop publishing and high-speed communications like the Internet have reestablished the direct tutor-student relationship across distance. Additionally, satellite communication and videoconferencing can enable leading institutions to communicate with students and faculty any where in the world (Acker et al., 1993).
Research

In 1992, mathematicians at Bell Communications Research and Digital Equipment Corporation posted a message on several network bulletin boards via the Internet, asking for volunteers who could contribute some computer time to the factorization of a particular number. The organizers then divided the problem and distributed the necessary software by electronic mail (National Academy of Science, 1993). Participants responded and returned their results by electronic mail. Collaborative effort over the Internet solved the problem and also illustrated the cooperation between corporate researchers and academics. Another project that had wide participation via the Internet is Project H, which grew out of discussion on the qualitative research list. Using content analysis and quantitative methods, a very large group of researchers from around the world joined forces to research computer-mediated group discussions (Ellsworth, 1995). On-line together, researchers developed their hypotheses, design, methodology, analytic model, variables, ethics, and copyright guidelines. The pilot study was also carried on-line. According to Ellsworth (1995), the results have been analyzed and are being reported in several collaborative scholarly publications.

The Human Genome Project (HGP) is the most well-known research project on the Internet to date. Supported by the National Institutes of Health (NIH) division of Research Grants Genome Study, the Human Genome Project involves research in genetic map expansion, DNA sequence determination, and innovative development of technology, tools, and resources in genetics. The Human Genome Project has standing
committees devoted to each chromosome with committee members scattered across the world. Committee members from academe and the private sector can all access the Genome Database (GDB) at John Hopkins University in Baltimore, with sophisticated tools for editing and adding annotations to the database, and they can share data and analysis via the Internet. Scientists who map a new gene can submit their results electronically via the Internet for review by the relevant committee. After review, the new information may be added to the database as an unconfirmed mapping for a gene, with information about the mapping techniques used. The unconfirmed entry stimulates other researchers to contribute supporting or conflicting evidence. Although only appointed editors can modify the database, access is available to researchers anywhere in the world without charge. This central database has provided a mechanism for continuous peer review and development of an informed consensus, in a way that has transformed the scientific process (Arms, 1992).

Faculty have also used the Internet to communicate not only with colleagues at their own institutions but also with colleagues with similar research interests at different institutions. In some disciplines, research results are shared electronically before they are published in journals (Comer, 1995). In physics, for instance, many articles are posted electronically as “preprints” long before the printed versions appear. These electronic serials are growing in number and legitimacy. Some electronic journals mirror paper-based journals, but an increasing number exists only in electronic form. Additionally,
both paper-based and electronic journals often accept submissions and deal with editing via the Internet (Ellsworth, 1995).

**Service**

For faculty, service is a very broad role both within and apart from the university. It often includes committee work, activity in professional organizations, and non-scholarly publishing (Ellsworth, 1995). Such service has been carried out over the Internet. Various segments of the higher education community have used the Internet to debate and vote on issues ranging from freedom of speech to constitution and bylaws. Increasingly, access to the Internet and the creation of temporary lists and newsgroups have been part of scholarly meetings (see “Research on Invisible Colleges”). In times of limited funding, this type of Internet activity has enabled individuals to participate in professional organizations or scholarly discussions without leaving their campuses.

**Research on Invisible Colleges**

Price (1961) noted the importance of informal networks to the growth and dissemination of scientific knowledge. He coined the term “invisible colleges” to describe these informal communities of scientific specialists. The concept of invisible colleges was also used by Kuhn (1970) in his work on the structure of scientific revolutions. As discussed by Lincoln (1992), Kuhn’s work has been brought into common parlance in the higher education literature by Crane and elaborated upon by several historians and sociologists of knowledge. Since Price (1961), informal
collaboration and communication within invisible colleges are commonly viewed as an essential period in the formal publication and dissemination of advances in scientific knowledge (Gresham, 1994). In a review of research on invisible colleges, Cronin (1982) concluded that such informal scholarly communication networks were the “life blood of scientific progress for both the physical and the social sciences” (p. 225). The social network of an invisible college or scientific community is generally composed of approximately 100 individuals who function as the scholarly “in-group” within a given specialization. Generally, members of such an invisible college do not live and work in proximity to one another; however, they produce the most significant research within the specialization (Gresham, 1994). This research is facilitated by the informal exchange of information through contacts within this social network at conferences and other forums. While these informal networks vary in structure across various research areas, they share the common functions of facilitating group identity and purpose within a research specialization and keeping participants abreast of current trends and new developments within their area of specialized interest (Gresham, 1994).

These informal communication networks provide a forum for the sharing and testing of new ideas through feedback and discussion. Interdisciplinary exchange of ideas emerges along the peripheries of inter-connecting invisible colleges. Cronin (1982) pointed to the generation and exploration of knowledge, especially in the social sciences. Also, practical information about research and funding opportunities is often exchanged through these informal networks. Due to publication lags in the formal scholarly
communication networks, the cutting edge of work and information in a given scholarly specialization is frequently found within these invisible colleges.

Cronin (1982) mentioned the following advantages of the invisible college in contrast to the more formal channels of scholarly communication: currency of information, specialization of information, opportunity for feedback and input at formative stages of idea development, and potential for interdisciplinary transmission of ideas. The disadvantages of invisible colleges as a means of scholarly communication include the elitist and restrictive nature of the networks. These colleges emerge around nuclei of major researchers, leaving many institutionally and geographically remote scholars cut off from the significant communication channels in their specialization. High costs are another disadvantage. Invisible colleges function through personal contacts, and this requires funding for frequent travel to conferences. As informal communications systems, invisible colleges have the further disadvantage of disseminating large amounts of trivial and irrelevant data, along with more significant information (Gresham, 1994).

Concluding his review of research, Cronin (1982) noted the potential for computer conferencing to emerge as a new means of informal scholarly communication but did not foresee any drastic changes in the invisible college through the introduction of computer-mediated communication (cited in Gresham, 1994). Lincoln (1992) and Hiltz and Turoff (1993) suggested that electronic networks might lead to a more open form of invisible colleges with wider participation and faster exchange of information,
leading to more rapid paradigm development within specialties, greater interdisciplinary communication between specialties, and an expanded rate of research breakthroughs.

Developments of Electronic Telecommunications in Higher Education

Gardener's (1989) review of developments in the United States and the United Kingdom divides the growth of electronic telecommunications, or what is commonly referred to as the "electronic campus," into three phases. These progress from a period in which there was pervasive provision of cheap personal computers, to a more developed and sophisticated appraisal of the potential of information technology, leading to a demand for a more coordinated approach and in many cases the appointment at a very senior level of what Gardener referred to as "IT Czars," who are now more commonly referred to as network administrators. Jones et al. (1993) stated that, during the first phase of large-scale personal computer use, the ownership of such equipment by all or a substantial majority of students was a mandatory requirement of several universities in the United States, but this did not generally require any outlay of institutional resources or restructuring of the curricula on their part. During the next stage, developments were more principled and institutions planned and organized their programs so as to make the best use of electronic networking.

What follows are four mini-case studies depicting the developments of electronic telecommunications at four universities: Carnegie-Mellon, Brown, Dartmouth, and Massachusetts Institute of Technology. These case studies are relevant because written information about the development of information technology involving other
universities is sparse, and they had the first extensive campus telecommunications networks in American higher education. Thus, these were the first institutions to fully embrace information technologies as accepted and expected mediums for inquiry and development and sharing of new knowledge.

Carnegie-Mellon had grown from a private regional technical college serving the local steel industry into a research university with an international reputation in engineering, particularly computer science and robotics, fine arts, and campus computing. Its aim was to have a computing environment that incorporated the latest and the most advanced technology (Arms, 1992). A task force was created by the president of Carnegie-Mellon in 1981 to formulate a view of what computing would span for the next several years. According to Tucker (1984), the view taken by the task force was that access needed to be made easy and pleasant and should include a high-quality local network. The computer was seen as a tool that could be used in a wide variety of ways. It was accepted that use of computers would be diverse and uneven. For the introduction to be successful, it was essential that the facility be robust and reliable. Students had reported bad initial experiences that had put them off. Such experiences were unfortunately, not uncommon (O'Shea & Self, 1993). Computer literacy was defined as an important educational goal and was seen as encompassing the intelligent use of computer tools. In addition, there was also an emphasis on the importance of a social dimension to the extent that it was recognized that computers should be used in a social context. This meant that resources would have to be diverted
from computers themselves to support modifications to student residences or provision of auxiliary working places.

The widespread introduction of and use of information technology was seen as an arena in which Carnegie-Mellon could become a center of excellence and a leader in the field (Jones et al., 1993). The report avoided specific recommendations on hardware. The decision was to go forward with the design and installation of a state-of-the-art system based on powerful work stations, connected to a network, such that every student and staff member, whether on or off campus, would be able to communicate electronically with all the campus' computing facilities. However, there still loomed the question of finding the necessary finances to cover the costs of the work stations themselves, of the system as a whole, of software, and of maintenance. Carnegie-Mellon reduced the cost it had to bear and sought to increase the broader impact of the project by (1) requiring students to purchase their own computers and to pay for them in installments over four years and (2) seeking a commercial partner in the form of IBM to help share the costs of development, installation, and maintenance (Jones et al., 1993).

Brown University, the second exemplar, was also considering its future in terms of information technology around the same time as Carnegie-Mellon. Soon after the Carnegie-Mellon and IBM announcement, Brown realized the "window" for doing a similar deal with IBM would be very limited (Jones et al., 1993). As a leading liberal arts institution, it was ideal for demonstrating that computers could be used in such an environment. It already had the most extensive and up-to-date campus
telecommunications network in American higher education, and like Carnegie-Mellon, Brown was faced with a rapidly increasing demand for computer services. It was believed that advanced information technology could greatly enhance scholarly activity in every domain (Jones et al., 1993). A 10-year program began with the installation of 10,000 work stations in Brown’s campus communications systems, which, when complete, would provide enough work stations to serve all students. At that time, it had not been decided whether to make student purchase of computers mandatory like at Carnegie-Mellon.

To assist the project, equipment grants were obtained from Apollo Computer ($600,000), Apple Computers ($500,000), and IBM to the value of $15 million over three years (Jones et al., 1993). The driving force for starting the project was the demand for computing facilities on campus; this force was strong and growing very quickly. The Institute for Research in Information and Scholarship (IRIS), which was set up with support from IBM, was described by Brown’s president as “the technical and creative impulses that will drive and focus a broad range of experiments. Information developed by IRIS will show us how the next generation of computing can best serve faculty and students in the humanities as well as in sciences, preserving our strong liberal arts tradition” (taken from Swearer, cited in Tucker, 1984, p. 16).

The third case study involved Dartmouth College. Like Brown University, Dartmouth was a small, private university focused on a liberal arts undergraduate program. It introduced the library model of computing when it developed its own time-
sharing operating system in 1964 (Arms, 1992). Since then, the aim has been to provide free, easy-to-use computing facilities for everyone in a computing environment that incorporates the latest and most advanced equipment. This required a team which developed software and built hardware when what was needed did not exist commercially (Arms, 1992).

The fourth exemplary university was Massachusetts Institute of Technology. Its instructional project (ATHENA) was described as an educational project whose mission was to “explore the value of advanced networked graphics work stations ... throughout Massachusetts Institute of Technology’s curricula” (Lerman, cited in Jones et al., 1993, p.17). To achieve this goal, ATHENA took advantage of generous grants from Digital Equipment Corporation and IBM that included maintenance, hardware, and software (Jones et al., 1993). With the aid of such grants, a campus-wide network was developed comprising 2,000 personal computer work stations. The system was networked so that users could communicate electronically and exchange software, including graphics and pictures. At the time of planning, the specification of the work station was sophisticated, one that would still be suitable beyond five years (Jones et al., 1993). A single campus-wide network resulted, within which local area networks could be used. Having this “twin” system allowed for the main campus network and local area technology to updated independently. The system was to support a range of uses across the curriculum, including databases, computer laboratories, administrative organization, and management, such as the choice of course options (Jones et al., 1993).
Electronic Telecommunications at the Target University

The target university, where I have worked and studied the past four years, is a typical state-funded university, much larger than Brown or Dartmouth and with less money to spend per student. The university aims to provide access to the most efficient and effective information technologies and enabling services that it can to the university community. The university uses mostly commercially available hardware and software and relies primarily on recovering the cost of services from those who use them.

Although the university under discussion is not a pioneer in academic computing or networking, the computer user with a campus (i.e., Sonnet) or home (i.e., HomeNet or Resnet) connection can reach an array of valuable resources on the Internet. The library system at the target university was the first on-line library system in the country, and the College of Education which is known nationally for its teacher education programs has begun to place more emphasis on the improved methods of communication that information technology offers. In addition, the University Technology Services Department indicated that 67% of the more than 50,000 students who attended the target university owned personal computers. This figure is significant, given that state-funded universities cannot make computer ownership compulsory.

In the autumn of 1989, the Provost and Vice President for Academic Affairs charged the Office of Academic Computing (OAC) with developing a plan for academic computing at the target university, which would encompass both general strategy and specific implementation. The need for the plan was driven by the increased demand for
computing by faculty, staff, and students and by the increased importance of information technology reflected in the new General Education Curriculum (GEC) which included requirements for a statistical analysis course and for writing throughout the curriculum. Academic computing at the target university was defined as all computing activities necessary for the faculty and students to satisfy their academic requirements (OSU Office of Academic Computing, 1997).

The desire to push forward into a prominent position as a recognized technology-based institution of higher learning and to become a leader in providing computing resources was seen as an opportunity for the target university to stand out from its peers. The Information Technologies Strategic Plan (formerly the Plan for Academic Computing) set forth recommendations to improve information exchange, instruction, research, and productivity through access to data, video, and voice technologies for faculty, students, and staff at the target university. The Information Technologies Strategic Plan called for implementation guided by a series of short-term implementation plans, which were to coincide with budget cycles and academic/fiscal years to integrate the strategic directions with institutional resources. The Information Technologies Implementation Plan set forth goals, commitments, reallocations, and resource requests to implement the Information Technologies Strategic Plan. Implementation plans were developed annually covering 2-year cycles to allow for rapidly changing and sometimes unpredictable environments, users’ needs, and developing technology. The task force made specific recommendations regarding hardware, along with a list of recommended
commercial vendors (for the purpose of this dissertation, the names of the vendors have been excluded) (OSU Office of Academic Computing, 1997):

1. A new desktop computer, whether Windows or Macintosh platform, should be expected to serve a demanding user for about two years, and be passed to a less demanding user for another two years' service before retirement.

2. Both desktop and laptop computers should be selected for their lifetime costs, rather than their initial costs. Equipment should be of high quality and easy to maintain.

3. Any organization purchasing a computer should understand that it is responsible for the continuing costs and ultimate replacement of that computer.

4. All computers should be ready to connect to the campus network (i.e., Sonnet).

5. Staff support, whether by the user of the equipment or by professionals, is one of the largest costs associated with computing. Equipment should be configured to minimize this cost. Most computers cost a great deal less than their users' time.

The recommendations for the powerful UNIX workstations, which permitted faculty, staff, and students to communicate electronically both on and off campus with the campus' computing facilities, were less specific. The Plan stated that individual departments or units must have a very high level of internal expertise to use one of the UNIX machines and that the level of expertise as well as the requirements of the
particular field or discipline should dictate the precise vendor and the relevant requirements.

**Future of Electronic Telecommunication Networks in Higher Education**

Computing service organizations are witnessing unparalleled growth. Growth in use of traditional services such as processing power and printing is 20% or 30% annually, even though much processing and printing are now done on personal equipment (Arms, 1992). Over the last two years, network traffic and the use of electronic mail in universities and colleges have exploded. The ramifications have spilled over into the classroom. The proportion of colleges courses using electronic mail more than doubled between 1994 and 1995, extending from 8% to 20% (Green, 1996). The University of Pittsburgh, which is a state-funded university, as is the target university, reported recently that network traffic doubled, and the traffic between the campus network and the Internet tripled (M. Spears, personal communication, December 1996).

At the target university, 361 listservers and 551 reflectors have been set up over the last two years. Many of these have been established for the purpose of facilitating electronic communication between instructors and students in courses spanning the curriculum. The electronic mail program, Eudora, is the application in highest use in campus computing labs; approximately 90,000 uses were reported from lab sites during the winter quarter of 1996. The dramatic increase in the use of electronic mail had been noted by the University, which has placed a high priority on increasing support facilities (Chism, 1996). In a recent target university poll (OSU Survey Research Unit, 1997),
75% of the faculty indicated that the World Wide Web and other forms of electronic communication would be major components of course delivery in the future. Equipment costs are falling, but not as fast as demand is rising.

The divisions in higher education between the “haves” and the “have-nots” extend deeply into the issues surrounding access to the Internet. At many universities, there have been no general programs to provide faculty members with personal computers or network connections in their offices. Faculties have had to compete for grants, negotiate with department chairs, or pay for their own computers or connections. Even if institutions are financially sound, the faculty and students can be “have-nots” if the administration and computer systems administrators place a low priority on getting on the Internet (Ellsworth, 1995). When universities make attempts to become more technologically up-to-date, new technology comes along to make it obsolete. In days of limited resources, some departments guard their computers and will not let other students or faculty use them (D. Brownfield, personal communication, January 1996).

Expectations have also risen. Once access to computing and information services is available, demand shifts to quality of service. Systems for mail and library services must be user-friendly, now that everyone is expected to use them, not just the technical specialist. How does an entity best provide faculty and students with assistance on using the computers they now have in their work spaces? How does an entity best provide technical support and repair services for hardware problems? Once faculty members see
that a few resources are available on the Internet, they press for access to more (Arms, 1988).

The key problem facing most universities is how to satisfy this growth in demand during periods of fiscal retrenchment (D. Silverman, personal communication, March 1994). The federal government has reduced student funding for loans, grants, and work study programs, and universities are having to use more of their own funds for scholarships and loans (Kasich, 1995). In times of economic recession, corporate support is scaled back, and fees cannot be raised without losing some students. In 1993, the Academic Computer Service Task Force at the target university called upon central administration to provide budgetary support for computer services and to investigate other funding alternatives. It is very unlikely that central funding will be provided for special projects, such as expanding the network to every building on campus. To connect to the infrastructure, reallocation of central funds would be necessary and some old services will have to be discontinued, or projects that involve delivering high-resolution images or moving video over campus networks may have to be postponed (Arms, 1992). The rate of progress may be slower, but universities will keep moving toward the goal of providing access to a world of information at the users fingertips, and the general recognition that the creation of a global network infrastructure is no longer an optional extra, but essential (Arms, 1988).
Academic Uses of Computer Conferencing

There is an emerging literature on the uses of computer-mediated discussion groups or conferences in the academic community. Computer-mediated communication (CMC) refers to “electronic mail and messages, electronic bulletin board systems, computer conferencing systems, and other forms of computer-based network communications” (Johnston, 1992). CMC is an emerging technology, and research about its influence on faculties is subject to change as new features and capabilities are incorporated into the technology (Ruberg & Sherman, 1992).

Hiltz (1984) surveyed participants in four scientific conferences on the Electronic Information and Exchange System (EIES) which included scholars researching futurology, social networks, general systems theory, and devices for the disabled. According to the survey, the results of participation in these four conferences included clarification of theoretical controversies, expanded networks of professional contacts, greater awareness of information sources, scholarly activity in the subject areas, and increased communication both within specializations and across disciplines. In another study, Freeman (1984) pointed to the EIES conference as an important factor in the emergence of Social Networks Analysis as a new scientific specialty.

Gurd and Picot’s (1987) study, involving two store-and-forward mail networks and faculty members from 16 Canadian universities, revealed several barriers to network use. The most important barriers “were identified by participants as the fact that their colleagues are not on a network, and an inability to locate the network addresses of people they wanted to communicate with on the network” (p. 248). Other perceived
barriers to network use were due to a lack of time, a lack on ongoing purpose to communicate, the system being difficult to learn or use, and technical difficulties.

Based on a survey of participants in communications and psychology electronic conferences (Gresham, 1994), Schaefermeyer and Sewell (cited in Kovacs & Kovacs, 1991) noted that, for these network users, e-mail had begun to replace telephone, postal mail, and face-to-face communications as a preferred means for the scholarly exchange of information concerning research and instructional interests as well as for social communication.

Kovacs and Kovacs’ (1991) survey, involving a number of subscribers to ARACHNET (an e-conference for e-conference moderators and e-journal editors), included 20 moderators of e-conferences in the subject areas of computer science, English, ethnomusicology, labor economics, library and information science, literature, history, philosophy, physics, political economy, postmodern culture, psychology, Southeast Asian studies, and text processing. According to the moderators, the following were uses of electronic conferences as a research tool: establishment of collaborations, information exchange/confirmation, maintaining current awareness, development of research ideas, and medium of publication. In addition, many moderators note that e-mail is replacing postal and phone communication among scholarly colleagues. Gresham (1994) pointed out that these activities corresponded almost identically to the informal communication exchanges described in earlier research on invisible colleges.
Holden and Mitchell (1993) used the Delphi Technique (a forecasting and information gathering process which uses anonymous written responses instead of physically bringing people together) to investigate the future of CMC in higher education. Their study involved 35 faculty members from colleges and universities around the world which incorporated at least one form of CMC into their teaching. Sample data from questionnaires were evaluated by a panel of experts who offered a set of predictive statements about CMC's future role in higher education.

Among their findings, Holden and Mitchell (1993) stated that cooperative learning activities would be facilitated by CMC. "There was high consensus among the experts that using electronic bulletin boards both to structure collaborative/cooperative student work and to facilitate discussion will become prevalent in the near future" (p. 33). The Delphi study also revealed that the network would have to be readily accessible by both faculty and students. This included 24-hour access to the network, network access from dorms, offices, classrooms, and library study rooms, and toll-free remote access to the network. In addition to ready network access, Holden and Mitchell (1993) reported, "Faculty will need additional time and new teaching skills to use instructional CMC applications effectively" (p. 35). Finally, faculty attitudes were identified in the Delphi study as a major obstacle to future use of CMC. Holden and Mitchell (1993) reported that "non-CMC-using faculty oppose changing their teaching methods" (p. 36) and that this resistant attitude was an obstacle that must be transcended if CMC were to be used successfully in future instructional applications.
Berge and Collins (1993) also observed the use of computer conferencing to augment personal and professional networks, noting that “co-authors for articles and books have been discovered, researchers with similar projects have been found, employment, funding and research opportunities have been turning up regularly through computer conferencing” (p. 10). In a later article, Berge and Collins (1994) proffered a more qualitative report on electronic conferencing. They furnish several quotes from an e-conference discussion on the potential social impacts of computer-mediated communication to illustrate the quality of scholarly debate and discussion possible in an electronic conference.

Librarians and the Internet

Tillman and Ladner (1992) sent a five-page questionnaire to 113 special librarians who responded to “Call for Participation” announcements posted on nine computer conferences in July 1991 and a similar announcement in the August 1991 issue of “SpecList,” the monthly newsletter of the Special Libraries Association (SLA). Special librarianship “is/are library and/or information service geared to meet the needs of specialized users or specialized situations, independent of organizational structure, whether they are in information organizations sponsored by private companies, government agencies, not-for-profit organizations, or professional associations or in specialty units in public and academic libraries” (cited in McClure, Moen, & Ryan, 1994).
Fifty-four respondents completed the questionnaire, which sought information on the computer conferences to which they subscribed, the length of time they had been using either Bitnet or the Internet, and the type of training they had in using either of the two networks. In addition, the respondents were asked to rank five functions or capabilities available on either Bitnet or Internet (i.e., electronic mail and computer forums, remote database searching, file transfer and data exchange, research and publication on the Internet, by extent of use). These questionnaires also included open-ended questions concerning major advantage or opportunity and major disadvantage or barrier for special librarians, and most interesting or memorable experience on the Internet.

Analyses of the responses indicated that the respondents' median experience level on the Internet or Bitnet was 24 months, that 65% of the respondents had trained themselves on the Internet, while 59% had learned informally from a colleague, that formal training (ranging a single one-hour class to more structured learning) was available to 39% of the librarians, and that an overwhelming majority of the special librarians in the study (93%) used the Internet for electronic mail. In addition, all 50 respondents who replied to the question about major advantage or opportunity for special librarians in using the Internet mentioned some aspect of electronic communication in their responses. In other words, these special librarians who themselves were active Internet users considered electronic mail to be the major reason why special librarians should use the Internet, because it provides a convenient, timely
nondisruptive, and inexpensive mechanism for communication with their colleagues throughout the world (Tillman & Ladner, 1992). The respondents mentioned the same things: "Truly breaks down the walls (physical, psychological, economic) to communication ... Ease of communication when you want it ... Forging new and unique work relationships with colleagues" (p. 8).

Eisenberg and Milbury (1993) surveyed members of the School Library Media Network (LM-NET), a worldwide electronic discussion group (listserv) on the Internet whose primary audience is school library media specialists, concerning their use of Internet resources and the impact of their use of Internet on the role or status of their media programs. The authors stated that, once connected, library media specialists were quick to use the Internet for the full range of applications of technology. When LM-NET members were asked, "What use do you make of Internet resources in your job as librarian," respondents listed an impressive and wide variety of uses, including access to collections, direct information services, access to technology, instruction and library media management.

Eisenberg and Milbury (1993) also stated that, by bringing the Internet into the school, the library media program assumed a central role in educational change and reform. "Often, this draws support, encouragement, as well as improved status to both the library professional and the program" (p. 213). Respondents to the survey provided a glimpse into the impact of Internet use in library media programs. Of the 42 respondents, 29 answered the question, "What impact has your use of the Internet had
on the role or status of your library media program?” Almost all were enthusiastic, with 23 (80%) reporting that their role or status had improved, and another 4 (14%) were uncertain but hopeful that their Internet use would soon have an impact. Only 2 respondents (6%) believed that there was no impact.

In their combined qualitative-quantitative study on electronic networking in academic and public libraries, McClure et al. (1994) studied key issues affecting academic and public libraries in the use of Internet/National Research and Education Network (NREN) information services and resources. Among their findings involving academic libraries, McClure et al. (1994) stated that, not only will the library have to reconsider specific services and activities within the library, but its roles and relationships with other campus units and with organizations beyond the local campus must be considered. “Thus, what the library does, how it does it, and how it defines itself as information collector, manager, and disseminator will need to change quickly in the immediate years ahead; being connected via the Internet/NREN to other libraries, remote and local constituency groups, and to an ever-expanding array of electronic resources significantly changes the existing notions of what constitutes library services” (p. 136). McClure et al. (1994) suggested that faculty and students increasingly were relying on networked information resources and services, some of which shortcut, replace, or extend traditional library services and products. They also noted that the claims were unclear as to the significant increases in productivity, enhanced national
competitiveness, and that "everyone" could be a better scientist, researcher, student, or educator as a result or being "networked."

Their (McClure et al., 1994) findings that affected the development of public libraries in the networked environment indicated that public librarians were enthusiastic about national networking as represented in the literature or in speeches they had heard; librarians believed that the profession, as a whole, had little awareness of the key issues or topics related to the NREN and national networking; some participants mentioned the risk-taking aspect of utilizing unproved new technologies and wondered if the "train had left the station or had it not yet arrived" (p.177); and access to networked information posed a very real barrier for some of the participants. McClure et al. (1994) inferred from their contextual data that the immediate public library involvement in the design and structure of the Internet would ensure that the public library was a key player and stakeholder in the evolving national networked information society.

**Telecommunications among Preservice Teachers during Early Field Experiences**

A joint study known as Teacher-LENK was initiated by IBM Academic Information Systems and the Curry School of Education at the University of Virginia to study a network to support the student teaching process. They used laptop computers with built-in modems in each student-teacher classroom to access the network mainframe computer via telephone lines. Some benefits of telecommunication identified in this project included obtaining support from peers during stressful periods, sharing teaching ideas, receiving answers to questions about content to be taught, and being a
communication link during field experiences (Bull et al., 1989). A main idea identified was that it is no longer necessary to be in a common geographic location or proximity in order to exchange ideas rapidly and informally.

According to Eskridge and Langer (1992), new teachers needed support during their initial years of teaching. Pacific-LINK, one of their projects, connected teachers in public schools to a bulletin board that allowed communication between new teachers, experienced teachers, and university professors. "One major advantage of communicating in this manner is that the teachers can do it at their convenience" (Eskridge & Langer, 1992, p. 488). The primary goal of Pacific-LINK was to facilitate new teachers’ growth as reflective practitioners in their own teaching and the impact of that performance on students. Eskridge and Langer’s (1992) findings suggested that telecommunication systems facilitated support for new teachers by bridging distance, establishing a forum for discussion, sharing material and lesson plans, and providing help.

Eskridge and Langer (1993) infused technology into existing teacher preparation courses to familiarize teachers with technology. An interactive conference program enabled prospective teachers in a reading and language arts development course to participate in conferences concerning education in a forum setting. Two class periods were used to demonstrate the technology to the students in the university computer laboratory. The instructor had established an on-line conference for class members and posed new discussion items for reactions. Students were encouraged to respond to each item by discussing and reflecting on the topic through writing on the computer. Student
feedback confirmed the appeal of using a computer-assisted conferencing system in preservice teacher education classes (Eskridge & Langer, 1993).

"Dial-a-Teacher" was a project that connected student teachers with experienced elementary education professors through electronic mail (Lowe, 1993). The e-mail system was made available to 48 preservice teachers in 7 school districts for the 1991-92 academic year. Students had already taken a general computer course; however, prior to the study, a workshop and access guide were given to participants. Because student teachers were typically placed far from the university, they were isolated from other student teachers as well as the university. "Dial-a-Teacher" provided contact and support in an effort to increase student teacher morale and confidence. Each student teaching school received the necessary equipment to operate the system. Letters were sent to supervising teachers explaining "Dial-a-Teacher" and asked them to encourage the students to use the system during available times. Message content included requests for help with lesson plans, discipline problems, and where to find specific supplies. A follow-up survey was used to collect recommendations for future implementation of the program. One recommendation that emerged from this survey was that 81% of the participants would have liked to communicate directly with other student teachers, and all said they would use a similar system if it were available to them as a beginning teacher.

TeacherNet linked 10 student teachers, during their 16 weeks of student teaching, to the Internet, bulletin boards, libraries of the world, and other California
teacher educators (Casey & Vogt, 1994). Telecommunications were used to improve support and communication between university supervisors and student teachers. Students were using e-mail and conferencing to enhance their teaching during the student teaching experience. Through the use of telecommunication during student teaching, several benefits were reported. Students increased their reflectivity due to another opportunity to reflect on what they were learning, including teaching approaches and decision making. There were increased feelings of rapport and team support when access to e-mail was provided during the student teaching experience. Casey and Vogt (1994) also identified inherent problems in telecommunication projects with network downtimes and replacement of software as the two of the most frequent deterrents to the students using telecommunications.

Hoover (1994) conducted a study joining preservice teachers, their supervisors, and university faculty members in group-oriented inquiry during student teaching. This project was conducted using PENN*LINK, a communications and information network, which connected the state's school districts. Participants were 19 secondary preservice teachers who were required to send three messages weekly. In addition to the required messages, participants completed questionnaires, interviews, and quantitative logs as other data sources. Hoover (1994) discovered in her analysis that "preservice teachers enthusiastically responded to electronic mail as a medium of communication and reflection about teaching" (p. 653). Results of this study indicated that, through the use
of telecommunication networks, preservice teachers had the potential for self-supervision.

An electronic communication network established at Iowa State University's College of Education linked student teachers with each other, Iowa State faculty members, and experienced teachers (Thompson & Hamilton, 1991). The researchers found that getting participants to use the system was an initial problem of the project. Introductory training on using the system had been given, but access to computers set up at the schools was problematic (Thompson & Hamilton, 1991). To resolve these issues, further training was given and computer sites and software were provided. Analysis of messages sent during the project period identified student teachers who shared the most with other student teachers concerning student experiences.

LaMaster (1996) studied whether field experience students could provide one another with support, guidance, and pedagogical feedback relative to teaching their lessons, and gain the students’ perspective on the use of electronic communication in the field experience process. Participants were 23 juniors in the methods year of the Physical Education Teacher Education program at The Ohio State University. In addition to the required e-mail logs, participants posted teaching questions, responded to peers’ questions, and completed weekly journals, surveys, and group interviews as other data sources. Results of her study indicated that, as preservice teachers used e-mail more frequently, their levels of perceived self-efficacy improved significantly.

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Summary

This chapter reviewed current literature on four different research areas: “Invisible Colleges,” academic uses of computer conferencing, librarians and the Internet, and telecommunications among preservice teachers during early field experiences. Internet studies involving faculty were not included because this researcher was unable to locate systematic research. The literature reviewed provides an interpretive context for the study under discussion. The descriptions provided are snapshots of dynamic institutions (e.g., universities, university libraries, and K-12 schools) that have evolved and changed over time. They detail the evolution, development, and current use of electronic networks and networked information resources. More research is needed to fill the gaps existing in this body of knowledge. Further studies will expand this knowledge base, providing faculties with a better understanding of the potential impact of the Internet on the university community as a whole.
CHAPTER 3

RESEARCH METHODOLOGY

Research is formalized curiosity. It is poking and prying with purpose. It is a seeking that he who wishes may know the cosmic secrets of the world and they that dwell therein. (Hurston, 1969, p. 182)

Introduction

The purpose of this study was to examine and describe the personal and educational interactions of a group of university faculty members who had direct and unrestricted access from their desktop computers to the Internet. Qualitative research methods were used as the research framework (Patton, 1990). This chapter is divided into six sections. First, a rationale for qualitative research is given. The second section contains a review of the data collection methods used in this study. Third, the sampling issues of setting, respondents, and processes is presented. A full account of the attention given to the issues of ethics is provided in the fourth section. The fifth section contains an explication of the issues related to validity, reliability, and objectivity. The chapter concludes with a summary of the researcher's biases.
Rationale for Qualitative Research

Strauss and Corbin (1990) defined qualitative research as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (p. 17). An assumption fundamental to qualitative research is that the participant's perspective on the phenomenon of interest should unfold as the participant views it, not as the researcher views it (Marshall & Rossman, 1989). There is a plethora of terms used to describe various approaches to qualitative research, i.e., interpretive, hermeneutic, phenomenological, naturalistic, critical, and case study. The perspective adopted for this study was naturalistic (Denzin & Lincoln, 1994). "Naturalistic inquiry attempts to present 'slice-of-life' episodes, documented through natural language and representing as closely as possible how people feel, what they know, and how they know it, and what their concerns, beliefs, perceptions and understanding are" (Wolf & Tymitz, 1977, p. 7). In addition, the naturalistic approach avoided the artificial response typical of a controlled laboratory setting (Bogdan & Biklen, 1992b; Fetterman, 1989; Guba, 1978).

To gain the participant perspective, the unstructured in-depth interview was used as the primary method of data collection for this research. The interview method allowed this researcher to enter into what Patton (1990) called "another person's perspective" (p. 278). Researchers using qualitative interview methods assume that the perspective of others is meaningful, knowable, and able to be made explicit. Charmaz (1991) described interviewing as a "direct conversation that elicits inner views of respondents' lives as they portray their worlds, experiences, and observations" (p. 385).
Charmaz (1991) entered into a conversation with the participant to understand how the participant socially constructed his/her reality with regard to the phenomenon under study. For this study, there were several advantages to using the in-depth interview as a data collection technique. The in-depth interviews allowed this researcher to collect large amounts of rich data quickly from faculty members who had very busy schedules, asked follow-up questions immediately, and when necessary for clarification, scheduled follow-up interviews.

Data Collection

Site Selection and Participants.

The study was conducted in the College of Education of a major research university in the midwest. Conducting the study with the College of Education faculty had a definite advantage. The College had been hard wired to the Internet for just a short time. Thus, the researcher had the opportunity to be one of the first contributors to research involving education faculty and the Internet at that institution. In addition, the researcher had the opportunity to study participants in an institution that was geographically dispersed across several buildings and where faculty had various levels of Internet experience ranging from no experience to very extensive. Faculty members at the university were connected directly to the Internet via Sonnet, an Ethernet cabling system that provides desktop access to local, state, and worldwide networks including the Internet. The selection of the institution met the following criteria:
1. There was a large number of faculty members who had various levels of Internet experience at the site.

2. Faculty members had used both direct and indirect connections to the Internet at the institution.

3. Convenience was a consideration.

A stratified purposeful sample of 10 faculty members (5 tenured and 5 untenured) from the College of Education was used in this investigation. In purposive sampling, participants are selected because they can illuminate the phenomenon under investigation (Miles & Huberman, 1994; Patton, 1990). The respondents selected for this study included faculty members who had various levels of Internet experience and who were able to provide valuable information about the issues which were of central importance to this investigation. The respondents were selected using the snowball or chain sampling technique (Patton, 1990). Snowball sampling is an approach for locating information-rich key informants by soliciting names from well-positioned people who could answer the question, “Who can I talk to about this phenomenon?” (Patton, 1990, p. 176). Glesne and Peshkin (1992) referred to this sampling technique as “networking,” wherein the researcher makes one contact and uses the referrals from that contact to make other contacts.

Support for the study was obtained from the Senior Associate Dean for the faculty at the College of Education via a joint posting (“Call for Participation”) to the College of Education Faculty Listserv (coefaclist@lists.acs.ohio-state.edu) encouraging
faculty members to assist the investigator. In the posting (Appendix A), the researcher requested the cooperation of faculty in identifying and locating faculty thought to be potential participants. Faculty from all five academic departments responded.

Based on the referrals obtained from the snowball approach and the "Call for Participation," the researcher compiled a list of prospective participants (grouped by tenure status) and contacted these people via e-mail, sending each prospective participant a brief description of the proposed research. In addition, the researcher e-mailed to each faculty member a set of preliminary forms to determine whether he/she qualified for the study (Appendices B-E). Twenty faculty members initially expressed a willingness to be studied and were available. Of these 20, 10 were selected as respondents. The selection of these 10 respondents was based primarily on the data collected from the set of preliminary forms and input from one of the Deans in the College of Education who was asked to identify those faculty members who would be information-rich sources. Each respondent was given an alias for use in reporting.

During the first week of April 1996, the researcher e-mailed to the 10 selected faculty participants letters of confirmation (Appendices F & G). Because this researcher was working with faculty members who had very demanding schedules and work obligations out of the country, the researcher was concerned with the issue of mortality and what effect it could have on the study. A goal was to maintain the sample size if any of the respondents withdrew early. As a means to this end, the researcher assigned six respondents (three tenured and three untenured) to a primary group and the remaining
four to a secondary group. Both groups were involved with the study in exactly the same manner with two exceptions — only members of the primary group were interviewed formally and completed the grounded survey that arose from the interviews. The rationale of this strategy was to have readily available respondents who could replace a primary group member in the event this respondent was not available for an interview or withdrew early. One primary group member, Steven, had to withdraw early due to a teaching commitment out of state. Additionally, in an effort to maximize diversity across respondents, the sampling process unfolded as the study progressed. Maximum diversity or heterogeneity was maintained by age, faculty rank, ethnicity, gender, department and program area, and level of Internet experience. The research utilized this strategy to garner responses from a more diverse group of individuals, with high and low levels of Internet experience.

**Gaining Access**

Bogdan and Biklen (1992b) stated that gaining entry to a site was "tricky" and suggested that a field worker should be flexible, creative, and persistent. Entry in the site which one has determined would yield the most fruitful observational ground might not always be easy or available. Thus, the researcher must negotiate entry before any shared experiences could have occurred or before any relationships were built (Connelly & Clandin, 1990). The researcher sent an e-mail message to each participant confirming the date and time of their interviews. Follow-up e-mail messages and a training session (Appendix H) were offered to provide additional information to the participants and to
answer any additional questions which the participants had. The training session and
tutorial sessions were also sources of data.

Several data collection methods were used in the study. These included two
types of interviews, a grounded survey, e-mail messages, and reflective journals which
the respondents were asked to maintain after the training sessions.

**Interviews.**

The general interview guides were used to collect data (Appendices I through K).
The general interview guides contained lists of questions or topic areas that the
researcher wished to explore during the interviews. The researcher also used the general
interview guides as checklists to make sure that all of the relevant topics were covered
during the interview (Patton, 1990). Each interview guide covered topics related to the
respondent’s personal or educational interaction on the Internet.

The researcher used several sources to develop the questions and topics on the
general interview guides. First, some of the questions were developed based on research
on computer-mediated communication and from surveys involving special Librarians and
the Internet. Second, questions and topics were added to the general interview guide,
based on the research questions for the study. And third, before the actual data
collection, questions were added, based on informal interviews with three faculty
members in the Department of Communication (outside the College of Education) who
had used both direct and indirect connections to the Internet. It was not the intent to
conduct a pilot study, and these faculty members were not a part of the actual study. Rather the intent was to informally test the instrument which this researcher had developed and to modify the instrument in light of conversations with faculty members who could discuss their Internet experiences with both dial-up and direct connections to the Internet. This technique proved to be advantageous because these faculty members raised some issues which were not covered in the literature and which could possibly be included in the general interview guide.

The researcher was also able to develop some questions through probing, i.e., there were occasions when respondents were asked to elaborate and/or clarify responses. For example, during the first interviews at the College of Education, Ruby was asked to “describe the most useful Internet-related applications on your computer.” She replied, “Which ones are you referring to?” When asked to list all the applications that were on her computer, Ruby stated that she was not aware of all the applications that were installed on her computer and that she did not use all of them. This led to a series of questions which were not on the general interview guide. As a result, Ruby discussed in great detail the applications she used most and the applications she used least. After the interview with Ruby, this researcher modified some questions on the interview guide and conducted follow-up interviews via e-mail with participants who had already completed the first interview.

In addition, questions were also developed as a result of topics and issues raised by participants themselves. One key issue raised by several respondents during the early
stages of data collection was the importance of adequate Internet training. Thus, the question "Do you think you have received adequate Internet training?" was added to the general interview guide. Whenever questions were added to the general interview guide, follow-up interviews were conducted with the participants to assure that each participant had the opportunity to respond to the new question.

Each interview was tape recorded and the length of each interview varied depending on the course of the conversation and the time constraints imposed by the participant. While most of the interviews were completed in two sessions, several interviews did take three sessions to complete. In the first interview with each participant, the researcher attempted to cover as many of the questions and topics on the interview guide as possible. In the second interview, an attempt was made to clarify and expand on statements which were made in the first interview when necessary to complete the remainder of the interview questions. After the initial data analysis, the researcher conducted two group interviews — one with the tenured faculty and one with the untenured faculty — to further clarify unclear statements and/or meanings and to confirm or disconfirm some of the conclusions and interpretations of earlier interviews. Patton (1990) commented that the general guided interview was "especially useful in conducting group interviews. It helps keep the interactions focused but allows individual perspectives and experiences to emerge" (p. 283). These meetings averaged 1½ hours in length.
**Other Data Sources.**

Although interviews were the primary method of data collection for this investigation, the researcher also used three secondary sources — electronic mail messages, a grounded survey (Appendix L), and personal reflections. Prior to the beginning of the study, the participants were advised that they were to communicate with the researcher electronically using e-mail. They were encouraged to e-mail questions, comments, triumphs, problems, etc. These e-mail messages and replies were saved on a floppy disk and were included in the data analysis. After the three rounds of interviews were completed, a grounded survey was e-mailed to the participants to confirm the information already received through the interviews. Later, some statistical treatments were conducted on the responses which offered some outside validity to the study. The participants who attended the Internet training session were asked to reflect on the training session and to e-mail their comments. These entries were also saved on a floppy disc and were also included in the analysis.

**Data Analysis**

Data analysis is the process of systematically searching and arranging interview transcripts, field notes, and other materials the researcher accumulates to increase understanding of the phenomenon. Data analysis involves working with data, organizing the data, dividing the data into manageable units, synthesizing the data, and searching for patterns (Bogdan & Biklen, 1992a; Huberman & Miles, 1994). Researchers use data analysis to bring order, structure, and meaning to what has been collected.
Procedure.

Data analysis does not refer to a stage in the research process; rather, it is a continuing process that should begin as soon as the research begins (Glesne & Peshkin, 1992). Data were analyzed as they were collected. After each interview was completed, the taped conversations were replayed and notes made which were later used to begin the actual coding and analysis of the data using the typed transcript. Following a line-by-line analysis of the entire transcribed study data, codes that this researcher developed were assigned to specific events, incidents, or other instances of phenomena, concepts were identified, and categories were developed (Strauss & Corbin, 1990). Coding the data involved searching through the data for regularities and patterns and noting words and phrases to represent themes and patterns. The words and phrases represented coding categories; major codes represented specific topics, and subcodes represented items related the major codes. Codes (category abbreviations) were assigned to “units of data” (usually paragraphs and sentences of data from the field notes and/or interview transcripts) (Bogdan & Biklen, 1992a). Glesne and Peshkin (1992) recommended that researchers use a codebook to begin developing a coding scheme shortly after research begins so that it would reflect the emerging, evolving structure of the manuscript. This researcher adopted this strategy and began developing a codebook at the beginning of data collection. Based on the research questions and influenced by Spradley’s (1979) taxonomic analysis, the domains or category codes included barriers, attitudes,
preferences, and applications. Domains were further partitioned into “cover terms” and “included terms,” which are presented in the next chapter.

After establishing coding categories, Nudist 3.0, a computer package, was utilized to facilitate the coding and categorization of the data (cited in Denzin & Lincoln, 1994). The computerized program allowed an opportunity to extract units of data and match those units with the corresponding codes. The data were then printed out according to the codes, sorted in logical order, and stored in files for easy reference. The Calendar of Events (Table 3.1) highlights the events of this naturalistic inquiry. It is important to observe that the various events have considerable overlap. For example, data analysis and early formation of hypotheses were ongoing from the time input from the first respondent was received, up until the generation of the final report.
Table 3.1: Calendar of events.

Trustworthiness

Glesne and Peshkin (1992) stated that efforts to achieve trustworthiness required the researcher's continual alertness to his or her own biases and subjectivity, as well as the continual search for negative cases. From the outset of the study, the researcher must make a conscious effort to achieve trustworthiness and be concerned with how he/she will convince the readers that the data are valid, the study is worth reading, that it is credible, and that it is indeed an accurate description of what was gained from the participants.
Lincoln and Guba (1985) discussed four components of trustworthiness: credibility, transferability, and dependability, and confirmability. These components have evolved in response to the concepts of internal validity, external validity, reliability, and objectivity within the positivistic paradigm. The following discussion describes these four criteria as well as techniques used to enhance the probability of increasing the trustworthiness of the inquiry.

Credibility is established if participants recognize descriptions as their own (Sandelowski, 1986). The truth value of the study is subject-oriented rather than research-defined. Participants determine whether or not an investigation is credible. Techniques employed to enhance credibility of the data were reflexive journal, triangulation, peer debriefing, negative case analysis, and member checking.

**Credibility.**

From the outset of the study, this researcher kept a reflexive journal which included the daily schedule and logistics, methodological decisions, rationales, and personal reflections about what was happening in terms of the researcher's own values and interests and for speculation about growing insight into the experiences of the respondents (see "Dependability" and "Confirmability").

Triangulation is “the combination of methodologies in the study of the same phenomena or programs” (Patton, 1990 p. 187). Studies which rely on single data sources, investigators, or methods are vulnerable to errors linked to that source,
investigator, or method. The use of triangulation improves the credibility of data interpretation (Lather, 1986; Lincoln & Guba, 1985; Miles & Huberman, 1984; Patton, 1990). Three triangles were used in this investigation. The multiple data sources included transcripts of audio recordings from interviews, data from e-mail messages, and data from participants' journals. Investigator triangulation utilized a team of three researchers to provide helpful insights into development of the unstructured in-depth interview guide and suggestions for creating a code book. Furthermore, these researchers practiced coding interviews and critiqued computer programs designed for qualitative data management and analysis. Another member of the research group served as the peer debriefer (described below). Likewise, multiple methods were achieved through different interviews used and the grounded survey. All of these activities enhanced the credibility of this research. "Stripped to its basics, triangulation is supposed to support a finding by showing that independent measures of it agree with it or, at least, don't contradict it" (Miles & Huberman, 1984, p. 234).

Lincoln and Guba (1985) described member checking as the "single most crucial technique for establishing credibility" (p. 239). Because the goal of the researcher is to understand the perspectives of the participants, it was essential that the researcher verify and, if necessary clarify, the statements made during the interviews. This process was continually utilized by providing the participants in this study with constant opportunities for participant feedback, both during data collection and during data analysis. Member checks were conducted at the end of each interview, and a copy of the interview
transcript was given to each participant to allow that participant to make corrections to any part of the transcript.

Negative case analysis involves the search for patterns and trends that do not fit within the identified patterns. These instances may be cases that support patterns, broaden patterns, cast doubt on patterns, or alter patterns altogether (Patton, 1990). For example, Chuck's experiences with the College of Education's technical support personnel were much different than were the other five primary group participants' perceptions of the support personnel, and thereby provided an instance that broadened the analysis.

This researcher solicited the critiques and insights of a peer debriefer who teaches a class on how to use the Internet and who is experienced in qualitative methodology. The peer debriefer helped this researcher to understand his own posture and values and what role they played in the inquiry, helped facilitate the working hypotheses, and provided opportunities to try out successive methodological steps in the emergent design.

**Transferability.**

Establishing transferability is different than establishing external validity in the positivist paradigm. In a "strict" sense, transferability is unattainable in qualitative research; that is, it is not possible to develop "truth" statements that are generalizable (Lincoln & Guba, 1985). Naturalistic inquiry generates idiographic statements that are
relevant to a particular context. The plausibility of transferring social or behavioral phenomena to other contexts is enhanced by providing rich descriptions of the specific data base (Lincoln & Guba, 1985). "Thick description" is one means of enabling interested parties to make judgments about fittingness with other contexts (Guba, 1981).

Thick description is characterized as portraying the context and emotion of a particular situation. Such description goes beyond "surface appearances" (Denzin, 1989, p. 83). Thick description establishes the significance of an experience, or the sequence of events, for the person or people in question. In thick description, "the voices, feelings, actions, and meanings of interacting individuals are heard" (Denzin, 1989, p. 83). Chapter 4 presents many instances of the participants' voices, feelings, and actions through direct quotation.

**Dependability.**

Dependability is established through a process referred to as "auditing" (Guba, 1981; Lincoln & Guba, 1985). The auditor makes sure that there is "fairness or representation" of the data, and that the "point of view" of the data is accurate (Lincoln & Guba, 1985). In other words, the auditor examines both the process and product of the inquiry (i.e., the data, findings, interpretations, and recommendations). The peer debriefer and members of the research group served as auditors for parts of this naturalistic inquiry.
Confirmability.

The audit is also a technique for establishing the confirmability of the inquiry (Lincoln & Guba, 1985). The "records" which assist with establishing confirmability are the field notes, observational notes, methodological notes, and theoretical notes. All of these documents make a "reflexive journal" (Guba, 1981). The reflexive journal contains notes about methodological decisions, reflections about what is happening within the inquiry, as well as a schedule of events (Lincoln & Guba, 1985). For instance, it was noted after recording difficulties with the first interview to be sure to carry an extended microphone to improve the sound quality of the audio tapes.

Treatment of Ethics

Bogdan and Biklen (1992b) and Tobin (1992) stated that increased sensitivity to the omnipresent nature of ethical issues might help to diminish the incidence of unethical practices in research. Some of the unethical practices they referred to included not providing participants with a full explanation of the study prior to beginning the investigation, using actual participant names rather than pseudonyms, not informing participants of the research questions being investigated, and failing to secure written consent from the participants guaranteeing them anonymity. Lincoln and Guba (1985) stated that "ethical practice ... demands fully informed consent from each of the respondents from whom ... data will be sought. Moreover ... the respondent must have the option of withdrawing from the study at any time without prejudice" (p. 253).
For this investigation, official approval to commence the study was obtained from the Human Subjects Review Board which stipulated that a consent form must be signed by the participants. Accordingly, prior to commencing the project, the researcher constructed a participation consent form (Appendix M). This form and a copy of the initial set of questions were e-mailed to the initial group of faculty member who expressed a willingness to participate in this study. The consent form contained information about (a) the project, (b) the researcher, (c) issues relating to confidentiality and data ownership, (d) early withdrawal, (e) a section to complete describing particular demographic characteristics, and (f) study-related activities expected of the participants. The consent form also included a signature section. All participants were required to sign a signature block which acknowledged their agreement to participate in the study and their acceptance of the terms of the study.

Two weeks before the study began, the researcher visited one-on-one with each of the 10 respondents selected to participate in the study in their offices. This was an opportunity to resolve any questions or concerns the respondents had about the investigation and to build rapport. The participants were assured that their involvement was voluntary and that they could withdraw at any time. Furthermore, it was stressed that confidentiality would be maintained for any written, publicized work from the project. At the conclusion of the meetings, the participants submitted their signed consent forms which were in turn countersigned by the researcher. These forms were then reproduced with one copy to the participants and the original to the researcher.
Researcher Biases

As Denzin (1989) and Yin (1989) pointed out, it is difficult for investigators to remain neutral and impartial observed during an investigation. Furthermore, Peshkin (1988) discussed the need to be aware of one’s subjectivity — that subjectivity is invariably present in the research. He stated, “I see this monitoring [of one’s subjectivity] as a necessary exercise, a workout, a tuning up of my subjectivity to get it into shape. It is a rehearsal for keeping the lines of subjectivity open and straight” (p. 38). For the present study, it was necessary to minimize the investigator effects, while analyzing the data and reporting the findings.

In conducting this investigation, the researcher assumed two very unique roles that prevented me from being completely unobtrusive or impacted by some of the responses the participants gave me. First, I was a Ph.D. candidate conducting research on faculty in the College of Education. Lather (personal communication, November 14, 1996) calls this doing “up” research rather than “down” research. In most research, the researcher is of higher status than those being researched. For instance, a university or faculty member might conduct research on computer-assisted instruction in a grade school, which would be considered “down” research with the university researcher having status over the young pupil. Also, I noted in my reflexive journal that several faculty members were uneasy or gave very brief answers when responding to questions about the level of technical and administrative support for the Internet. Perhaps some of the tentativeness on the part of the respondents was because their technological
knowledge was inadequate or because it was being showcased in a very public document, namely this dissertation. It can be speculated that some of the faculty members did not wish to divulge their feelings concerning administrative support for the Internet. Doing so could possibly jeopardize their professional careers or stigmatize them as trouble makers.

The second role that this researcher assumed was that of technical support person. I visited with and e-mailed the participants regularly to resolve any hardware or software problems they were having related to the study. In addition, I offered a discussion and training session to members of both the primary group and the secondary group to resolve any technical issues that had developed after my last visit and to garner a better understanding of the respondents' perspectives. Throughout the course of this study, I did my best to be sensitive, responsive, and open to any findings I thought were contradictory to my views. As an added measure, to ensure that the findings and interpretations of this investigation remained as closely as possible to the study data, research group members monitored the analysis and provided feedback throughout the data analysis stage of this investigation.
CHAPTER 4

ANALYSIS AND RESULTS

In its broadest sense, technology refers to the system by which a society provides its members with those things needed or desired. The use of technology in education, with respect to increasing productivity and output by augmenting the effects of human effort and by changing the productive process, must be as effective as it has been in business. (Ohio State Board of Education, 1992, i)

Introduction

Data for this study were collected using questionnaires, two types of interviews (guided and focus group), a grounded survey, e-mail messages, and personal reflections. The purpose of the study was to investigate and describe the personal and educational Internet interactions of a group of education faculty members who had direct and unrestricted access to the Internet from their office desktop computers.

Demographic Characteristics of the Respondents and Rationale for Participation

The 10 participants in this study were full-time faculty members at the target university. The respondents were selected from an initial group of 20 people who expressed interest in participating in the study. Respondent selection was based on data
from a preliminary questionnaire, responses from a “Call for Participation” announcement which was posted on the College of Education faculty listserv, data from the respondents' applications, and interview preferences scheduling forms. Sample-selection guidelines were influenced by Patton (1990) which included a sample size of 10 respondents with five academic departments represented.

Six of the 10 participants were assigned to a primary group, and the remaining four were assigned to a secondary group. Only primary group members were interviewed formally and completed the grounded survey. The rationale for using two groups was to have readily available respondents who could replace a primary group member in the event an individual was not available for a formal interview or withdrew early.

All respondents were full-time faculty members in the College of Education and each taught classes in one of the five academic units that comprised the College of Education. In addition, all 10 respondents had earned doctorates. Four were untenured (three assistant professors and one associate professor), and six were tenured professors (four associate professors and two full professors). Six respondents were male; one was African-American, and one was Asian (Indian). One female respondent was Hispanic, and the remaining three females were Caucasian. Demographic characteristics of the sample are summarized in Table 4.1 below. As stated earlier, the names used in this dissertation are pseudonyms and are used to ensure anonymity of the participants.
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<td>&gt;50 years</td>
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Table 4.1: Demographic characteristics of the respondents.

Cal, an untenured assistant professor in "Department A," had been at the target university for several years. He stated, "I began using the Internet during Graduate School. I used mostly Gopher servers to locate information on databases." He also stated that his most memorable experience on the Internet "was making wedding plans with my bride to be." Cal described his Sonnet connection as "liberating and trouble-
free.” His rationale for participating was to “gain a better knowledge of the Internet and all the possibilities it could bring.”

Rena was an untenured assistant professor in “Department B” who had been at the target university for less than a year. Rena stated that she had been using the Internet constantly for the past couple of years. “I regularly visit many education-related websites, and I find them enormously useful for acquiring resources of all types.” In response to the most memorable experience question, Rena stated, “They are all interesting; I continually marvel at this fabulous resource.” She described her Sonnet connection as wonderful. “I feel more affected by the Internet than by television. It has been just a wonderful resource.” She, like Cal, used a dial-up connection while in graduate school. She agreed to participate because, “I want to learn about your approach to the study and to learn about your findings.”

Chuck, a tenured full professor in “Department C,” had been at the target University for over 30 years. Chuck had been using the Internet for the past four years; however, his Internet experience had been limited to using just e-mail. He had accessed Magnus via modem from work and home. Chuck indicated that his most memorable Internet experience “was receiving e-mail from a long-lost colleague.” He described his Sonnet connection as “trouble-free. [Also] it does not tie up my damn phone lines.” Chuck agreed to participate because, “I know and respect your advisor, and I want to learn more about the Internet.”
Ruby was a tenured associate professor in “Department D” and had taught at the
target university for several years. During the course of the investigation, Ruby was
promoted from assistant professor to associate professor with tenure. Not unlike Chuck,
her Internet experience was limited to e-mail on Magnus and Sonnet. Although she
initially stated she had not had a most memorable Internet experience on her preliminary
questionnaire, she did offer in the first formal interview, “I went out of town for two
weeks and came back to discover that I had over 60 new messages. This has never
happened to me. I guess this has been the most memorable experience to me.” Ruby
agreed to participate “to learn more about the Internet and to connect to the outside
world.”

Lee was an untenured assistant professor in “Department E” who had taught for
a couple of years in the target university. Prior to joining the faculty at the target
university, Lee helped to design a local area network of six lab stations and a master
station in a high school science lab in a high school in California. He also set up a
listserv at another large university for instructors “to share information about writing and
journaling strategies they used in their courses and to pose questions and discuss
problems.” His Internet experience consisted of “periodically searching the Internet for
resources for teaching and for information on grants and possible research support. We
[in Department E] have a new Home Page for our department, and admission and
application information is posted there.” He also mentioned that he subscribed to several
listservs at the target university that had enabled him to keep connected with both
university faculty members and K-12 educators. His most memorable Internet experience was discovering his departmental Home Page on the Web. Lee stated his Sonnet connection meant that “I can access the Internet without charge ... by the hour and without having to wait my turn. I can connect to the Internet any time I want to from my office computer.” He agreed to participate in this project to “learn a bit more about other faculty’s use of e-mail and the Internet and perhaps learn and think a bit more about how I use it.”

Monique was a tenured full professor who had been a professor for many years; the past several years were at the target university in “Department A.” Monique started using the Internet about eight years prior to this study. However, her Internet experience had been restricted to the use of listservs and e-mail. Her most memorable Internet experience was setting up a pre-session conference using e-mail for a national association for which she was a member. “E-mail was absolutely indispensable for communicating with participants.” Concerning Sonnet, Monique stated, “Sonnet is wonderful and very reliable. I log on to e-mail first thing in the morning, and I am on all day.” She agreed to participate because “I thought I would get some help in surfing the Internet.”

Moses, a tenured Associate Professor in the “Department D,” had taught courses for quite some time. He had used the Internet for two years to communicate via e-mail with colleagues and students around the world. He recalled collaborating with a colleague from Korea on a paper that was being submitted to a referred journal as his
most memorable Internet experience. Moses stated, "Sonnet has become a way of life for me. I check messages every day, and I use the Internet (mostly e-mail) to help support my courses. The Internet makes it easy for my students to keep in touch with me." His main reason for participating was to "point out to the College the need to conduct faculty workshops and to facilitate faculty use of the Internet by providing nonthreatening support. Often times good workshops call for fees, for which departments will cover the cost for secretaries but not for faculty. Somehow our perspectives or visions have gotten stilted." Moses stated, "I am excited about this study, and I wish I had more time to devote to it. However, this is my off quarter." Moses was a member of the secondary group.

Alexis was a tenured associate professor in "Department C." All of her university teaching years had been at the target university. Besides using e-mail and listservs on the university's network (Sonnet), Alexis' use of the Internet has been limited due to her lack of time. Alexis said, "Perhaps my most memorable Internet experience is just seeing what is out there, what is possible, and beginning to understand that the sky is the limit." Her initial reaction to having a Sonnet connection was that "it has not meant anything at this point due to my failure to really use the Internet extensively." Alexis agreed to be a respondent because "I am interested in technology, the Internet and because I know how difficult it is to get subjects." Alexis was a member of the secondary group.
Andy was also a tenured Associate Professor in “Department C.” He had been at the target university for several years. His Internet experience consisted of using Elm mail (e-mail) on Magnus and Eudora on Sonnet. He had connected to the Internet via Sonntag and Sonnet. Andy stated that his most memorable Internet experience was “accessing the Internet from my office computer during regular working hours. Before the College installed Sonnet, it was very difficult to access the Internet.” Andy wanted to participate in this study because he wanted to “learn how to use the Internet effectively.” Andy was originally a member of the secondary group; however, when Chuck dropped out of the study to go on sabbatical, Andy took his place in the primary group.

Mac was an untenured associate professor in “Department E” who had taught for several years at the university, the past two years as a regular faculty member. Mac worked at the target university as an adjunct professor and senior administrator during the seven years immediately preceding his appointment as a regular faculty member. Mac started using the Internet during “the fall of 1987 ... I’ve used the following Internet-related applications: Eudora, Fetch, OASIS, and Turbo Gopher.” He stated that his most memorable Internet experience transpired the summer prior to the study when he instructed his students to access the Internet and the World Wide Web to answer some assigned homework questions. Mac and his students discovered that everything on the Internet is not 100% accurate:

That experience showed them and me how careful one has to be about the information received on the Net. Some information is great, useful
and exciting; however, some is frightfully misleading and even wrong!

Mac offered these comments when asked to discuss his Sonnet connection:

My Sonnet connection is far better than Sonngate. The direct link is faster and nearly always available. This linkage is crucial for the Grant Proposal Seminar that I teach and for the summer workshop. The students and I use the NET extensively to locate possible sources of funds and other resources useful to grant seekers. Some of the teachers who were taught to use the Internet during the summer cannot use it effectively because their classrooms are not directly linked via a T1 line. The telephone hookups are slow and often tied up. [Mac]

Mac agreed to be a respondent because, “I wanted to increase my knowledge of and skills in using the Net. I was especially seeking to learn additional ways of using the Net in my classes, and to see if I could find any time saving techniques.” Because of his time constraints, Mac was a member of the secondary group.

**Analysis of Data**

This section comprises the data analysis of the interviews and is organized in the following manner. First a statement of each research question is presented. Following each question is a taxonomic analysis of the cover and included terms that emerged from the data. Cover terms and included terms were used as a means of categorizing common occurrences of concepts that were identified from the data. A discussion of these terms, combined with quotes from the respondents to help substantiate subsequent conjectures, is then provided. Finally, a summary of what was discovered is given. The summary includes corresponding conjectures which represent the culmination of the inductive data analysis. Conjectures are to be considered working hypotheses or questions that can be
followed up (Lincoln & Guba, 1985). A full analysis of the secondary data sources (e.g., grounded survey, e-mail messages, and respondents' personal reflections) is presented in the next section.

**Research Question #1**

What barriers did these faculty members encounter when accessing the Internet?

My taxonomic analysis of the domain, Barriers, revealed four cover terms and four included terms. The structure of cover terms and included terms that emerged from the taxonomic analysis is displayed in Figure 4.1 below.

![Figure 4.1: Taxonomic analysis of kinds of Internet barriers to Internet use.](image)

**Lack of Comprehension.**

Two issues related to lack of comprehension emerged from this study. During our first formal interviews, several respondents mentioned that, due to their inability to comprehend the Internet, they had been prevented from exploring many of the Internet
applications that were installed on their computers. Cal had this to say when asked about barriers he has encountered while accessing the Internet:

One of the things I think is a barrier for me is lacking a basic comprehension of the Internet in regards to all of the Internet-related applications. I am very proficient in the kinds of things I do on a regular basis such as, electronic mail. However, I do not use FTP, nor do I use any of the Web browsers to search the Web. I do not think I am taking full advantage of the Internet, and that I see as a limit within myself. [Cal]

Ruby's lack of comprehension also limited her to experimenting with only a few applications:

One of the things that sort of represents my ignorance is that I think of the Internet as just being sort of Eudora and e-mail and things like that. That's partly because that's where I spend the majority of my time, and I just do not understand how to use the other applications. I know there is a lot more stuff out there, and I guess I am wondering for myself at what point am I going to begin to explore more of that stuff. I would like to learn how to attach and send files and even poke around the web. [Ruby]

During Monique's second formal interview, she seemed convinced that, if she tried experimenting with Internet applications other than Eudora, she was destined for failure:

A lot of times I sit at my home computer to try out new applications or to just surf the net. I try very hard to use several Internet applications that I have not used before. However, I just cannot get them to work. Now I'm semi-convinced that if I try these new applications I will not be able to get them to work. I wish I understood them better or if someone in the College would offer to train faculty to use them. [Monique]

During a tutorial session with Chuck and Rena, I noted they did not understand how to open an attachment in Eudora. I pointed out they needed to double click on the attachment icon at the bottom of the message, and Eudora would automatically open up
the attachment. Lee and Rena expressed their inability to understand how to use Netscape Navigator to do a productive search on the Web using Web Crawler.

You know, how do you do an effective search on the Web. I'm trying to figure out how to do a search that won't come back with 4,890 responses. [Lee]

I suggested they experiment with a couple of the newer Web search engines (e.g., Web Crawler or Info Seek) to make their inquiries more productive. Lee eagerly mentioned in a subsequent conversation that his searches on the Web had become more productive.

Problems and questions related to this included term diminished after three months and, by the end of the study, were no longer an issue. This was probably due to the support the respondents received from me, in addition to their own personal growth in using the Internet.

Internet Jargon.

Internet jargon was the second included term that emerged from the participants' lack of comprehension. I expected this issue to emerge as a problem because, in order for “users” to interact effectively with the Internet, they must understand the terminology. I vividly recall Chuck asking me to “explain the instructions on how to decode a document because I do not understand that UUDECODE stuff.” Ruby stated that one of her biggest frustrations is with the language. “You ask us to do something, and I have a hard time doing it because I don’t understand what you are saying. It
would be a good idea if you could go over the terminology with us. I would suggest e-mailing us a list of the terms we need to know or don’t understand.” Shortly after Lee and Rena began experimenting with Web Crawler, they reported difficulty with the terminology of the search engine. “I spend a lot of my time getting a bunch of useless searches because I don’t know which words to use in my search. I will probably get better as I become more familiar with the terminology and key words” [Rena].

Although the Internet jargon posed a small barrier for the respondents initially, this was no longer an issue mid-way through the study. It is presumed this resulted from their personal experience using the Internet combined with the researcher’s frequent contact with them. However, the importance of understanding the terminology of the Internet should not be understated.

**Time.**

The respondents’ lack of comprehension was exacerbated by their time constraints. Although these university faculty members have more flexibility in their schedules than their K-12 counterparts to experiment with and learn more about the Internet, they do have to balance their time on the Internet with their traditional roles of teaching, learning, research, and service. When asked how time impacted their use of the Internet, the respondents replied:

Time is very valuable to me; I am one who is very busy. So I am not looking for ways to kind of pass time playing around on the Internet. Also, I don’t have that natural curiosity that some of my colleagues, for example, at Wisconsin, who were kind of real technologically-oriented and who just couldn’t wait to fool around with the Internet. They were
often, pardon the stereotype, young men. I just did not have the time to do any of that. [Rena]

Time is very critical to me in terms of how I spend it. I am involved in a big research project with a colleague at the University of Wisconsin and that takes a lot of my time. I think that I alluded to earlier that e-mail sort of facilitates a lot of communications back and forth where you don't have to play phone tag with people or hope to run into them at a meeting or a conference, and I think that is a wonderful thing about the Internet and e-mail. However, recently, a couple of my advisees have been e-mailing me long series of questions about their programs. I have discovered that I do not have enough time to answer questions of that nature. [Cal]

I am actively involved in the American Education Research Association (AERA). I chair one of the Special Interest Groups (SIG), and I am also a journal editor in my area. It is tough finding time to surf the net or finding time to learn how to construct a Web page. I thought I would have time to learn some of this stuff over spring vacation. Learning to construct a Web page was on my list of things to do over spring vacation; however, I did not get around to it. [Monique]

Time becomes a problem when the mail volume increases, and you have to sit around for the system to process your mail. You know its really a damn problem when you have a lot of other stuff going on and you run out of time. [Chuck]

Time is very crucial for me because I have small kids at home, and I am up for tenure. So, I don't have a lot of time to learn about the Internet. The best time for me to really learn this stuff is during the summer when I have the quarter off. In fact, I plan on purchasing a new computer, and I told one of my graduate students that he is going to be responsible for teaching me how to use it. [Ruby]

I am very careful about how I spend my time. I also have small kids at home, and I do not want to take time away from them, nor do I want to take work home. For instance, my wife and I considered logging on to the Internet last night to e-mail her brother because we have not heard from him in several months. However, we decided not to log on to the Internet because we had been gone from the kids all day. [Lee]
The barrier of time was clearly a dominant cover term throughout the course of this study; however, time was less of an issue for respondents who had home access. This notion supports the findings of Honey and Henriquez (1993) who discovered that participants in their study conducted much of their telecommunications-related activities from their homes and on their own time. Access was the next cover term to emerge from my study.

**Access to Information and Connectivity.**

Although each respondent had direct and unrestricted access to the Internet from their offices, several respondents did not have access to the network from home. Therefore, they had to travel from home to their offices to access the Internet or respond to their e-mail. Ruby stated, "It is a big inconvenience having to pack up the kids and bring them into the office just to answer my e-mail." Chuck noted that, "since someone broke into my office and stole my laptop, I cannot access the Internet from home. It has become too inconvenient for me to drive to campus just to use the Internet." Rena noted that her home computer was not equipped to run the HomeNet software to connect to Sonngate. "You know my Laser 286 doesn't have Windows nor the HomeNet software, and therefore I cannot connect to the Internet from home."

Another problem with home access to the Internet was establishing a connection. Respondents noted during high usage periods that it would take long periods of time for the mail server to process e-mail. Also, the server was prone to "lock-up" due to heavy
usage. Rena often remarked, “The technology infrastructure has not kept pace with the growing traffic and demand.” Chuck mentioned, “I had to wait over an hour just to receive an attachment someone had sent me.” The few examples here seem to indicate that faculty members preferred a direct connection to the Internet and access was becoming a problem as the demands for Internet services increased.

Finally, when I asked the respondents if they would be in favor of paying a fee to access to the Internet that is being proposed by the University Technology Service, several respondents had this to say:

Requiring me to pay a fee is like forcing me out of a job. Free access to the Internet is so vital to academic work. The very nature of the university is suppose to be the free exchange of ideas that are not restricted by who can or can not pay. [Lee]

I think a fee would be disastrous. Access to the Internet ought to be built into the price of doing business. Using the Internet is a faculty member’s way of fulfilling his or her responsibilities to the university. [Rena]

It would be like asking me to type up a 10-page paper, and I’ve got to buy the stapler to staple the pages. It doesn’t make sense to me. [Chuck]

**Administrative Support.**

The last cover term that emerged under the domain of barriers, as articulated by the participants, was a lack of administrative support. This barrier manifested itself in two main areas. First, respondents thought adequate training was not being provided by the College to help keep them abreast of the developments of the Internet and the voluminous data stores. Lee shared the following comment concerning faculty training:

The only thing I’ve been offered here [in the College of Education], as far as the Internet, is a series of workshops that I have not found to be of
much use. They are very basic workshops, and I've had things to do that were much more important. [Lee]

Cal revealed why he does not participate in Internet training sessions offered by the College of Education or University Technology Services (UTS):

There have been a number of times when I've looked at courses and seminars that were offered by UTS or the College, and thought I should really take one of those courses. I did take one when I first came here, but it turned out to be very basic stuff about how to log onto Magnus and use e-mail. Well, I had been using Eudora, and was a few steps ahead. [Cal]

Monique mentioned her lack of training has prevented her fully utilizing the Internet:

There are faculty members here in the College who have not received adequate training in using the Internet. Furthermore, there needs to be more follow-up training once a session is conducted. We really need some assistance. I know that there is an enormously rich resource out there that I'm not yet connected with in any systematic way. [Monique]

Ruby stated that there was a need for faculty to learn about the Internet and to learn how to utilize it more effectively.

I believe faculty could do a lot more things with the Internet and e-mail if adequate training was provided. There is a big push by the Dean to get everyone on e-mail because almost all of her correspondence to faculty will be in the form of e-mail. However, not every faculty member uses e-mail or is on the faculty listserv. Therefore, the College should conduct a couple of training sessions on the Internet and especially e-mail to help everyone on board. [Ruby]

Chuck's comment echoed Ruby's in stating that the College administrators needed to take steps to make training more accessible to faculty.

I believe the leadership or the administrators of the College ought to push harder to make training more accessible to faculty. Maybe faculty
training would not be such a problem for so many of us. However, I do question how many faculty would attend. [Chuck]

The respondents’ lack of training dissipated over the course of this study. I also observed marked improvements in terms of the number and quality of the Internet training sessions that were offered to faculty. Mid-way through this study, a session was offered to faculty on Web Page construction. I did observe 4 of the 10 respondents in attendance. In addition, my intentions were to provide faculty participants with the necessary skills to maneuver the Internet by offering ongoing individualized support and a 1-day training session to assist in their personal development.

The second administrative support issue involved what respondents perceived as a lack of network support. Several respondents outright questioned the administration’s willingness to commit resources in terms of hiring competent network support personnel. When this investigation began, there were no designated technical support people for the College of Education. However, there was support personnel (i.e., graduate students with little or no network experience) who worked for University Technology Services or were employed by the College of Education as graduate administrative associates to assist faculty with their technical-related issues. Rena described the college’s support personnel as “hackers”:

I might be reading the support personnel entirely wrong, and I don’t know how extensive their competency really is. I think they are kind of like hackers who really do not have any formal network training. [Rena]

Monique believed that the administration should hire someone who knew both Macintosh and PC platforms:
I remember last quarter I happened to mention to Ned, one of the technical support people, that we should hire someone who knew Macintosh computers. This was a new thought to him. It had never occurred to him that there were faculty and staff in the College who used Macs. So, I mean that’s pretty sad, but it has been a continuing frustration for us. When Terry was here, all he knew was IBM. [Monique]

Ruby believed that the network support was inadequate, and she often received conflicting advice in terms of resolving technical issues:

Whenever I had a problem with the network I would go to John (one of the tech people). Later, if I could not resolve the problem, I would talk with the other tech person, Mike, and he would tell me something totally different from what John told me. This was frustrating because I did not know who was correct. [Ruby]

Finally, Cal and Chuck suggested that the administration allocate more resources in terms of establishing a totally networked environment:

I think the administration should allocate funds to help faculty buy new equipment, programs, and software. We are one of only a few Colleges that does not have a Local Area Network. We could share resources like printers, software, and peripherals and could even have a local e-mail system. [Cal]

It is important that the administration build and support a full network lab for the College of Education. It does not look good for a College of Education like ours not to be on the cutting-edge of technology. [Chuck].

**Summary and Conjectures.**

Under the domain of barriers, four cover terms and four included terms emerged from this study. First, participants experienced problems of comprehension with various Internet-related applications, and they had trouble with the Internet lingo or jargon.
Second, the participants identified time as the biggest hindrance to using the Internet. It was difficult for the participants to find sufficient time to use the Internet while fulfilling the traditional roles of academe, i.e., teaching, learning, research, and service. Third, access became a dominant cover term especially for those participants who did not have home access. Respondents noted that, during high usage periods, it was often difficult to establish a connection. Finally, the respondents noted two areas in which administrative support for the Internet could be improved (e.g., training and improved network personnel). The data suggested that the participants' lack of comprehension and their high levels of frustration were attributed to their lack of training and the level of support from the College of Education’s network support personnel. Several participants noted that very few Internet training sessions were offered by the College of Education or the UTS, and the administration needed to get faculty motivated to attend the training sessions. Participants questioned the competence of the network personnel and referred to them as “hackers who were just tinkering around.” Participants stated the administration should hire a full-time support person or Graduate Teaching Associate with extensive network experience to train them and help resolve their network problems.

As a result of this investigation, the following conjectures are offered for the domain Barriers:

- Internet use by the faculty is impacted if faculty members do not have an understanding of how to use the Internet applications.

- Internet use by the faculty is impacted if faculty members do not have a basic understanding of the Internet lingo or jargon.
• Internet use by the faculty is impacted if there is not adequate administrative support to support hardware and software upgrades.

• Internet use by the faculty is impacted if adequate and timely computer and network support is not available.

• Internet use by the faculty is impacted if faculty members are not given adequate training on using the Internet.

• Faculty members who have Internet access from work want similar access from home.

• Faculty members who spend time using the Internet for teaching believe that their colleagues may not appreciate or understand the new forms of teaching encouraged by the use of the Internet. As a result, they may find that they are not evaluated properly on this criteria for promotion and tenure.

**Research Question #2**

What are faculty members' attitudes toward the Internet? The taxonomic analysis of the domain, Attitudes, revealed two cover terms with four included terms. The structure of cover terms and included terms which emerged from the taxonomic analysis is displayed in Figure 4.2 below.

---

**ATTITUDES**

- Optimism
  - Powerful
  - Exciting
- Pessimism
  - Lack of Concern
  - Two-edge Sword

**Figure 4.2:** Taxonomic analysis of types of attitudes related to gaining access to the Internet.
Throughout the course of this study, conversations with the respondents ascertained their feelings regarding gaining access to the Internet. The goal was to identify those respondents who had negative feelings toward the Internet in order to help them feel more self-efficacious about using the Internet and other technologies. To this end, individualized instruction was given to all participants, and a full day training session was open to all respondents.

**Optimism.**

Two included terms (phrases) emerged under the domain of Attitudes that were optimistic in nature. These terms represented an array of positive words and phrases which several respondents used to describe how they felt about the Internet (e.g., great, enhances learning, tip of the iceberg, etc.).

The Internet is a powerful tool, and it has peaked my interest in reading about technology. For instance, I am inclined to read things about the Internet in the newspapers. You know that, if there is an article in the New York Times about, let’s say something Microsoft is doing, I will read it. So, I think I am kind of in touch with what is happening with the latest technology. And I think, we have only seen the “tip of the iceberg” in terms of what potentially is coming down the pike. You know, I think we have seen things happen so fast in technology expansion, there’s no reason to think it’s going to stop. [Rena]

Lee expressed the excitement he felt about cruising the Internet:

Using the Internet has been great. It makes me sort of grin, you know. I like it; it is really neat. I mean sometimes I just want to “cruise around” and see what these different sites and places have on the Web. There is
something about going places you have never been. It's almost like traveling in your chair. You know I use to teach at a high school in California. So, I wanted to see if they were on-line, and I found their home page. However, it was still under construction. I was able to find a list of some of my former colleagues and their e-mail addresses. I was able to find out about some of the grants and projects they had going. So that was just a big lift for me. The Internet has just changed my attitude toward computer technology. It really has; it's almost an energizer. [Lee]

Cal used terms like "powerful" and "incredibly" to describe how he the Internet has enhanced learning:

I think the Internet has been incredibly important, especially as a tool to enhance learning in the classroom. I have a research project that's ongoing with an elementary school teacher in Madison, Wisconsin, who has his students writing their own journals about their science and math cultural experiences. In other words, what their culture was like from their points of view while they were growing up. The teacher helps the students post their journals onto the Web, and people from around the world respond to their postings. So, I think in this instance, the Internet has been a powerful tool in which students can study not just their own cultural experiences but those of others as well. [Cal]

Pessimism.

In addition to optimistic attitudes, several respondents expressed negative feelings toward the Internet. When examining the barrier domain, it is likely their pessimistic attitudes were strongly influenced by their prior training or lack thereof. During our first formal interview, Ruby expressed a lack or interest or concern in fully accessing the Internet:

I think initially I could not see the benefits of e-mail or the Internet. It took me nearly a year to get on it. I never went to the workshops; I never had time. After a colleague gave me a few pointers and persuaded me to get on the Net, I was able to receive messages but it took me three months before I sent a message. I had to seek out the assistance of
another colleague to assist me in composing and sending messages. [Ruby]

Although Monique used the Internet extensively to access e-mail and to set up listservs, she still expressed a great deal of frustration and negativity toward the Internet:

Well, I have a lot of respect and interest in the Internet and computer technologies in general. However, there is the frustration factor combined with time constraints that prevent me from finding a lot of "riches" that are out there. I just do not know how to find them. This has prevented me from attending some of the training sessions offered by UTS. Why should I attend a session on making a Home Page when I do not know how to use the World Wide Web? So at the same time, I'm impressed with the Internet and all it promises; however, I'm also frustrated because I can't fully access the Internet. [Monique]

Chuck and Cal experienced two sides to the use of the Internet. Chuck stated the following on his preliminary questionnaire and made reference to the statement during both formal interviews:

The Internet is like a two-edged sword. On the one hand, you can have a one-on-one relationship with somebody who is off on the other side of the world. I think this ability to communicate with anyone regardless of geography is immensely valuable. However, on the other hand, it can de-personalize the whole communication process. The contact is disembodied some way. You are talking to someone out there, but you never see their face. [Chuck]

Cal echoed similar sentiments:

The Internet is a great tool for enhancing learning and pedagogy. However, I have noticed in several schools that I have observed, students are playing a lot of games on the Internet. That bothers me because I do not want this fabulous tool to become just another toy.
Summary and Conjectures.

Throughout the study, participants were asked to articulate their attitudes about being connected to the Internet. Under the domain of Attitudes, two cover terms and four included terms emerged. Three participants expressed a great deal of optimism toward the Internet and used phrases such as “powerful” and “exciting” to describe the Internet. Rena reported that the Internet was a powerful tool and had positively impacted her attitude toward technology. Lee stated that his connection to the Internet has improved his attitude toward teacher education and had “opened up a new world for me.” In a very compassionate manner, Cal stated that the Internet was a fabulous tool to enhance learning and broaden the way faculty members taught. Cal was most impressed by the Internet’s global scope.

Although faculty members perceived being connected to the Internet as a positive experience, two participants expressed negative feelings. Ruby, for example, showed a lack of concern toward the Internet at the beginning of the study. She stated that early she did not see the benefits of e-mail or the Internet. However, she noticed that through her continued use of the Internet and attending the training session, she became more proficient at using Internet-related applications and developed a less pessimistic attitude toward the Internet. Both Chuck and Cal cautioned faculty not to be totally sold on the Internet. “The Internet is like a two-edged sword. It can put you in touch with a lot of people instantly, but you lose that personal contact that is so important in teaching” [Chuck]. “The Internet is a great tool; however, I worry as educators that we do not let
it become too much like a game. Having enough terminals to go around is one problem. But another important question is what the equipment is used for. I read somewhere that most 4th-grade math students were using computers to play games, like Donkey Kong. By the 8th-grade, most math students were not using them at all” [Cal]. Finally, Rena expressed concern about the “haves” and the “have-nots.” “I am concerned about those kids who do not have access to a computer or the Internet. Are we going to expect the same level of work from them? Our teachers will be going into many poor inner-city school systems that have not made getting on the Information Highway a top priority.”

As a result of this investigation, the following conjectures are offered for the domain of Attitudes:

• Faculty members who use the Internet develop more positive attitudes toward technology and are more likely to integrate the use of the Internet into their classrooms.

• Faculty members who use the Internet may develop an understanding of the positives and negatives of being connected to the Internet.

• The faculty’s prior Internet training or lack thereof may impact its attitude toward the Internet.

• Faculty members who use the Internet believe the Internet can enhance learning.

• Faculty members who use the Internet believe that access to the Internet or lack thereof can create a system of “haves” and “have-nots.”

• Faculty members who use the Internet believe the Internet can broaden the ability to communicate.
- Faculty members who use the Internet believe the Internet can depersonalize communication

**Research Question #3**

What type of Internet connection did these faculty members prefer (e.g., Sonnet or Sonngate)? A taxonomic analysis of the domain, Preferences, revealed two cover terms and four included terms, as displayed in Figure 4.3 below.

Figure 4.3: Taxonomic analysis of Internet connection preferences.

**Sonngate.**

Terms including "unfriendly" and "frustrating" were only two of many negative terms and phrases that respondents used to describe Sonngate. Both Lee and Cal mentioned that Sonngate provided inadequate, unfriendly access to the Internet. "Sonngate, was simply unfriendly" [Lee]. "You could not understand the instructions. Faculty members could not use their phones while logged onto the Internet; it was an either/or situation. Your e-mail messages were often bounced so you could not be
certain that your messages were sent” [Cal]. Rena and Chuck used words like “awkward” and “time consuming” to describe the unfriendly interface of Sonngate. “You know Sonngate was such a primitive, time consuming route just to access the Internet. You often got hung up and you had to re-boot your machine” [Rena]. Ruby believed the unfriendliness of Sonngate and her lack of technical knowledge prevented her from exploring the Internet more extensively. “I have not used the Internet that much because Sonngate was so difficult to use and my office computer was not that great. However, I have gotten my computer upgraded, and I have found Sonnet to be more user friendly.”

Monique expressed the frustration she felt when using Sonngate:

You know, Sonngate is so frustrating. You had to go through so many steps. I mean there was a whole procedure, and I can remember taking a sheet of notebook paper and writing out every single step. You know at this point you hit return, and at this point you do this. It’s very frustrating. And every so often they would change the procedure, and I would have just mastered one algorithm and they would change it. I remember that and that was when I first came to the university. It’s easy as can be now. [Monique]

Ruby and Chuck both stated that the most frustrating thing about Sonngate was having to utilize the telephone line. “You know I’d get e-mail, and I’d forget the phone line was in use and try to make a few phone calls. Then I’d remember that I could not get on the phone. It was just nerve-racking” [Ruby].

Lee mentioned that the most frustrating thing about Sonngate was trying to establish a connection to the university’s mail server.

It was very frustrating to wait from ten minutes to a half an hour just to send a message. Sometimes it was quicker just to make a phone call. I
discovered during high usage periods from noon until 5:00 p.m. The mail server would become overloaded and processed e-mail at much slower speeds, or it would sometimes bounce your mail. [Lee]

**Sonnet.**

The last cover term that emerged under the domain of preferences was Sonnet. Every respondent commented on the user-friendliness of Sonnet. "Sonnet has enabled me much easier access to the world of the Internet than Sonngate" [Monique]. "My Sonnet connection is much easier and friendlier to use. There was a complicated log-in procedure with Sonngate. Sonnet provides easier access to the Internet than Sonngate" [Cal]. "My colleagues kept saying I needed to get a Sonnet connection because it is faster and more user-friendly than Sonngate. They were right" [Ruby]. "You can use the phone and computer simultaneously" [Chuck]. "Without a doubt, Sonnet is very user-friendly, and it eliminates the glitches of Sonngate" [Rena]. "At home we make a choice to either make phone calls or to be logged onto the Internet; like I used to do here in the office. Now, when I come into the office, I can log onto my computer, access my mail, and answer the phone whenever it rings without causing gibberish on my screen. That is nice" [Lee].

Cal had this to say about the perceived convenience of Sonnet:

Sonnet is convenient and has allowed me so much freedom to communicate with the people I want to and to have access to people at any time, day or night. I’m not talking about speaking to them personally, but being able to send and receive a message and so on. I mean, this type of access to the Internet is something I would consider to be a great benefit of being on faculty here. And I would hate to see that it comes to a point where faculty are charged to access the Internet. [Cal]
Monique echoed similar sentiments:

I do not think I can overstate how convenient it has been to have a direct connection to the Internet. I was privileged to get a Sonnet connection before a lot of my colleagues here in the College of Education. I got my Sonnet connection when I was elected co-chair of a Special Interest Group with the American Educational Research Association (AERA). I went to my Department Chair and said, I got to have a Sonnet connection because a dial-up connection just will not do it any more. Although it took several weeks, I have been pleased with it ever since.

Rena, Ruby, and Chuck noted the most convenient aspect of Sonnet was its superior interface that allowed users to work within a Windows or point-and-click environment. “This environment is so convenient because I do not have to memorize a lot of commands. All I have to do is just point and click” [Rena]. “Using Eudora is so simple. You see exactly what you are doing right on the screen. It took me a long time to figure out how to use the e-mail on Magnus” [Ruby]. “I really like this Windows environment. You can see everything that is on the screen, and you have a couple things going at once” [Chuck].

Finally, Lee stated that the most convenient aspect of a Sonnet or direct connection was the “ability to access and share information on the World Wide Web. Sonngate did not permit you to do that because you could access the Web. You had to use I think Gophers, and everything wasn’t presented the way it is presented on the Web” [Lee].
Summary and Conjectures.

Prior to this investigation, the participants had used a dial-up or terminal-host connection to the Internet involving a computer and modem (i.e., Sonngate). During formal interviews, site visits, and training sessions, the participants often compared their previous connections to the Internet to their current direct connection to the Internet (i.e., Sonnet). Consequently, discussed what it was like to transition from an indirect connection to the Internet to a direct connection that put the world at their fingertips in a matter of seconds. Participants were then asked to state which type of connection they preferred. Repeatedly, every participant preferred the current direct connection to the Internet over the terminal-host connection. Words and phrases, such as “user friendly,” “convenient,” and “easy to use,” were constantly used by participants to describe their opinions toward Sonnet. When asked to offer their thoughts on Sonngate, participants were less than complimentary. Lee stated that Sonngate provided inadequate access to the Internet; Cal claimed that Sonngate was unreliable (“Your messages were often bounced”); Rena emphasized the poor quality of Sonngate’s user interface; Ruby said Sonngate was more difficult to use than Sonnet; and Monique believed much of the participants’ frustration and lack of motivation involving the Internet could be attributed to their previous experiences with Sonngate. As a result of this investigation, the following conjectures are offered for the domain of Preferences:

• Faculty members preferred direct access to the Internet over a terminal-host connection.
• The faculty’s level of frustration when accessing the Internet decreased when they transitioned from an indirect connection to the Internet to a direct connection.

• Faculty members need time, training, and administrative support when transitioning from an indirect connection to the Internet to a direct connection.

• Faculty members must have direct and unrestricted access to the Internet to access any publicly-available Internet resource.

Research Question #4

What Internet-related applications did faculty members find most useful? The taxonomic analysis of the domain, Applications, revealed three cover terms with three included terms, as displayed in Figure 4.4.

![Figure 4.4: Taxonomic analysis of Internet-related applications.](image)

Respondents were asked to identify the Internet-related applications which they found to be most useful, the most frustrating, and the easiest to use. This data could be used two-fold: (1) to prepare subsequent training sessions for faculty or administrators
who were new to the Internet, and (2) to support or refute the emerging literature on the use of electronic mail in universities and colleges (Green, 1996; Honey & Henriquez, 1993). The faculty respondents utilized the following Macintosh and PC-based programs (Table 4.2):

<table>
<thead>
<tr>
<th>Software</th>
<th>Description</th>
<th>Macintosh</th>
<th>PC-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eudora</td>
<td>POP mail client program for e-mail</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Netscape Navigator</td>
<td>Menu-driven Web navigational tool</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Turbo Gopher</td>
<td>Distributed Internet resource/information delivery system</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>H Gopher</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>NewsWatcher</td>
<td>Network news reader programs</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Trumpet</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Fetch</td>
<td>Allows file transfers</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>WSTP</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>NCSA Telnet</td>
<td>Provides remote connections or virtual</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>WINQVT</td>
<td>terminal connections</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Finger*</td>
<td>Displays specific information about a user of a particular computer system</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Whois*</td>
<td>Extracts specific information about a local person</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Can be accessed through Gopher, MAGNUS, or Eudora on the respondent's desktop computer.

Table 4.2: Software programs utilized by the respondents.

Respondents noted various levels of familiarity with the applications. Also, training for the programs was provided by a 1-day training session and individually during site visits by the researcher.
Most Useful.

Eudora was cited as the most useful and frequently used application in this study. As was mentioned earlier, the findings have possibly spilled over into the classroom. At the target university, Eudora was also the application in highest use in campus computing labs; approximately 90,000 uses were reported from lab sites during Winter Quarter of 1996 (Chism, 1996).

Lee stated, “I use Eudora because so much of my communication with colleagues here and elsewhere and even a fair amount of my teaching-related communications are over e-mail. Also, Eudora is quite user-friendly, which is why I probably get trapped into using it all day long.” Rena echoed similar comments, “I use Eudora every day to keep in contact with my colleagues and friends all over. I have it set to get a message every minute.” “Eudora sort of hooks me into the World Wide Networks of Networks to communicate with Colleagues and former students” [Chuck]. “I use Eudora to communicate with lots of folks both on campus and around the country at all times. I am the coordinator of my program area and chair a major committee here, and I review for several journals in my field” [Monique]. Ruby and Cal’s comments were similar to the other respondents. Ruby had this to say as well, “Eudora not only allows you to communicate with friends or colleagues, it helps eliminates the telephone tag syndrome.”
Most Frustrating.

There was no clear consensus among the respondents over which of the remaining applications they found to be the most frustrating. However, this lack of consensus was probably attributable to their lack of adeptness or experience with the remaining applications. For instance, Lee's comments supported this claim:

"Well, my first response is I don't have any frustrations. Some of these I don't know how to use, or I haven't used. You know, I haven't used Newswatcher, and I haven't had very much success with Whois. And I don't know whether that's because I don't know how or there is something wrong with the function." Ruby exclaimed, "I guess I haven't had any frustration with any of these applications because the ones that I'm familiar with, I can do to a certain extent. So, I haven't really been frustrated, yet." Cal stated, "Well, I don't use everything that's on this list, but I would say the Finger application. I very seldom get that to operate correctly." When asked during the group interview, Monique recalled Turbo Gopher as her most frustrating application. "My most recent frustration came with trying to use Turbo Gopher. It is frustrating basically because I do not know enough about it. I got into it, but then I just didn't know how to move around it."

Rena and Chuck identified Netscape Navigator as the application that was most frustrating to them. "Using Netscape to get onto the World Wide Web sometimes can be frustrating because I'll get in the middle of something and it says you've committed a fatal error or something like that and the program has to get shut down. You know this
will happen, and it will happen fairly often. A message will come up and tell you 'if the problem persists see your vendor,' that kind of thing. So, I have not pursued doing that, mainly because I will just run it again and I usually can get it, and it will work successfully. So that's frustrating when that happens. [Rena]. "Over time I try to get on the Web with Netscape. I become stuck, and I have to reboot the machine. After a while, that gets very frustrating" [Chuck].

**Easiest to Use.**

Respondents repeatedly mentioned Eudora as the easiest application to use. "I have used at least two, possibly three other e-mail programs before I got Eudora, and Eudora has been great. I mean it was just so natural and so easy. Of course, I went into it with the experience of having worked with those other systems, so I was not so much of a novice. It was just very easy to use" [Monique].

"I've been successful at Eudora, Netscape, Turbo Gopher, and Fetch; I mean quite a number of these, including Telnet. I guess Eudora again is probably the one where I am most successful. It is rare that I have any hang-ups with [it]. You know I send documents probably every day as attachments and stuff. It's just a lot easier to get stuff out that way. Also, my students e-mail me their assignments, and I just open them up and away we go. So I am real pleased with [Eudora]. I think it's a life saver" [Lee].

"I am successful at using Eudora because of its ease of communication any time any day" [Ruby]. "Eudora has made it so easy for me now to plan or register for
conferences or contact journal editors or subscribers" [Chuck]. "Eudora has given me
the least amount of frustration. It is great for sending or receiving attachments. I mean,
it's really nice when a colleague in, say Wisconsin, can send you a paper and you can just
print it out" [Rena]. "Eudora is pretty user-friendly. But again, I am pretty familiar with
it at this point in time. But when I first started using it, I also found that it was a pretty
friendly sort of thing to use. And a number of colleagues and friends have talked to me
about getting access to the Internet, and many of them are sort of afraid of accessing the
Internet. I have tried to communicate to them that using the Internet and especially
Eudora for e-mail is very simple" [Cal].

As the study progressed and participants became more experienced and confident
using the Internet, they began to explore a variety of Internet applications other than
Eudora. For instance, Ruby mentioned she had recently tried Netscape, Turbo Gopher,
and Newswatcher and was pleased with her experiences. Mac, an experienced Internet
user from the secondary group, stated, "I have used many of the applications before;
however, I have become more proficient at what I do, and I am eager to try downloading
files and video clips from the World Wide Web."

**Summary and Conjectures.**

From the taxonomic analysis of the domain, Application, three cover terms and
three included terms emerged. An applications profile was then developed to identify the
Internet-related applications which participants found most useful, most frustrating, and
easiest to use over the course of the study. The most preferred Internet applications participants used was Eudora. There was no clear consensus as to which application was most frustrating. Ruby's comment was typical, “I do not have any frustrations because I only use Eudora, and I understand it” [Ruby]. Netscape Navigator, Turbo Gopher or H Gopher, Fetch or WSTP, Finger, Telnet, Whois, or Newswatcher or Trumpet also received negative comments.

As a result of this investigation, the following conjectures are offered for the domain of Applications.

- Among the above applications, college faculty members use Eudora more frequently than the other applications.

- Among the above applications, college faculty members found Eudora easier to use.

- Among the above applications, college faculty members needed time and training to help alleviate the frustration they experienced when using Internet applications.

- College faculty members experience fewer frustrations as they became more familiar with and utilized Internet application more often.

**Grounded Survey**

The grounded survey is developed from the data the researcher has collected, such as interviews, observations, interviews, etc. As the researcher reviews the collected data and begins to observe emerging themes that appear throughout the data, a survey can be created as a means of checking and perhaps confirming the researcher's original theories.
Fieldwork data collection methods for the present study yielded rich slices of reality. The transcriptions, data reduction, and analyses were very labor intensive, but the results were well worth the effort. After having codified units and categories based in part on Spradley's (1979) taxonomic analysis, the task was to develop a series of statements or questions that reflected the major themes that emerged from the interviews and that supported the information this researcher had already received through the interviews. Therefore, a goal was to frame the statements from direct quotes brought out in the interviews and from the researcher's original theories. Bogdan and Biklen (1992a) suggested that direct quotations should be used intact whenever possible. Statements were reduced to a manageable size (20) for distribution to the entire sample who then ranked responses using a 5-point Likert Scale with response choices ranging from strongly agree to strongly disagree. Additionally, each questionnaire item was part of a pair with positively and negatively phrased statements. It was important for the respondents not to get into what W.E. Loadman (personal communication, April 7, 1995) termed a "response set." Respondents often have a tendency to answer yes or no to a series of questions without thinking over their responses.

At the end of the survey, subjects responded to the following unstructured open-ended question, "I believe ... about the Internet." This design feature (e.g., the balance between positively- and negatively-phrased statements and the open-ended question) allowed the data pool to increase with responses from the instrument, rather than just using it to rank and distinguish the central themes from the more idiosyncratic ones. The
survey was e-mailed to each member of the primary group. Five of the six primary group members e-mailed their responses back to me as requested. Cal, who was consulting at an Indonesian secondary school system, faxed his responses. These respondents had each been interviewed three times and had the same instructions. It was thought the responses to the survey would shed further light on the comments from the interviews. Responses to the Grounded Survey are displayed in Table 4.3 (Please note that a few respondents elected not to respond to certain items on the grounded survey [e.g., Questions #6, #7, #10, and #19]).
Using the Internet has allowed me to make more efficient use of my time.

Using the Internet in my job will only mean more work for me.

I feel at ease using the Internet.

I feel that using the Internet is confusing.

I can use the Internet to access many types of Internet-related resources.

Anything that the Internet is used for I can do just as well some other way.

Communications over the Internet can help me to be a more effective faculty member.

I do not think the Internet can be useful to me as a faculty member.

There is adequate funding to support the Internet.

I am in favor of a small tuition increase or a deduction in my salary to expand the College's Internet access.

If I use the Internet-related applications, I will be a more productive scholar.

Knowing how to use these applications will not be helpful in my professorial duties.

I feel threatened by the impact of the Internet.

I feel comfortable using the Internet.

I have received adequate training on how to use the Internet.

The administration's level of support for the Internet should be improved.

My use of the Internet has positively impacted my attitude toward computer technologies.

My use of the Internet has negatively impacted my attitude toward computer technologies.

My use of the Internet will have a positive impact on the preservice teachers or graduate students who I instruct.

My use of the Internet will probably not have a positive impact on the preservice teachers or graduate students who I instruct.

<table>
<thead>
<tr>
<th>1.</th>
<th>Using the Internet has allowed me to make more efficient use of my time.</th>
<th>SA</th>
<th>A</th>
<th>U/S</th>
<th>D</th>
<th>SD</th>
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<tr>
<td>2.</td>
<td>Using the Internet in my job will only mean more work for me.</td>
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<td>3.</td>
<td>I feel at ease using the Internet.</td>
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<td>4.</td>
<td>I feel that using the Internet is confusing.</td>
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<td>5.</td>
<td>I can use the Internet to access many types of Internet-related resources</td>
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<td>6.</td>
<td>Anything that the Internet is used for I can do just as well some other way</td>
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<td>7.</td>
<td>Communications over the Internet can help me to be a more effective faculty member.</td>
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<td>8.</td>
<td>I do not think the Internet can be useful to me as a faculty member.</td>
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<td>9.</td>
<td>There is adequate funding to support the Internet.</td>
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<td>10.</td>
<td>I am in favor of a small tuition increase or a deduction in my salary to expand the College's Internet access.</td>
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<tr>
<td>11.</td>
<td>If I use the Internet-related applications, I will be a more productive scholar.</td>
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<tr>
<td>12.</td>
<td>Knowing how to use these applications will not be helpful in my professorial duties.</td>
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<td>13.</td>
<td>I feel threatened by the impact of the Internet.</td>
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<td>15.</td>
<td>I have received adequate training on how to use the Internet.</td>
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<td>16.</td>
<td>The administration's level of support for the Internet should be improved.</td>
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<td>17.</td>
<td>My use of the Internet has positively impacted my attitude toward computer technologies.</td>
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<td>18.</td>
<td>My use of the Internet has negatively impacted my attitude toward computer technologies.</td>
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<td>19.</td>
<td>My use of the Internet will have a positive impact on the preservice teachers or graduate students who I instruct.</td>
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<td>20.</td>
<td>My use of the Internet will probably not have a positive impact on the preservice teachers or graduate students who I instruct.</td>
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Key:  SA = Strongly Agree, A = Agree, U/S = Uncertain/Sometimes, D = Disagree, SD = Strongly Disagree

Table 4.3: Responses to grounded survey.
The disparity in responses throughout the survey suggested that some faculty respondents were not comfortable using the Internet and did not perceive its utility. For example, in Question #3 ("I feel at ease using the Internet."), only 2 respondents noted they were at ease using the Internet. It is likely that faculty attitudes and perceived efficacy were influenced by prior training or lack thereof. Monique commented over the perceived lack of training faculty received using their Internet connection:

We really need some good training around here. There are a lot of faculty members in this College who are so behind. A few faculty members are not on the faculty listserv, and if you ask them to e-mail you, they will tell you that their computer is broken. Also, we need competent people who can train us. We cannot rely on the support staff here because they only now how to operate IBM computers. There are folks like me who use the Macintosh.

Not surprisingly, only one respondent (Question "15, "I have received adequate training on how to use the Internet.") agreed he had received adequate training on how to use the Internet. That lone respondent was Lee, a self-described, "high Internet user," who had received Internet training while in graduate school.

In addition, there were several disparate responses to Question #9 which asked respondents whether or not there was adequate funding to support the Internet connection (i.e., Sonnet). The 3 faculty members who agreed that there was adequate funding to support the Internet connection were untenured assistant professors who had received new computers from a start-up fund that had been established by the Associate Dean to provide for the needs of newly-hired professors in the College. The one respondent who strongly disagreed that there was adequate funding to support the
College's Internet connection was a tenured full professor who had to purchase his own computer.

To determine the importance and value of the Internet to their personal and professorial duties, faculty members responded to the following unstructured open-ended question at the end of the survey form, "I believe ... about the College of Education's Internet connection." Rena stated, "I believe the College, as well as, the University, should support Internet access just as they have supported libraries, laboratories, and phone systems. Intellectual life and resources for research flourish on the Internet." Chuck expressed how he believed the Internet would impact teaching and learning, "Computer technology and skill using [the Internet] will change dramatically the conceptions about teaching and learning. I'm not sure whether this will be a positive change or negative change. I suppose the test is in how we use it." Monique, not unlike two of her colleagues in the primary group (Lee and Cal), believed the College of Education was behind many local schools in access to technology. "We have to fix this and quickly!" Interestingly, Ruby and Rena, who described themselves as "low" Internet users in the second formal interview, believed they would support a computing fee for faculty and students to expand their Internet capabilities. However, Lee and Cal, who described themselves as "experienced" Internet users in the second formal interview, believed a tuition hike or a computing fee would be detrimental to the College of Education.
E-mail Messages

E-mail messages sent to the researcher were collected and analyzed during the first six weeks of the study. This 6-week collection and analysis period was selected because subjects would have most of their difficulties during this period. An analysis of all messages collected over the entire course of this study (9 months) would have been extended over too long a period and would have had a diminishing return of information. Messages and replies were read and reread until primary foci emerged (Patton, 1990; Strauss & Corbin, 1990). Focus categories were inductively arrived at and included (a) lack of technical knowledge among faculty and support staff within the college, (b) lack of formal Internet training, and (c) lack of administrative support or resources.

Types of messages sent and replies were predominately technical in nature for both groups. The primary group sent a total of 112 messages which were categorized as lack of technical knowledge (60.7%), inadequate resources (11.9%), and training (27.3%). The secondary group sent a total of 57 messages which were categorized as lack of training (25.9%), lack of technical knowledge (55.5%), and inadequate resources (18.5%) (Table 4.4).

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Participants</th>
<th>Types of Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Training</td>
</tr>
<tr>
<td>Primary</td>
<td>6</td>
<td>30.5%</td>
</tr>
<tr>
<td>Secondary</td>
<td>4</td>
<td>14.8</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>45.3%</td>
</tr>
</tbody>
</table>

Table 4.4: Group message percentages.
Personal Reflections Related to the Training Session

After the third month of the study (July), this researcher offered a training session open to all respondents to strengthen overall rapport and to resolve some of the technical problems they were experiencing. A training session offered during the study, rather than at the beginning of the study, would garner a more accurate account of the respondents' familiarity with the various Internet-related applications and resources that were being utilized independent of this study. Also, respondents were asked to document their personal reflections related to the training session and send them via e-mail. Because these entries were electronic in nature, it was not necessary to transcribe them.

Five of the nine respondents (Chuck went on sabbatical) took part in the training session; however, two respondents did not stay for the entirety of the session, which was 6 hours in duration. The training session took place at a fully networked public computing site (lab) that was funded and operated by University Technology Services. This computer site was chosen because of several factors: (a) The College of Education did not operate an Internet-capable lab, (b) its proximity to the College of Education, and (c) the Macintosh platform was preferred by everyone attending the training session. The site was equipped with 25 Macintosh Quadra 660 AV (i.e., full audio and only video-in capabilities) computer terminals networked with both laser and dot matrix printers. The computers were directly connected to the Internet via Sonnet, and each had a 68040 processor running at 3300 megahertz, 16 megabytes of RAM, and 230
megabyte hard drive. The following Internet-related software was located in the Communications folder: Eudora, Turbo Gopher, Finger, Whois, Fetch, Newswatcher, and NCSA Telnet, and Netscape. Sonnet provided direct Internet connectivity, and the applications provided the necessary tools to access Internet resources. Also, an Internet training specialist and a Ph.D. candidate in the Department of Communication at the target university assisted me with the session.

All five of the respondents (three from the primary group and two from the secondary group) who were in attendance, expressed positive reactions concerning the training session. For example, Ruby stated:

As you well know by now, I maintain a crazy schedule. However, the time for me yesterday was very well spent. I learned several new things that will help me on e-mail. I am sorry I was not able to stay for the Netscape training. The session like yesterday for me is the best way I learn, with hands-on experience. Thank-you for providing it. [Ruby]

Cal (primary group) echoed the following sentiments toward the training session:

I knew most of what was presented that day although I did learn a few new tricks and shortcuts using Eudora. Prior to the workshop, I was hoping that we would receive training on the use of Netscape and helpful suggestions for locating and downloading lots of different types of information (e.g., video, sounds, images, etc.). I left early, so perhaps you did cover this in a later session. You and your colleague provided valuable information to me on a specific question I had about moving text from one platform to the next. [Cal]

Andy, the newest member of the primary group, enjoyed the session but had trouble authenticating his log-in:

I generally enjoyed the session yesterday. Unfortunately, I didn’t expect (and neither did you) the trouble with my authentication. The part of the session that dealt with the history of the Internet and the World Wide Web were most helpful. [Andy]
Mac (secondary group) shared the following perception of the training session:

Many thanks for the very helpful workshop which you ably conducted yesterday. I learned some really useful steps and features of Eudora. While I have been using e-mail for over 9 years, there were some nice features that I did not know how to use. As I have found with many new technological items, a great deal of time with very knowledgeable leaders is always best for folks to get the most out of their time. But for faculty and most teachers, the time to concentrate on the new items with excellent help is hard to get. [Mac]

After reflecting upon the training session, Moses (secondary group) spoke passionately about what he perceived as inadequate faculty training:

It is the superhighway that we must learn to mediate effectively in our teaching and professional growth. The Internet is a wilderness right now and faculty members need help to not only learn to use it, but to use it effectively in their teaching. It is ironic that our city, which serves as the focal point of the information explosion of the world, does not do enough to help its faculty assume its rightful leadership role on this highway. Best of luck in your efforts.
CHAPTER 5

IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

I for one believe that, if you give people a thorough understanding of what confronts them and the basic causes that produce it, they'll create their own program, and when the people create a program, you get action. (Malcolm X, cited in Robinson, 1990, p. 56)

Introduction

The purpose of this study was to delineate and examine the personal and educational interactions of a group of university faculty members as they experienced direct and unrestricted access to the Internet from their desktop computers. Data from the following sources provided support for the findings presented in this chapter: respondents' information forms and preliminary questionnaire; responses to questions asked during informal conversations, group meetings, and formal interviews; responses to a grounded survey; and information culled from respondents' journals and e-mail messages exchanged between the respondents and this researcher.
Summary of Findings

Problems of comprehension, time constraints, access, and inadequate administrative support emerged from this study as barriers to faculty members' use of the Internet. Where present, respondents' lack of comprehension of Internet procedures manifested itself in two ways. First, respondents were not conversant in the language of the Internet, or what is often referred to as Internet-lingo. It was anticipated this would be a problem because several of the respondents had very little Internet experience ... and, as the culture of the Internet changes, so does the language (Laquey & Ryer, 1993; “Life on the Internet,” 1994). Second, respondents had difficulty comprehending several of the applications that were installed on their personal computers. This was not expected to be a significant problem because the respondents reported they had been using most of the Internet-related applications prior to the study. Some participants transmitted e-mail messages, stating that they were experiencing difficulty utilizing Netscape and Turbo Gopher or H Gopher. In one message, Monique wrote, “I would like to access the Web, but I don’t know how to navigate it.” Cal wrote, “I would like to use Turbo Gopher to surf the Net; however, I can’t find the folder.” The issues related to comprehension diminished considerably over the course of the study as respondents became more skilled in accessing the Internet and grew more knowledgeable and comfortable with the language of the Internet.

The pressure of time was the most pervasive barrier to Internet use by faculty members. Those respondents who did not have access to the Internet from home expressed a strong desire for home access. Respondents' reports of insufficient time
were consistent with the current literature on educational technology (Janowiak, 1990; Honey & Henriquez, 1993), academic computer conferencing (Berge & Collins, 1993; Holden & Mitchell, 1993), and studies involving the use of telecommunications among preservice teachers during early field experiences (Bull et al., 1989; Casey & Vogt, 1994). Unlike high school faculties, many university faculties do not have an extended break during the summer to experiment with or implement new technologies into their curricula. Thus, this problem was expected to emerge as a strong barrier. It was not anticipated that so many faculty members would be willing to invest so much of their personal income and time to gain better Internet access. For example, Ruby spent over $2,500 on a Pentium computer and high-speed modem to access the Internet and World Wide Web from home. This desire for home access was consistent with the findings of Harris and Anderson (1991), Hasselbring (1991), Holden and Mitchell (1993), and Weir (1992), who reported that convenient, easy, and 24-hour access to the network is critical in the adoption and use of computer networks. Honey and Henriquez (1993) also discovered that respondents conducted much of their telecommunications-related activities from their homes and on their own time.

An additional problem experienced by respondents was gaining access into the system (i.e., Sonnet) during high usage periods, whether the respondents were at home or in their offices. This was due to the high number of users that accessed the university network. There were certain times when accessing Sonnet was more difficult than at other times, and respondents tended not to try to access the network during high usage
periods. Typically, respondents who had Internet access from home were more positive about using the Internet and focused less on finding time to use the Internet. This was understandable, considering they did not have to leave their homes and could access the network whenever they wanted. This was consistent with Tannehill, Berkowitz, and LaMaster (1995), who explored teacher networking through electronic communication.

Two major problems associated with a lack of adequate administrative support surfaced in this investigation. First, the respondents' lack of Internet experience was attributed by them to the level of training provided by the college administration or University Technology Service Office. Several respondents mentioned that the level of Internet-related training was inadequate, or that they could not fit the training sessions into their schedules. Harris and Anderson (1991), Honey and Henriquez (1993), and Gallo and Horton (1994) reported that the vital role of training in the success or failure of telecommunications-based projects should never be overlooked. Thus, if faculty members are not adequately trained to use the university network, they could become tied to the mechanics of learning the system rather than using it. Alternatively, they may not learn to use the Internet efficiently, and their inefficiency could, in turn, contribute to the time barrier. Based on the findings of this study, suggested competencies included knowing how to set up and use a personal computer and modem, understanding the technical connections involved, being fluent in the use of communications software, mainframe interface, and conferencing skills.
Additionally, respondents stated their unhappiness with the technical support they received from the College and from University Technology Services. The problems of comprehension, time, and access, coupled with inadequate administrative support, were considered to be strong barriers to faculty members' use of the Internet. They claimed the college's designated network support personnel were "incompetent, untrained hackers who had no network experience." The current literature supported a need for technical support of telecommunications-based projects (Honey & Henriquez, 1993; Weir, 1992). Therefore, college administrators should provide faculties with adequate technical support when considering wiring their buildings to the Internet. A trained network support person, whose job is dedicated to administering the network and providing support to its users, is essential to faculty who have Internet connections (Gallo, 1993). This is essential if the College is to be connected to the campus network and, through it, to the Internet at large.

The university faculty members involved in this study displayed mixed emotions about being connected to the Internet, ranging from optimism to pessimism. Reflecting upon both the problems and triumphs that emerged from this investigation, it is important to note the following:

1. Only one out of the 10 respondents dropped out of the study, and his departure was due to a prior research commitment.

2. By the end of the study, respondents were more focused, both on utilizing the Internet better and on its impact on them as faculty members, rather than on finding
time to use it. Faculty respondents in this study expanded their use of the Internet since completing this study [this researcher subsequently became a technology consultant for the College of Education, a position from which to make such observations].

3. In general, all participants, including a key informant (the Senior Associate Dean for Faculty), have demonstrated a heightened awareness of the Internet and other high-speed networks.

Words such as "powerful" and "exciting" were often used to describe the optimism respondents had toward the Internet. Respondents found the Internet to be very exciting. They saw a source of power in the Internet, in that the Internet put an array of valuable resources at their fingertips. Honey and Henriquez (1993) addressed the concept of "information overload." The vast amount of information on the Internet is very daunting, and "information overload" has become a buzzword of the 1990s. The study terminated before information overload emerged as an issue. Thus, the data do not speak to this issue. As more of the faculty members connected to the Internet, comprehending the Internet would be very difficult if they did not have the luxury of knowledgeable colleagues or network support personnel to turn to for technical assistance.

Two respondents initially expressed a great deal of pessimism toward the Internet. After several initial contacts with these two respondents, this researcher determined they had a lack of urgency regarding full-access to the Internet. These respondents did not have home access, were not subscribers to the College of Education
Faculty Listserve, and their Internet experience had been limited to e-mail. Nevertheless, the pessimistic (often resistant) attitude of faculty members to using the Internet and various forms of CMC was an obstacle that would need to be overcome if the Internet were to transform college campuses and the way students learn. This prediction was substantiated in the literature by (Bull et al., 1989; Holden & Mitchell, 1993; Maddux, 1991; Willis, 1991). Based on the findings in this study, this researcher concluded that barriers such as time constraints involved in learning new technologies, the “savage user interface” of the previous campus network (i.e., Sonngate), and a perceived lack of administrative support contributed to their lack of enthusiasm.

In addition, three respondents were very concerned regarding the Internet’s lack of nonverbal cues, including gestures, facial expressions, and tone of voice. This was understandable because when someone tries to express humor, surprise, anger, sarcasm, etc., the text-based nature of Internet messages makes it difficult because the nonverbal components of human communication are missing (Ellsworth, 1995). So, how would someone make up for this loss of nonverbal expressions, communications, or symbols, ":-)") (representing a “smiley face”)) not withstanding? These concerns were addressed in the literature (Edigo, 1990; Hiltz, 1986; Kehoe, 1992; Robertson, 1991; Townsend, 1984; Waggoner, 1992), which emphasized that recipients of e-mail communication often had difficulty discerning the tone of a message. Contrary to the literature and the findings of this study, Holden and Mitchell (1993) stated that the lack of interpersonal face-to-face communication, which characterized CMC, was unlikely to be an obstacle to
Internet or CMC use. While a couple of respondents were eager to identify the drawbacks of accessing the Internet, these same faculty respondents were equally eager to experiment with and learn how to utilize the Internet better.

Many colleges and universities are not yet connected to the Internet, and on many connected campuses, the university community can gain only limited connections, usually through terminal-host connections involving a computer and modem, rather than via direct access. The faculty respondents at the target university were unique in that they had “transitioned” from indirect access to the Internet (via Sonngate) to direct access to the Internet (via Sonnet). During the course of this investigation, respondents often compared the two types of connections to the Internet. Respondents used terms like “unfriendly” and “frustrating” to describe Sonngate, their previous access to the world of the Internet. Conversely, they used terms such as “user-friendly” and “convenient” to describe Sonnet. Sonnet has provided them with a “friendly, convenient” entrance onto the Internet.

It was discovered in this investigation that a terminal-host Internet connection, although relatively easy to obtain and less expensive than a high-speed connection (e.g., Sonnet), may not be an appropriate method of connection if it were to be used as an access system. Terminal-host networks and many “traditional computer labs” were predominately used as delivery systems for managing instruction, scheduling, and distributing software, and very little network use for accessing information from outside the university (Newman, 1993). However, when colleges and universities became totally
wired to the Internet, faculty members and students had the ability to access and gather information from distributed resources and communities of peers, thus fostering the concepts of students as collaborative learners and faculty members as facilitators or resource allocators (Gallo, 1993).

The application-usage profile that emerged from the study appeared to be consistent with the findings of Chism (1996), who reported that Eudora was the application in highest use at the target university. This huge demand for electronic mail has been noted by the target university which had placed a high priority on increasing support facilities. Respondents also identified Eudora as the application easiest to use and Netscape as the most frustrating. It is suggested that the popularity of Eudora, as the "application of choice," was greatly influenced by the respondents' familiarity and previous success with the program and because University Technology Services promoted the use of Eudora. Data collected during March 1997 from the original respondents and from faculty members who did not participate in the study strongly suggested that this profile was not being maintained, in part due to the growing popularity of the World Wide Web and faculties becoming more knowledgeable and comfortable with accessing the Internet. The World Wide Web is the fastest growing segment of the Internet (Comer, 1995; Marriott & Underwood, 1995; St. Lifer, 1995).

Furthermore, the purpose for which faculty members used the applications was consistent with the current literature. Honey and Henriquez (1993), Kent (1994), Ladner and Tillman (1992), and Laquey and Ryer (1993) reported that sending e-mail
was the most common use of the Internet, followed by accessing news and bulletin boards and accessing remote computers. Honey and Henriquez (1993) also reported that “sending e-mail to colleagues, exchanging information on forums and bulletin boards, and accessing databases containing resources relevant to students are the most widely and effective professional development activities” (p. 16).

**Implications for Educators**

The results of this study can be utilized by education faculties and educational reformers alike who are involved in transforming telecommunications networks in American higher education, from systems of delivery to systems of access. One way in which this can be accomplished is for universities to be totally wired to the Internet. Newman (1993) reported that, when computer networks were used as systems of access, students assumed greater responsibility for their projects. For example, writing students at Stanford University used CMC to exchange essay drafts over the Internet. The electronic discussions that emerged encouraged more widespread participation and gave students a more visceral sense of audience, i.e., a community of readers who took their ideas and their writing seriously (Hafner & Tanaka, 1995). Furthermore, the results suggested that faculty members’ experience with the Internet through training sessions or frequent use was vital if faculty members were to embrace new technologies. This was of critical importance because some of the faculty respondents in this study taught in the teacher education program at the target university. These teacher educators were likely to be important models for future teachers who in turn are likely to be important models
for their students, helping to produce positive student attitudes toward computer
technologies. Recently, the United States Secretary of Education emphasized, in an
address to the nation’s top educators, that many preservice teachers were emerging from
colleges of education with an aversion to technology (Riley, 1997).

The conclusions that follow are presented as recommendations for college
administrators who have established or who are considering establishing Internet
connections at their institutions. These recommendations address network access,
faculty assistance, adoption of CMC, and connectivity.

The data acquired from the respondents embraced several issues at the same
time. First, faculty members are demanding more computing services, and the general
expectation is that central funds would be allocated to cover the cost of these services.
However, central funds are becoming unavailable, and administrators are struggling with
which services to continue and which services to postpone. Thus, mandatory computer
fees might be on the horizon. Second, faculty members in this study clearly expected the
college or university administration to arrange for and provide faculty development
opportunities for them. In reality, faculty members were independent, autonomous
decision-makers who were capable of prioritizing their time for faculty development
opportunities to learn about the Internet. Nevertheless, because faculty members had
busy schedules, the major barriers to optimizing use of the Internet were time and
keeping abreast of new developments. This further led to their “techno-stress,”
especially in light of little technical support.

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**Recommendations**

1. Colleges should provide faculty members with direct and unrestricted network access from their offices, and college administrators are encouraged to utilize network support personnel who are capable of providing adequate technical support.

2. Colleges and universities should support home use of the network by faculty members by (a) providing faculties with the communication software necessary to connect to the Internet from their homes (i.e., HomeNet), and (b) utilizing the purchasing power of the university to procure equipment at reduced prices.

3. College administrators and faculty members should work cooperatively to develop training sessions to assist them in comprehending the Internet.

4. College administrators and promotion and tenure committees should reexamine the traditional criteria of promotion and tenure of faculty members (research/scholarship, and service) if the Internet is to be integrated into the work of faculties.

5. College administrators should consider working toward complete university-wide networking. The results of this study were consistent in emphasizing the benefits of a high-speed, hard-wired connection to the Internet (i.e., Sonnet) over a dial-up terminal host connection (i.e., Sonngate).
Suggestions for Further Research

The study is an in-depth study of the educational and personal Internet experiences of a select group of education faculty members. Because of the small number of participants, these findings cannot be generalized to other education faculties at similar institutions. However, the thick, rich description necessary for the reader to judge the transferability to a given situation was provided in this report. The heterogeneity of the sample assured that the results were not attributed to a small faction of College of Education faculty. The research is intended to present a qualitative study of a small number of participants who have had a “lived experience” in transitioning to the Internet.

While this researcher did observe the respondents after formal data collection, theories of diffusion of innovation and change (Rogers, 1995; Rogers & Kincaid, 1981) were not formally investigated. Rogers (1995) stated that CMC adoption programs for non-CMC-using faculty members should address user perceptions of several CMC attributes: relative advantage, compatibility, complexity, trialability, and observability. However, findings of the present study suggested that most faculty members were aware of the many advantages of e-mail and other forms of CMC, such as speed, cost effectiveness, flexibility, and convenience. In addition, as faculty members became more comfortable with Eudora and some of the other Internet-related applications, the perceived complexity of the Internet diminished. Further research is needed to identify the extent to which these cases are typical of Internet use by faculties at similar institutions and to address questions which may have implications for adoption, use, and
modeling of technologies in colleges of education. For example, what effect does prior training have on faculty members' attitudes toward the Internet? The findings from this study seemed to suggest to some extent that faculty members' attitudes toward computer technologies such as the Internet may be influenced by their prior experiences.

Other questions which were generated as a result of this study include: What impact does the Internet have on pedagogy? What effect does access to the Internet have on the self-image of university faculty members? How does the preparation of an Internet course compare to preparation for a more traditional course? Where does advising by e-mail fit, vis-à-vis office hours? Does the use of the Internet improve faculty members' efficiency or production? How can participation in faculty development activities using the Internet be increased? How can administrators provide access to computing resources during periods of fiscal retrenchment? What impact do mandatory computing fees have on access? What type of faculty development is most useful in helping faculty members learn about the Internet? What alternative reward structures can college administrators use to evaluate faculty members who incorporate the Internet into teaching, research, and service? How does publication in an electronic journal compare to a paper-based journal? What does it mean to be an editor and referee for an electronic journal? How will network security issues be addressed as more students and others gain access to the Internet? How will universities strike a balance between freedom of speech and censorship?
The findings from this study indicate there is much more to be learned concerning the impact of the Internet on faculties. The future of the Internet and higher education is promising. However, the challenges are numerous. New and easy-to-use interfaces will be developed to make access to the world of the Internet user-friendly to all. Activities such as using e-mail and the World Wide Web for teacher-student correspondence and dissemination of class materials will become more commonplace as faculties continue to adopt CMC. Collaborative research projects on the Internet similarly to the Human Genome Project will become more common. Multimedia projects in college classrooms (like those at Trinity University in San Antonio, Texas) will become prevalent in college classrooms in the near future. The campus library will face some of the most difficult adjustments to the ubiquitous Internet, ranging from copyright issues to learning about and installing Internet tools and resources, working with the World Wide Web, developing new relationships with the computer center, and most importantly redefining its role in higher education (Ellsworth, 1995). As a case in point, California State University at Monterey Bay recently opened without a library. The Chancellor of the 22-campus system and the Board of Regents believed that it was not necessary to build a traditional library when money could be better spent on technology for getting information via computer.

Further research about these and other important questions and issues can make significant contributions to the field.
Appendix A

Call for Participation
Call for Participation

Posted to: coealclist@lists.acs.ohio-state.edu
Supported by: Senior Associate Dean Daryl Siedentop

Education faculty members who use the Internet are wanted to participate in a research project; the project aims to investigate and describe the personal and educational interactions of a group of education faculty members who have direct and unrestricted access to the Internet (i.e., Sonnet) from their office computers. The project will also inform education faculty members about electronic networks such as the Internet and pending National Information Infrastructure (NII) so they can use these systems to communicate with colleagues and students.

Education faculty members cannot ignore this revolutionary development in communications and information flow for three reasons. First, the use of e-mail and on-line discussion groups for informal scholarly communication is expanding with breathtaking rapidity. Second, informal scholarly networking is moving from physical locations in conferences and research centers into “cyberspace,” the virtual space created by electronic networks. And arguably, the professional and/or image of education faculty will be affected by participation or nonparticipation in this global networking. Research is being conducted by Thomas S. Tucker, doctoral candidate in the College of Education, as part of his dissertation project. Professors Suzanne Damarin (Advisor, College of Education), Stephen Acker (Department of Communication), and Daryl Siedentop (Associate Dean, College of Education) comprise the dissertation committee.

Any faculty members interested in taking part in the study should contact Thomas S. Tucker via e-mail ...

... or phone at 614.292.8823.
Appendix B

Letter of Introduction
Letter of Introduction

Dear Prospective Participant,

Thank you for expressing an interest to participate in my Ph.D. research project. As was posted on the College of Education Faculty Listserv, the project aims to investigate and describe the personal and educational interactions of a group of education faculty members who have direct and unrestricted access to the Internet (i.e., Sonnet) from their office computers. Prior to beginning the project, I will need to gather some information from you. Within the next day or two, you will be e-mailed a participant information form, a research project release form, a preliminary questionnaire, and an interview preference scheduling form. Please complete these forms and e-mail them back to me by 18 April 1996.

If you have any questions about the material you may e-mail me at:
tucker.8@osu.edu
... or call 614.292.8823.

Next, I will briefly discuss the kind of commitment I am asking you to make. The methodology I plan to use is based on a 3-part process. The first phase will consist of two in-depth interviews and one group interview. Each of the interviews will last approximately 1 hour in length. The second part of the methodology requires that you fill out a grounded survey to assure that any material I use from your interviews faithfully reflects what you meant. This should take approximately 15-20 minutes. Finally, you will be asked to read over the typed transcripts and react to my analysis. If this last stage is not possible for you, please inform me.

In order to strike a balance between my dissertation requirements and the practical constraints on time and resources, two groups of faculty members will be used. The first group will consist of six faculty members and the second group will consist of all the remaining faculty members who expressed an interest in participating in the study. Both groups will be involved with exactly the same project activities except the interviews and grounded survey. Only the six faculty members of the primary group will be interviewed formally. The second group of faculty members, however, may serve as alternates for any in the primary group who elect to withdraw from the study prior to its completion. The primary group participants will be selected based on their applications, schedules, and recommendations made from the Associate Dean. You will be notified which group you are in no later than Friday, April 19, 1996. Activities presently planned include the formal interviews on April 25 and May 20.

As you can see, I am asking for a significant time commitment on your part. While I know that you are a very busy person and you must make careful decisions about how you spend your time, I believe that you will find the interview process personally rewarding and enriching because it can offer you the opportunity for personal reflection and consolidation of your experiences. I also believe that your participation will provide an important account of the impact a direct and unrestricted Internet connection has on a group of faculty members.
Please be assured that I will not use your name in formal or informal discussions relating to this study and will take every precaution to protect your identity.

Educationally yours,

Thomas S. Tucker
tucker.8@osu.edu
6669 Morehampton Court
Reynoldsburg, OH 43068
Appendix C

Participant Information Form
# Participant Information Form

**Name**

<table>
<thead>
<tr>
<th>Last</th>
<th>First</th>
<th>M.I.</th>
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**Home Address**

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<th>State</th>
<th>Zip</th>
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**E-mail address**

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<th>Work phone</th>
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**College Degrees & Major Areas**

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<th>Age Range</th>
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<td>Tenured</td>
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<td>□ 30-40 years</td>
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<tr>
<td>□ 4-6</td>
<td>Associate Professor</td>
<td>Untenured</td>
<td>Female</td>
<td>□ 40-50 years</td>
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<tr>
<td>□ 7-12</td>
<td>Assistant Professor</td>
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<td></td>
<td>□ &gt;50 years</td>
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<tr>
<td>□ 13-20</td>
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</table>

**Program Area**

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<tr>
<th>E-mail to:</th>
<th>... or send to:</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:tucker.8@osu.edu">tucker.8@osu.edu</a></td>
<td>Thomas Tucker</td>
</tr>
<tr>
<td></td>
<td>6669 Morehampton Court</td>
</tr>
<tr>
<td></td>
<td>Reynoldsburg, Ohio 43268</td>
</tr>
</tbody>
</table>

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Appendix D

Interview Preferences Scheduling Form
Interview Preferences Scheduling Form

Along with other data collection activities, each respondent will be interviewed at least twice in a structured setting (once in April and once in May). I will conduct the interviews, and they will be approximately one hour in length.

The interview dates for April and May are determined. At this time, the date for the group interviews has not been determined. The first interview is scheduled for Thursday, 25 April 1996, and the second interview is scheduled for Monday, 20 May 1996.

Please indicate below your time preference for these interviews. Using the numbers 1 through 6, where 1 is most preferred and 6 is least preferred, write your preferences in the space provided next to each time slot.

<table>
<thead>
<tr>
<th>Interview 1</th>
<th>Interview 2</th>
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<tbody>
<tr>
<td>25 April 96</td>
<td>20 May 96</td>
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<tr>
<td>8:00 a.m.</td>
<td>8:00 a.m.</td>
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<tr>
<td>9:30 a.m.</td>
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<td>11:30 a.m.</td>
<td>11:30 a.m.</td>
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<tr>
<td>1:30 p.m.</td>
<td>1:30 p.m.</td>
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<tr>
<td>3:30 p.m.</td>
<td>3:30 p.m.</td>
</tr>
<tr>
<td>5:30 p.m.</td>
<td>5:30 p.m.</td>
</tr>
</tbody>
</table>

Please e-mail your responses at your earliest convenience to:
tucker.8@osu.edu

Educationally yours,

Thomas S. Tucker
Graduate Student
Higher Education & Student Affairs/Communication
Appendix E

Preliminary Questionnaire
Preliminary Questionnaire

1. Please describe your computer experiences. (In other words, how experienced are you with computers?)

2. Please describe your computer network experiences.

3. Please describe any experiences you have had with e-mail and/or listservs.

4. Please describe any experience you have had with the Internet. How long have you been using the Internet?

5. Have you ever used a modem? If so, have you used a personal computer and a modem to connect to the Internet?

6. Please describe, based on your experience, the major disadvantage or barrier for education faculty members in using the Internet.

7. Please describe, based on your experience, the major advantage or opportunity for education faculty members in using the Internet.

8. Please describe your most interesting or memorable experience on the Internet.

9. Please describe what it has meant to you by having direct and unrestricted access to the Internet (e.g., Sonnet).

10. Please describe what you expect to acquire from this project. State the main reason you have agreed to participate in this project.

11. Please make any other comments you would like to make about the use of the Internet by education faculty members.

Please e-mail your responses to:
tucker.8@osu.edu

Educationally yours,

Thomas S. Tucker
Graduate Student
Higher Education & Student Affairs/Communication
Appendix F

Letter of Confirmation to Secondary Group Members
Letter of Confirmation to Secondary Group Members

Dear Respondent:

Thank you for taking time out of your busy schedule to peruse and respond to the information I e-mailed you. Based upon that information, you have been selected to be a member of the secondary group. As a secondary group member, you will be asked to:

a. serve as an alternate for anyone in the primary group who elects to withdraw from the study prior to its completion.
b. communicate via e-mail and or meet with me to discuss any project-related activities (e.g., triumphs or difficulties you are experiencing, emerging issues, etc.). A written account of our e-mail or informal discussions will be kept as part of the raw research data.

Your time and effort are greatly appreciated. I truly look forward to working with you in this important endeavor. In addition, I will be returning to you a counter-signed copy of your research project release form in a day or so. If you have any questions or comments concerning the project, please contact me at:
tucker.8@osu.edu
... or at 614.292.8823.

Thomas S. Tucker
Graduate Student
Higher Education and Student Affairs/Communication
Appendix G

Letter of Confirmation to Primary Group Members
Letter of Confirmation to Primary Group Members

Dear Respondent:

Thank you for agreeing to participate in my Internet research project. After carefully studying the information you furnished me, you have been selected to be a member of the primary group. As a primary group member, you are expected to:

a. participate in two 1-hour interview sessions which will be conducted in your office. Each interview will be audio taped and included as part of the raw research data.

b. communicate via e-mail and meet individually with me from time to time to discuss project-related activities (e.g., emerging issues, triumphs, difficulties, etc.). A written account of our e-mail and informal discussions will be kept and included as part of the raw research data as well.

c. complete a grounded survey after the first two rounds of interviews to help assure I am hearing what I think I am hearing.

d. participate in a group interview that will be announced at a later date.

e. read over the typed transcripts and react to my analysis. If this last stage is not possible for you, please inform me. The interview dates and times for April and May have been determined. Please refer to your “Interview Preference Scheduling Form.” Shortly, you will be receiving an e-mail confirming your interview time and a counter-signed copy of your research project release form. If you do not, please e-mail me to confirm the time of your interview and to receive your copy of the release form.

Your time and effort are greatly appreciated. I truly look forward to working with you in this maiden endeavor. If you have any questions or concerns, please contact me at: tucker.8@osu.edu
... or call 614.292.8823.

Thomas S. Tucker
Appendix H

Training Session for Primary and Secondary Group Members
Training Session for Primary and Secondary Group Members

Dear Respondents:

Please accept this invitation to attend a half-day Internet training session for faculty participants on July 15, 1996 from 9:00 a.m. until 1:00 p.m. The purpose of the training session is two-fold:

1. I would like to rectify any problems that you may be experiencing with any of the Internet-related applications or your system hardware.

2. An additional purpose is to assist you in better utilizing the applications that are installed on your office computer.

I have reserved a fully networked site through University technology, and I will be e-mailing you soon with more specifics regarding the location of the training session and hardware/software availability.

Thanks again for your participation!

Thomas S. Tucker
Appendix I

General Interview Guide I
General Interview Guide 1

In all cases, probe for examples.

1. Tell me about your Internet experiences. How do you use the Internet?
   • personal use
   • academic use
   • classroom use

2. Tell me about your dial-up experience using a modem to connect to the Internet.
   • Did you like this type of connection?
   • Was it friendly?

3. Tell me about some of the barriers you have encountered using the Internet.
   • Give specific examples.
   • How did you overcome them?

4. How often do you utilize the Internet?
   • Every hour
   • Every day
   • Every other day

5. Do you encourage your students to use the Internet?
   • How?
   • How often?
   • Do students e-mail you?

6. Please name some Internet applications that are installed on your computer.
   • Did you install them? If not, who did?
   • What are your favorite applications?
   • What are your least favorite applications?

7. Tell me about some resources you have discovered on the Internet.
   • Which have been beneficial to you?
   • Which have not?

8. Has the Internet impacted your communication with other faculty members and students?
   • If so, how?
   • Do you communicate more with faculty members and students since you have been connected to the Internet?
9. Do you think you have had adequate training using the Internet?
   • How do you feel?
   • What kind of assistance do you think will be required to make the Internet and the World
     Wide Web more useful throughout the college/university?
   • Are you going to attend the home page workshop?

10. Tell me what it has meant to you by having a Sonnet connection to the Internet.
    • Direct and unrestricted access to the Internet.
    • Is this connection more efficient than the dial-up connection (i.e., Sonngate)?

11. Would you continue using the Internet if a fee were required?
    • If not, why?
    • What would be a reasonable fee?
    • Should access to the Internet be free for faculty members? What about students and
      staff?
Appendix J

General Interview Guide 2
General Interview Guide 2

In all cases, probe for examples.

1. Given the following Internet applications are installed on your Macintosh or PC:
   - Eudora (Internet mail)
   - Netscape Navigator
   - Turbo Gopher or H Gopher (for browsing and searching documents)
   - Fetch or WSTP (for file transfer)
   - Newswatcher or Trumpet (network news reader programs)
   - NCSA Telnet or WINQVT (for remote connections or virtual terminal connections)
   - Finger (for extracting specific information about a person from a remote site)
   - Whois (for extracting specific information about a person from a local network)

   • Identify the application that is of greatest benefit to you.
   • Why is this application beneficial to you?
   • Identify the application that is the greatest source of frustration.
   • Why is this application so frustrating?
   • Identify the application you use most frequently.
   • Describe how you use this application.
   • Identify the application with which you have had the most success.

2. Describe the administration’s level of support for the Internet.
   • Is it sufficient?
   • Is it lacking?
   • How could it be improved?

3. Discuss the technical support the administration provides to the College.
   • Is it sufficient?
   • Is it lacking?
   • How could it be improved?
   • Is the technical staff well-trained?

4. Tell me about the level or type of Internet training that the administration provides for faculty members.
   • Is it sufficient?
   • Is it lacking?
   • How could it be improved?
   • Tell me about the training staff or support personnel.

5. Do you think the College of Education faculty listserv is a valuable resource to you?
   • If so, why?
   • If not, why?
6. What effect has the Internet had on your view of education?

7. How has your use of the Internet impacted your attitude toward computer technologies?
   • Negative
   • Positive
   • Indifferent

8. What role, if any, do you perceive education faculty members playing in assisting the K-12 community in their quest to get on-line?

9. Do you think you will incorporate the Internet more into your classes next fall?
   • If so, how will you go about doing so?
   • If not, why?
   • How will you provide for the "have-nots"?
   • Will you make Internet use mandatory?

10. Compare and contrast your previous dial-up connection to the Internet (Sonngate) to your current unrestricted and direct connection to the Internet (Sonnet) from your office computer.
    • Which connection do you prefer?
    • Which connection is more efficient in terms of time?
    • Which connection is more user-friendly?
    • Discuss the transition in general.
Appendix K

General Interview Guide 3
General Interview Guide 3

In all cases, probe for examples.

1. What are some of your concerns regarding the Internet and academe?
   • Address issues like promotion and tenure.
   • Access.
   • Censorship.
   • Be specific.

2. Has the Internet impacted the way you teach?
   • If so, how?
   • If not, why?

3. Would you describe the Internet as a 'nightmare' or 'paradise'?
   • Give examples or rationale.

4. Has your participation in this study been worth your time?
Appendix L

Grounded Survey
Grounded Survey

Please take several minutes to answer this mail message. Emerging from interviews were data that need to be verified as central themes or outlying idiosyncratic views from your perspective. I solicit your candid, thoughtful responses to all the following statements.

You do not have to answer any questions you do not wish to answer. Your responses to this survey are confidential; your e-mail address will be stripped from this survey when I receive it. Feel free to withdraw your consent and discontinue participation any time during this activity. Filling out this survey should take about 15 minutes or less. If you have any questions regarding this survey you can send a separate e-mail inquiry to my address tucker.8@osu.edu

Thank you for your time and assistance.

Thomas S. Tucker

Directions: To answer each question on-line, edit this message and type the response that most closely "mirrors" your view in the space below each question. Feel free to add your own response at the end of the document. If you do not have editing capability with your mail system, e-mail your responses in the format of question number and letter answer (for example: 1 [A]).

If you are using Eudora — From the message menu, select reply, send me your message. If you are not using Eudora, use the reply function of your e-mail package and send me your message.

Campus mail—Thomas Tucker, Newton Hall, 1585 Neil Avenue, Room #116

Use the following key:

SA = Strongly Agree
A = Agree
U/S = Uncertain/Sometimes
D = Disagree
SD = Strongly Disagree
| 1. | Using the Internet has allowed me to make more efficient use of my time. |
| 2. | Using the Internet in my job will only mean more work for me. |
| 3. | I feel at ease using the Internet. |
| 4. | I feel that using the Internet is confusing. |
| 5. | I can use the Internet to access many types of Internet-related resources. |
| 6. | Anything that the Internet is used for I can do just as well some other way. |
| 7. | Communications over the Internet can help me to be a more effective faculty member. |
| 8. | I do not think the Internet can be useful to me as a faculty member. |
| 9. | There is adequate funding to support the Internet. |
| 10. | I am in favor of a small tuition increase or a deduction in my salary to expand the College's Internet access. |
| 11. | If I use the Internet-related applications, I will be a more productive scholar. |
| 12. | Knowing how to use these applications will not be helpful in my professorial duties. |
| 13. | I feel threatened by the impact of the Internet. |
| 15. | I have received adequate training on how to use the Internet. |
| 16. | The administration's level of support for the Internet should be improved. |
| 17. | My use of the Internet has positively impacted my attitude toward computer technologies. |
| 18. | My use of the Internet has negatively impacted my attitude toward computer technologies. |
| 19. | My use of the Internet will have a positive impact on the preservice teachers or graduate students who I instruct. |
| 20. | My use of the Internet will probably not have a positive impact on the preservice teachers or graduate students who I instruct. |
| 21. | I believe the following about the Internet ... |
Appendix M

Research Project Release Form
Research Project Release Form

I grant permission for Thomas S. Tucker to use the information provided to him through interviews, questionnaires, and e-mail correspondence for a project being completed for his Ph.D. research project. I reserve the right to discontinue involvement in the project.

I understand the researcher has agreed to ensure the confidentiality and anonymity of me as participant, my data, and my department.

I understand my involvement will cause as little disruption to my faculty responsibilities as possible.

I understand that research reports may include direct quotes from me; in such cases, they will be attributed to a fictitious professor.

I have read the project release form and agree to participate in this study. I also accept the terms related to the study as outlined in this form and in the Introduction Letter. Acceptance is acknowledged by both my and the researcher’s signatures below.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Researcher</th>
</tr>
</thead>
<tbody>
<tr>
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REFERENCES


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