This is to certify that the
dissertation entitled

TECHNOLOGY AND THE LEARNING COLLEGE:
COMMUNITY COLLEGE STUDENT VOICES

presented by

AREND ANDREW VANDER POLS

has been accepted towards fulfillment
of the requirements for the

Ph.D. degree in Higher, Adult, and Lifelong Education

John M. Dirkx
Major Professor's Signature

May 14, 2004
Date

MSU is an Affirmative Action/Equal Opportunity Institution

TECHNOLOGY AND THE LEARNING COLLEGE: COMMUNITY COLLEGE STUDENT VOICES

By

Arend Andrew Vander Pols

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Higher, Adult, and Lifelong Education
Department of Educational Administration

2004

ABSTRACT

TECHNOLOGY AND THE LEARNING COLLEGE:
COMMUNITY COLLEGE STUDENT VOICES

By

Arend Andrew Vander Pols

American community colleges have invested heavily in technology for learning with the hope that such an investment will advance the transformation of the community college into the democratic ideal of "The Learning College", a vision that many community college proponents advocate. The community college as learning college focuses all its processes and energies on the learning of all of its members, both students and staff. Proponents of technology for the learning college assert that technology enhances learning by increasing access, collaboration, equality, and customization for all community college constituents. Others advise caution in the wholesale adoption of the infusion of technology in the educational environment, warning that the introduction of technology can sometimes have unforeseen and unwanted consequences.

This study focused on the perceptions of seven students about their experiences participating in computer-assisted academic literacy classes at a community college located in the metropolitan area of a large city during the Fall of 2002. Student interviews, student background surveys, researcher field notes and class and institutional documents were analyzed for common themes using qualitative methods. The study found that the student perspectives revealed that technology infusion did promote the principles of the learning college and helped to contribute to the creation of a more democratic, learner-centered, collaborative educational environment. Students valued the inclusion of technology into their environment and saw technological literacy as essential

to their academic success and their full participation in American society as a whole. However, while technology was indeed instrumental in the shaping of the learner-centered environment, it was primarily the "high humanity" involvement of the instructor, school staff, and classmates and the ways they used the technology, that guided the formation of a learning-centered environment. The student perspectives also revealed some unwanted and unexpected consequences of technology infusion into their educational environment that worked against the realization of the principles of the learning college and the creation of a learner-centered learning community.

This dissertation is dedicated to

my wife and son

Carole Beth Vander Pols and William Arend Vander Pols

for all your love and patience

—especially patience—

God bless you,

and to community college students, faculty, and staff everywhere

who believe in the promise of democracy's open door.

ACKNOWLEDGEMENTS

The completion of this dissertation comes at the end of a long journey, and I have many people to thank for helping me along the way. My advisor Dr. John M. Dirkx deserves all the credit for the depth of this work, if there is any depth to be found. Thank you for inspiring me to look beyond the surface and peer into the hearts of those who allowed me to share their lives for a few hours.

My committee members and friends Drs. Marilyn Amey, Ann Austin, and Rhonda Egidio have had to wait a long time to see what would become of me and they did not give up hope. Thank you for your interest and attention to my project. Special thanks to Drs. Amey and Austin for the opportunities to work with you over the years in the Department of Educational Administration and the chance to see two truly dedicated professionals at their craft.

Thank you to the College of Education at Michigan State University for their financial support in awarding me a University Graduate Continuing Fellowship Award, and Walter F. and Mary Jane Johnson for funding the Dissertation Research Award. It is not the money but the confidence you showed by investing in my research that means so much to me.

Catherine Therese Flaga, your friendship, encouragement, guidance and role modeling has made all the difference and has helped me through many a crisis. I truly believe that I would not have finished this work had I had not met you, and I thank God for you. Sonia Garcia-Lombardini, thank you too for being a co-commiserator and friend.

To the "Msugrandrapidsdissertators Club" Nancy, Sharon, Falinda, and Deb, thanks for spending your Saturdays getting me through that special dissertating purgatory

that happens after classes are over and you are on your own.

Maxine Craig, I owe you so much and I miss you. Thank you for befriending a Northern boy with your typical East Texas hospitality and for allowing me to baby-sit an Apple II for the summer of 1982. You may have started all this.

Thank you to my former colleagues at Houston Community College, where I first learned to love the ideal, if not always the practice of "being" the community college; especially Dr. William A. Young, Jr., who took a chance on a fourth grade teacher so long ago. Thank you Bill! Your dissertation in a refrigerator story has buoyed me many times in its retelling.

To my parents, Aart and Anna Vander Pols, and my parents by grace, Herman and Helen Scholten, thank you for your encouragement, prayers, and love.

Carole Beth Vander Pols and William Arend Vander Pols, you are my reason for being and my reason for finishing this project. Thank you for supporting me through the long stretches when I wavered from my goal. Your own educational journeys have given me a sense of history, been my inspiration, and are my hope for the future.

And finally, thank you to the community college students, instructors, and administrators who opened up their educational environments for me to share for a few hours. I hope that this research and the telling of your stories will help to further the work of keeping high technology always in service of high humanity.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

PURPOSE OF STUDY AND RESEARCH QUESTIONS

During the past several years community college visionaries, administrators, policy makers, and other leaders have articulated their vision of the ideal community college in a concept called "The Learning College" (League for Innovation in the Community College, 2001; O'Banion, 1997); and they have looked toward "The Promise of Technology"(O'Banion, 1997, p. 63-80) as the way to achieve this ideal. Proponents of this push toward ubiquitous computing in the community college environment see the technologies of computers, software, computer networks, and the Internet, as a major tool to be used in achieving the ideal of the American community college as a learner-centered, learning-centered and democratic institution (Milliron & Miles, 2000; O'Banion, 1997). The *2001 National Community College Snapshot* indicates that 95% of American community colleges are Internet connected (American Association of Community Colleges, 2001b). The 2000 report of the Campus Computing Project reports that the use of email in community college classes rose from 2 to 40 percent in the period from 1994 to 2000, and that over 20 percent of community colleges indicated Web pages were used in instruction during 2000 (Green, 2000). Billions have been spent on building telecommunications infrastructure, updating computer hardware, and purchasing, developing and implementing software, and providing training to administrators, faculty, staff, and students (Olsen, 2001). The true monetary costs of maintaining the technology and keeping it current are difficult to determine, but likely number in the millions per year (Finkelstein, Frances, Jewett, & Scholz, 2000; Jacobs, 1995; Olsen, 2001).

That American community colleges have invested in the "Promise of

Technology" is plain to see. However, critics argue that the influences of technologies within an environment, both intended and unintended, are often are counter to the core values proponents of "The Learning College" claim to hold—values of democracy, personal determination, and freedom—values inherent in a learner-centered environment (Carstens & Worsfold, 2000; Ellul, 1990; Norman, 1998; Speck, 2000). There is evidence to suggest that technology infusion can help to perpetuate existing inequities in educational environments. For example, there is growing concern that a so-called "digital divide" may exist, and that differing opportunities for access to emerging technologies may have helped further the polarization of the "haves" and "have-nots" in society (Galdieux & Swail, 1999; Warschauer, 2000) and Zuga (1999) argues that most technology arises out of male dominated environments and its infusion into an educational environment serves to intensify gender inequities in that environment.

Scholars have used several lenses through which to examine the effects of technology infusion in higher education. Previous scholarly work has focused on the perspective of faculty and the implications for faculty work (Bebko, 1998; de Vry & Hyde, 1997; Gilbert & Geoghegan, 1995; Neal, 1998; Okpala & Okpala, 1997; K. L. Smith, 1997). Work has also been done from the administrative and policy maker perspective concerning the changing nature of the higher educational institution as it enters an age marked by the transforming effects of new technologies (Duderstadt, 1997; Graves, 1997; Moore, 1995; Pelton, 1996; Van Dusen, 1997).

But less evident in the literature are pieces that examine the impact of the integration of emerging technologies on the unique learning environment of the American community college, particularly from the student/learner's perspective. While

glowing anecdotal reports of technology integration in the classroom abound, the troubling aspects of technology infusion into the educational environment have remained largely unexplored in the community college literature, and the voices of those most affected and whom proponents of the "Learning College" profess to serve, its students, have yet to be heard. If American community colleges hold becoming learning and learner-centered organizations as a core value and engage emerging technologies as a major tool for gaining this goal, the perspective of their key constituents—students—must be explored. The purpose of this study was to develop a deeper understanding of students' perceptions of their experiences in American community college learning environments that are characterized by the integration of the "new" technologies.

Background and Rationale

The American community college is unique among higher educational institutions because of its broad mission of access and service (American Association of Community Colleges, 2001a). It serves a more diverse student body that attends school for a wider variety of reasons than any other American institution of higher education (American Association of Community Colleges, 2001b; Griffith & Connor, 1994; Phillippe & Valiga, 2000), and has been characterized by its focus on serving student, community and workforce needs through teaching and learning (American Association of Community Colleges, 2001a; A. B. Smith, 1994).

Called "Democracy's Open Door" by Griffith and Conner (1994), the community college ideal is as an avenue to higher education for all Americans, regardless of class, race, gender, academic preparation, or disability. It "... serves as both springboard and safety net for the inevitable millions who wish to move upward as well as those who

missed earlier opportunities and are ready to try anew." (Griffith & Connor, 1994, p. 131). The community college mission, broad and comprehensive, has at its heart the goal of a democratic institution whose purpose is to foster broad participation in higher education and in society as a whole.

In recent years, following trends in education as a whole, the language of community college mission, vision, and value statements have been revised to include phrases reflecting current thinking of what it means to be a democratic institution, phrases such as "communities of learners", "learner-centered", and "collaboration". While its effectiveness as a democratic institution is in dispute (Dougherty, 1994; Rhoads & Valadez, 1996), there is general agreement that community colleges are institutions that work toward fulfilling these visions by focusing on teaching, learning, and access (Doucette, 1993; Griffith & Connor, 1994; O'Banion, 1997; A. B. Smith, 1994). Community college leaders across the nation are embracing the ideal of the community college as the learning-centered institution (League for Innovation in the Community College, 2001). Terry O'Banion (1997), a leading proponent of the community college as learning-centered institution, coined and popularized the phrase "The Learning College", and it has become a rallying cry for many in the community college community (Evelyn, 2001). The learning college, explains O'Banion in the foreword to his book *A Learning College for the 21st Century*, is "... a new concept, but it is built on long-established values in the community college ..." (p. xvi).

The learning college, according to O'Banion, is both "learning-centered" and "learner-centered". O'Banion distinguishes between the two as being separate but important components of the learning college (O'Banion, 1999). A learning-centered

institution focuses all its functions on learning outcomes. A learner-centered institution puts the student first. The learning college strikes a balance by integrating "...these concepts and requires both care and service for the individual and attention to quality learning outcomes." (O'Banion, 1999).

O'Banion states that "The learning college places learning first and provides educational experiences for learners anyway, anyplace, anytime." (O'Banion, 1995-96, p. 22) and is based on six key principles (O'Banion, 1997, p. 45). These principles are:

- The learning college creates substantive change in individual learners.
- The learning college engages learners as full partners in the learning process, with learners assuming primary responsibility for their own choices.
- The learning college creates and offers as many options for learning as possible.
- The learning college assists learners to form and participate in collaborative learning activities.
- The learning college defines the roles of learning facilitators by the needs of the learners.
- The learning college and its learning facilitators succeed only when improved and expanded learning can be documented for its learners.

Boggs & Michael (1997) state that at a learning college one can expect the promotion of "... collaborative learning; learning communities; focus on learning outcomes; better use of technology; recognition of the importance of everyone's role in promoting, supporting, and facilitating student learning and a new unity of purpose among all the college's people." (p. 198).

Instructional technology and its impact on learning has been studied for a number

of years, primarily utilizing the metaphor of technology as a tool for teaching, but new technologies that are being integrated into the current community college environment are dramatically different from the technology of the past. Previous instructional technology consisted primarily of presentation technologies such as television, filmstrip, slide, and film projectors. New emerging technologies, primarily computer and Internet based, offer capabilities for interaction and communication as well as presentation. There is growing realization that technology in general, and the new technologies in particular, must be understood in the contexts into which they are integrated, using metaphors or constructs more complex that that of "technology as tool" (Nardi & O'Day, 1999). For this study, "new technologies" were defined as those centered around computer technology and information technology, or "... the hardware, software, communications infrastructure, and associated training and contracted services that enable local or global presentation, exchange, storage, and transmission of information in digital or analog form for teaching, learning, student support services and administration." (Clagett, 1998, p. 2). Emerging technologies have been integrated into the community college with enormous speed but with little attention paid to possible unintended or unexpected consequences. Integration of technology with such enhanced capabilities into a learning environment may influence learning environment dynamics in very new ways (Bruffee, 1993; Kirsch, 1988).

O'Banion and other proponents of the learning college see the new emerging technologies as "... a key building block in creating a firm foundation for the learning college; it has many characteristics that support the goals and principles of the learning college." (O'Banion, 1997, p. 70; see also Joseph, 1988). Among the qualities proponents

of technology cite as its promise for the learning college is that it seems to increase access and accessibility to learning experiences. "The learning college places learning first and provides educational experiences for learners anyplace, anytime, anywhere." (O'Banion, 1997, p. 70). New communication technologies allow learners to participate from a distance, always open web-based classrooms and asynchronous learning networks free learners from time constraints (Lever-Duffy, 2000; Milliron, 2000). Proponents claim that technology improves student learning by facilitating the individualization and customization of learning through computer-based testing and learning modules (Doucette, 1993; Ehrmann, 1995; O'Banion, 1997), by providing forums for collaborative work (Doucette, 1993; Gordon, 1996; Milliron, 1998) and facilitating the creation of learning environments based on constructivist pedagogy, where learning is learner-directed rather than instructor-lead (Frank, 2000; Gordon, 1996; Milliron, 1998).

For O'Banion, particularly important among the characteristics of technology for the learning college is that it is "... a time- and place-free medium and usually an ism-free medium." (O'Banion, 1997, p. 71). O'Banion sees technology as the avenue to removing barriers of time, place, racism, ageism and sexism in the learning college. There is doubt, however, that technology is or can ever be an "ism-free" medium. O'Banion himself alludes to this: "Unless it is designed into the system on purpose, or unintentionally, technology is free of racism, sexism, and ageism." (O'Banion, 1997, p 72). As technologies are introduced into an environment they become more than simply a new part of that environment; technologies become infused into an environmental system and are both influencing and influenced by that system (Nardi & O'Day, 1999; Sclove, 1995). Sclove (1995) argues that technologies are polypotent social constructions that bring with

them cultural and political contexts, effects and meanings. Cooper (1999), Norman (1998), Ellul (1990) and others, have argued that most emerging technologies are technology-centered, arising out of a privileged technologist/engineering context, and are designed to serve the machine rather than the user.

Statement of the Problem

The integration of new technology into society as a whole and into the educational environment in particular seems destined to increase (Apps, 1988; Graves, 1997; O'Banion, 1997; Parnell, 1990). Community college administrators and faculty are integrating new technologies into learning environments as a way to achieve the ideal of learner-centered and learning-centered institutions. Community colleges have spent millions on technology infrastructure, much less on faculty development in the area of technology integration, and even less on hearing the voices of their key constituents—their students.

Research in education and technology has been on-going, but primarily focused on technology as a tool for teaching, asking the question "Does it increase learning or not?". However, scholars have noted that the implications of technology infusion into any environment are too complex to be understood with simple metaphors, and some caution that most technology arises out of a technology-centered context and that integration often carries with it unexpected and unintended consequences. This study widens the focus by looking at the integration of technology in the broad context of the learning environment, asking the question: "What do students say is happening here?"

Research Question

The primary research question guiding this study was: "How do students participating in a community college learning environment perceive their experience of the infusion of new emerging technologies into their learning environment?"

This study used a qualitative approach in gathering and analyzing data. An understanding of an educational environment—with its complex web of relationships between participants, content, and artifacts—lends itself to the type of exploration that a rich narrative from the student perspective of his/her experience can provide. An analysis of "what is happening" from the perspective of the students in the educational environment where technology is integrated may result in important insights into consequences that are intended and expected, or unintended and unexpected. The results of this study help to fill an important gap in the "Learning College" literature, and may help the community college community to assess the fit between its technology integration and achievement of its vision of the ideal institution. Such insights "from the field" can have implications on the individual student level, the classroom level, the institutional level, and public policy level, but also in the realms of instructional design and hardware and software design. For students the results of this study may have implications for strategies in surviving or succeeding in an educational environment characterized by technology integration. Results of this study may have implications for faculty and administration's choices about types of software and hardware, its method of integration and deployment, the extent of technology integration, and the types of learner-support that are needed. For instructional and technology designers, the results of this study add to the growing literature base of technology usability, and may aid in the

development of products and environments generated with a learner-centered approach.

Delimitations and Limitations of the Study

While the infusion of technology into the learning environment is likely to have impact at any level of education, its implications in the developmental education environment are of particular interest because of the large part developmental education plays in the fulfillment of the vision of the American community college as democratic institution. This study focused on students enrolled in developmental classes in the community college.

A large number of students attracted to the "Open Door" college are students who have few other choices for higher education because of a number of reasons (Griffith & Connor, 1994; Walker, 2001). One identified group of students who flock to the community college because of its open access has been identified as the "underprepared" (Johnson, 2000; R. H. McCabe & Day, 1998; Walker, 2001) or "at-risk" (Roueche & Roueche, 1999). These are students not ready for college level work, students who enroll in developmental classes such as writing, reading and mathematics. It is this group in particular that the community college has traditionally served (R. H. McCabe & Day, 1998), and that the learning college has made a commitment to serve (League for Innovation in the Community College, 2001). It is this group of students to whom "access" to higher education is of primary importance, and as McCabe (2000) states, "Access and developmental education are inseparable." (R. McCabe, 2000, paragraph 14). Underprepared students often come from families considered "low income" (Phillippe & Valiga, 2000), and have less experience with computer technology , both at home or school, than students that come from families with higher incomes (Galdieux &

Swail, 1999).

This study confines itself to in-depth interviews with a small number of community college students at one community college. Given the widely diverse student body of the typical community college—students with differing educational goals, preparedness for college-level work, socioeconomic levels—and the unique way community colleges reflect and respond to the communities in which they are situated, the scope of this study is limited. While the results of this study may give in-depth insight into the perceptions of the participating individuals, further research involving a number of community colleges from various rural, urban and suburban communities, and a larger number of students, in a wider array of educational programs is needed. Implications from this study for the community college population at large should therefore be made with caution.

CHAPTER TWO

CRITICAL REVIEW OF THE LITERATURE

Introduction

To provide a context for this study, several bodies of literature must be examined for items that intersect at the coordinates of "new emerging technologies" and "the learning college". First, the long tradition of scholarly writing on technology and society will be examined and, through a definition of the "new technologies", its wide scope focused on the literature of education. Second, the literature of the learning college as it is to be realized through technology will be surveyed. Third, evidence in the literature of undesirable consequences of technologically-enhanced learning environments will be explored.

Scholarly Literature of Technology

The scholarly literature examining the impact of technology on society and education has a long history and rich history. In *Phaedrus*, Plato records the Egyptian tale of Theuth, the inventor of writing. When Theuth shows his invention to the god Thamuz, he is told that its use would "... only spoil men's memories and take away their understandings" (Jowett, 1911, para. 21). Monsma (1986) argues that the scholarly literature examining technology can be grouped into three differing approaches working with three differing definitions of "technology". The *anthropological approach* defines technology as being at "the very heart of what it means to be human" (p. 13), and it is "nothing more than the area of interaction between ourselves ... and our environment"

(Kranzberg and Pursell, Jr., 1967 as cited in Monsma, 1986, p. 13). The *epistemological approach* defines technology as a special form of knowledge: "bodies of skills, knowledge, and procedures for making and doing useful things" (Merrill, 1968 as cited in Monsma, 1986, p. 15). *The sociological approach* defines technology as the mark of modern society, and focuses on its effects on society (Monsma, 1986). The discourse on technology and society from these three perspectives is wide-ranging, deep, and varied (Alfino & Pierce, 2001; Ellul, 1964, 1990; Hauptman, 2001; Jowett, 1911; LaTour, 1995; Minasi, 2000; Monsma, 1986; Nardi & O'Day, 1999; Priest, 1995; Sclove, 1995; Tenner, 1996) and will be drawn on to inform this review of the literature for the purposes of this study. In order to focus the scope of this review of the literature on the technology used by the participants in this study, however, a more narrow definition of "technology" is needed.

Toward a Working Definition of New Technologies in Education Literature

Reiser (2001a; 2001b) states that in education, "technology" has come to be commonly understood as "instructional media", which he defines as "the physical means via which instruction is presented to learners" (para. 9). In the early part of the 20th century the instructional technologies of the day were known as "audiovisual": such presentation tools as filmstrips, slides, charts, and audio and film, with the advent of instructional television around the 1950s (Reiser, 2001a). By the late 1970s "instructional technology" began increasingly to mean "computers" (Molnar, 1997; Reiser, 2001a).

In the early 21st century the wide-spread use of more powerful, networked, multimedia computers, e-mail, and the Internet marked a shift in the use of computer technology toward the merging of computers and telecommunications (Reiser, 2001a;

Roschelle, 1995). The definition of "new computer technology" in the educational literature was modified to include its expanded telecommunication capabilities (Bruffee, 1993; Molnar, 1997; Nardi & O'Day, 1999; Reiser, 2001a). The "new emerging" technology has several labels in the literature, including "collaborative technologies" (Roschelle, 1995) and "information technologies" (Alexander, 1999). Participants in this study, "Technology and the Learning College: Community College Student Voices", qualify, in part, because they are in community college classes that utilize, at minimum, the collaborative technologies of networked computers and the Internet.

Metaphors as Lenses and the Educational Literature

Nardi & O'Day (1999) argue that common metaphors have been used to explain the impact of technology on society and individual lives. These metaphors—technology as tool, as text, and as system—provide a set of lenses through which to examine the educational literature concerning the "new" technologies.

Technology as Tool

The most common metaphor used has been technology as a tool (Nardi & O'Day, 1999). Tools are used for making work easier, to lower costs, and increase productivity. Technology as a tool suggests that when a user chooses the "right" tool for the job, and uses it skillfully, productivity increases based on some measure (Nardi & O'Day, 1999). Research from this perspective abounds in the educational literature. Numerous studies examine the "amount" of learning as the dependent variable and the use or non-use of various types of technology as the independent variable (Lockee, Burton, & Cross, 1999). One such reference archive of these studies is the book *No Significant Difference*

(Russell, 1999), along with its companion websites "No Significant Difference" (Russell, 2002a) and "Significant Difference" (Russell, 2002b), both housed on the TeleEducation New Brunswick Website. Primarily an apology for distance education versus traditional face-to-face education, the "No Significant Difference" site and book list research dating from 1928 that concludes the amount of student learning using both instructional methods is virtually the same. The appearance of the "Significant Difference" site is new relative to the "No Significant Difference" site, and no doubt Russell's answer to criticism that studies showing significant differences were being ignored (Lockee et al., 1999).

The titles of citations on these sites mirror the advances in instructional computer technology as it developed from stand alone units to networked and Internet connected computers. In 1973, the first mention of computer technology as an instructional tool replaces television and radio as the instructional media for study, and in 1993 computer conferencing is mentioned. In late 1990s and early 2000s, the research cited increasingly involved the new technologies of Internet-enabled computers and collaborative technology. One such study by LaRose, Gregg and Easton (1998) examined the test scores of 49 students enrolled in an introductory telecommunications course. Students were randomly assigned to two groups. One group attended traditional "live" lectures during a semester, the other attended a "virtual" class that consisted of Web pages and recorded lectures available via a Web browser. Student achievement was measured by scores on three multiple choice exams. The authors concluded that there was no significant difference in student achievement between the groups.

The research from the perspective of technology as tool is by no means limited to the field of distance education. An oft-cited summary of research on computer assisted

instruction by Kulik & Kulik (1991) reported a 20 percent increase in learning. Yaverbaum & Nadarajan (1996) reported no significant differences in a study of the test scores of university students in a telecommunications class, who used a multimedia tutorial and those who did not. For a dissertation completed in 2001, Hagen found no significant differences in the overall performance of piano students who practiced using computer software and those who did not.

Lockee (1999) terms these types of studies "media comparison" and argues that their popularity with researchers has grown as computer technology has achieved widespread use in education, but that often their methodology is flawed, their measurement of "increased learning" is in many cases problematic, and the conclusions drawn from them—technology increases/decreases/does not influence learning—reflect positivist assumptions about the nature of knowledge and learning. Since productivity, as measured by test scores, is the focus of these studies, student perceptions if mentioned at all, are only mentioned as anecdotal comments in the findings.

While the knowledge gained from "technology as tool" research studies can be useful—in hardware and software design, technology usability, and even measuring some types of learning (Nardi & O'Day, 1999)—the positivist "factory model" view of education is being challenged (Fenstermacher & Soltis, 1992; Serafini, 2002; Tisdell, 1993). Constructivist theory about the nature of knowledge and education demands a technology metaphor that broadens the lens to encompass the communicative aspects of technology and its impact on the educational enterprise.

Technology as Text

Constructivist theories of education acknowledge at least a two-way interaction

between the learner and text (Alexander, 1999), but the metaphor of technology as tool only allows for the one way action of "user with tool results in product". For example, the construct of technology as tool does not address the notion that while a person may perform a task with a technology, the interaction may in part be prescribed by the technology itself (LaTour, 1995). A person may hammer or drill in order to puncture an object, but her choice may be prescribed by the tool at hand.

The metaphor of technology as text helps to take into account this two-way interaction between technology and user. Many technologies are designed by their creators to communicate their proper use, and some technologies communicate messages unintended by their designers (Norman, 1998). Nardi and O'Day (1999), in explaining this metaphor state: "Now we are encouraged to *read* the technology to understand its messages and imperatives." (p. 32).

Examples in the educational literature using the technology as text metaphor are scarce, perhaps because researchers examining technology in educational contexts acknowledge that its impact goes beyond a two-way interaction. One technology that would seem ripe for research from the perspective of the technology as text metaphor is "computer-mediated communication". Defined as a medium that results from the convergence of telecommunications, computers, and computer networks (Hollenbeck, 1997), computer-mediated communication in education consists primarily of text-based communications via the computer network between students and instructors and student to student. Hollenbeck (1997) states that such text-based environments will soon be "historical artifacts" (p. 215) as computer communications are now incorporating the multimedia capabilities of sound and video, capabilities which may carry with them their

own prescriptive and social impacts. Hollenbeck's opinion is shared by several authors (Bruffee, 1993; Reed, Spuck, & Bozeman, 1996).

Technology as System

Most studies of computer-mediated communication and other educational technologies that go beyond the technology as tool metaphor incorporate the idea that technology use occurs in a context, and they incorporate data that help to examine technology in educational contexts that go beyond test scores. Nardi and O'Day (1999) describe such studies as using the metaphor of "technology as a system". The context in which users interact with technology (and technology interacts with users) can impact its meaning. The construct of technology as imbedded in a system can help to address this aspect of technology integration. Technology is seen as part of a system on which it acts and is acted upon. Human beings are a part of this system and are impacted by technology in ways that go beyond task completion or technology communication. Norman (1998) further develops this concept by talking about systems that exist within systems, the human system and the technology system.

Richard Sclove (1995) examines the construct of technology as part of a social and political system in his book *Technology and Democracy*. Sclove introduces the idea that technologies are social products, brought about by forces within the system. Technologies are "polypotent", they impact and are impacted by the system in a multitude of planned, unplanned, foreseen, and unforeseen ways. The system (social, political, educational, personal environment) is altered because of the technology system within it and because of human interaction with technology. The system adjusts, adapts, re-balances, and everything within the system adjusts, adapts, re-balances, because of

what is introduced, how it is used, not used, and the meanings given to use/non-use. Humans do certain things in certain ways because of the technology available to them (and because of the way they perceive that technology), and they do or do not do things because of technology. The technologies created and developed come about in part because of the same dynamics in the system (Sclove, 1995).

Research studies from the perspective of technology as system are becoming more prevalent in the educational literature as researchers respond to the shift in educational thinking from positivist to constructivist, and the shift in technology from stand-alone presentation hardware to networked multimedia communication hardware and software. Researchers attempting to examine the multi-layered impacts of technology in an educational environment are increasingly using qualitative data as well as quantitative data to make meaning of the complex environments.

Many researchers are focusing on a "purely virtual" environment—the "new" distance education—where all interaction with others, content and technology occurs in an online environment. Such learning environments are being labeled as "virtual" classrooms, universities, campuses, (Blake, 1997; Burks, 1996; Do & Lee, 1997; Galdieux & Swail, 1999; Mateas & Lewis, 1996; Resnick, 2000; Turoff, 1997; Twigg & Oblinger, 1996; Van Dusen, 1997) where virtual teaching (Schutte, 1996) takes place. Other labels include "on-line" (Carstens & Worsfold, 2000; L. Cooper, 1999; Gilbert & Geoghegan, 1995; Moeller, 1995; Speck, 2000) and "cyberspace" (Davis, 1997; Sotillo, 1997) or "Web-based" (Gray, 1998; Raineri, Mehrtens, & Hubler, 1997; University of California- Berkeley, 2003).

In one such study, Frank (2000) looked at the perceptions of ten community

college teachers using computer-mediated communication. Using qualitative methods, she explored perceptions teachers had about changes in content, teaching methods, and their beliefs through the preparation for and use of a computer-mediated learning environment, and found that teachers reported the experience helped move them toward becoming more learner-centered and that online learning empowered students.

Some studies have focused on classes where the lines between a face-to-face and virtual educational experience are blurred. Students are expected to attend class in the traditional sense, but also participate in computer-mediated communication environments such as email, online discussion groups, and the like. For example, Thorpe (1997) found that community college faculty in his study who used technology to in their teaching did not change their teaching methods toward a more learner-centered approach.

Student perceptions in this body of literature are becoming more a focus of study than before, perhaps as a result of the shift in educational thinking from teacher-centered to learner-centered. Weeks (2000), in a study of advanced dental hygiene students who used a Web-based game to practice skills reported students' positive perceptions about their own learning using technology, along with findings of higher post-test scores. Sankaran (2000) examined student perceptions of Web-based courses versus traditional lecture courses and found no differences for preference for either based on ethnicity.

Technology and the Learning College

Research identified by the researcher as technology in the learning college exists mostly in the form of self-descriptive case studies. O'Banion (1997) includes six such reports in his book: each mention the role of technology in bringing about the transformation of their college toward becoming a learner-centered organization. In

O'Banion's book, Moskus (1997) describes the email systems, Internet classes, student services telephone system that Lane College has put in place in an effort to become a learning college, and Elsner (1997) states that at Maricopa "many faculty ... are using electronic forums and Internet protocols as the central learning scaffold to build a cyber-learning system" (p. 184). But only one report in O'Banion's book (McClenney, 1997) includes information about student feedback about the colleges' movement toward becoming learning centered. None include information about student perceptions about technology use in the learning college.

In a major work on technology in the community college titled *Taking a big picture look @ technology, learning & the community college*, (Milliron & Miles, 2000), no mention is made of student perceptions of technology enhanced environments. The book is edited by the current president of the League for Innovation in the Community College. The League is a major sponsor of the "Learning College Project" (League for Innovation in the Community College, 2001).

Evidence of Undesirable Consequences

The consequences of technology are many, and they can be described with many adjectives. But, as Nardi and O'Day (1999) point out, much of the literature, and especially opinion pieces, can be characterized as being breathlessly for, or raging against, technology—polarities they term "Technophilia and Dystopia" (p. 20). Perelman (1992), at one extreme, argues with glee that new technologies will cause the death of education as we know it. More moderate authors look at the "Promise of Technology" as a vehicle for educational reform (O'Banion, 1997; Pelton, 1996), while others argue that technology is, at great financial cost, being used to simply maintain the traditional factory

model of education (Cuban, 2001; Pepi & Scheurman, 1996), or worse, causing the loss of many of the benefits of traditional education because of the educational community's fascination with anything technological (Resnick, 2000).

But some authors argue that the consequences of technology infusion go beyond the polar opposites of "positive" and "negative". Ellul (1990), states that "All technical progress has three kinds of effect: the desired, the foreseen, and the unforeseen" (p. 61). Tenner (1996) writes of ""revenge", "rearranging", "repeating", "recomplicating", and "recongesting" effects, where a technological solutions to a problem causes newer, different, and more numerous problems. For example, Hauptman (2001) credits the convenience of email and the Internet with causing educational institutions to have to spend time and money to deal with increased student cheating and harassing email. He cites the easy access to online literature as a force in changing the nature and product of research. Online documents will have greater authority than those not online because "No one, not even a serious scholar, will be willing to waste time tracking down hard copy or microforms when the same material is available at one's office or home terminal." (p. 435).

Research studies in the educational literature that examine undesirable effects of technology infusion into a learning environment are far outweighed by studies that seek the desirable aspects. Since much of the research is produced by practitioners examining their own experiences in their own learning environments, it could be that practitioners having positive experiences and who see positive results may be motivated to report, but those having negative experiences are more likely simply to give up or are reluctant to report negative results because of an institutional "pro-technology" institutional climate

(Neal, 1998).

One area of study particularly applicable to the learning college has been access. Several studies have looked at access in the traditional sense, that is being able to get to technology, and have found differences in access by economic and ethnic factors (Galdieux & Swail, 1999). Green (2000) found differences in access by institution type. Community colleges where classes used email as an instructional tool lagged behind other higher educational institutions by almost half, and while two-thirds of public and private universities provided free off-campus Internet services for students, more than four-fifths of community colleges provided no off-campus Internet services at all (Green, 2000).

But, as Galdieux(1999) points out, access is not only about being able to get to a computer terminal or having one in one's home. Previous use (Cuban, 2001), skill level (Hauptman, 2001), critical thinking skills (Hauptman, 2001), learning styles (Bird & Gill, 1987), gender (Christie, 1996; Zuga, 1999), and other cultural factors (Warschauer, 2003) also effect access .

Summary of the Literature Review

Research on technology in educational environments has utilized at least three metaphors as lenses for understanding: tool, text, and system. As technology has developed from a presentation tool toward a communication medium, and educational thinking has moved positivist to a constructivist, so has research moved from studying the one-way interaction of user-tool-product to the complex and multi-layered examination of the educational environment characterized by the infusion of technology.

Research on student perceptions of technology infusion into the learning

environment has begun to appear in the literature. However, the community college literature on the learning college and technology consists mostly of descriptive and anecdotal reports from the field. Research on the perceptions of community college students in technology enhanced learning environments will help to fill this important gap in the literature.

The literature on access and technologically-enhanced learning environments is of particular importance to a study of the learning college. The current literature consists mainly of analysis of statistical data regarding the availability of technology by socioeconomic factors. Research on access by other factors is less prevalent, and remains an area where more work is needed.

CHAPTER THREE

METHODOLOGY

This was a qualitative study that examined student perceptions of technology infusion into a community college learning environment. Planning for the study began with a revised version of Wolcott's (1977) basic question for the ethnographer: "What is going on here?" Since the primary focus of this study was student perspectives, this question was refined to "What do the students think is going on here?" The question lent itself to a qualitative approach, as the answers to it were bound to be complex. Only a rich narrative could hope to capture student perceptions of an educational environment infused with technology.

Research Question

The research question guiding this study was "How do students participating in a community college learning environment experience the infusion of emerging technologies into their learning environment?" Data collected were primarily in-depth interviews with students participating in a community college learning environment where "new" technologies were employed. As Seidman (1991) observes, "At the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience." (p. 3). A background survey, site visits, field notes, and institution and classroom documents provided additional data.

Site and Participants

The site for this study was one campus of a large multi-campus community

college located near a major urban area in the Midwestern United States. On its website, in its catalog, and in other promotional materials the institution boasted a prime focus on open admissions, learner centered instruction, and a flexible curriculum.

The section of the country where the campus was located was culturally diverse but unique in that its ethnic mix included a larger percentage of African-Americans than the United States as a whole. Median income for the area was somewhat higher than the national average, with wide variations across smaller sections of the area. The region's educational levels were very similar to national averages.

Participants in the study were students who were in their first semesters of community college and who were enrolled in at least one developmental class. For this study, developmental classes were defined as classes at the community college taken in preparation for college level work, such as reading, writing, and math. Students in "English as a Second Language" classes, also offered at this institution, were not part of this study. Class sections chosen for this study were those identified by the college system's Vice Chancellor for Academic and Student Affairs and a department chair as those where emerging technologies were being employed in the educational environment. The selected classes were two sections of Academic Literacy II, both on the same campus and led by the same instructor. Both were morning classes held on different days of the week in the same classroom, a computer lab outfitted with a local area network with Internet access and a presentation podium equipped to give the facilitator access to the student network, an LCD projector, DVD player, and VCR. The lab was one of two such outfitted classrooms on the campus.

Data Collection

Procedures

Inquiries to administrators of several community colleges in the state were made seeking classes qualified for inclusion in the study. Institutions holding classes that fit the requirements of the study were somewhat difficult to find. An institution holding such classes was identified and, in accordance with institutional procedures, a letter detailing the study was sent to the Vice Chancellor for Academics and Student Affairs. A formal letter of approval for the study was issued to the researcher. Following approval of the project, the Vice Chancellor identified campus administrators and instructors who had knowledge of classes meeting the requirements detailed in the study proposal. Access through these individuals provided the researcher with contacts to individual instructors whose classes met the parameters established in the study proposal.

Several classes at Maple City Community College met the criteria for inclusion in the study were identified and invitations to the instructor participate in the study were issued. The classes were both facilitated by the same instructor, and she expressed willingness to provide access to her classroom. Arrangements for site visits and data collection were made. The instructor offered access to two separate classes that met on the same campus but on different days and times.

The researcher attended both classes and made a short presentation describing the study and participant rights to each of the selected classes. Students, instructors, and student aides were asked to sign an informed consent document detailing the study and their rights as participants in the study (See Appendix II). A background survey was

administered to all students who signed the informed consent form (See Appendix I). Two students in each class section declined to participate in the study. The background survey was based on a survey developed and utilized for a previous study (Dirkx, Kielbaso, Mishra, Smith, & Vander Pols, 2001). The survey collected information on student characteristics (age, gender, ethnicity/race, classes in which students were enrolled, and previous technology experience).

Twenty-nine background surveys were completed. Data from the surveys was compiled and analyzed. Student participant selection was made on the basis of the background surveys. An effort was made to select students of diverse backgrounds such as ethnicity, age and gender. Eleven students were identified as possible participants and invited to participate in the study. Invitations to participate in the study were given first to six students with little previous computer technology experience, however three of the invited students declined to participate further, and two of the students who agreed to participate failed to appear for interviews at their scheduled times. The students who participated fully in the study therefore ranged in (self-reported) skill with technology from novice to expert.

Students selected for participation in the interview portion of the study were offered a stipend of twenty dollars for their full participation. Full participation was defined as completion of the background survey, an initial interview at the beginning of the semester, and follow-up interview at the completion of the semester. Participants completing the background survey and one interview were offered five dollars.

Interviews with the six student participants who kept appointments were held on campus within the first two weeks of the beginning of the Fall Semester of 2002.

Interviews were conducted in a quiet but public area of the campus where privacy could be maintained. The interviews were semi-structured following the protocol developed by the researcher and based on a protocol from a previous study (Dirkx et al., 2001). Initial interviews ranged from thirty to forty-five minutes in length and were audiotape-recorded with consent of the interviewee (See Appendix II). The interviews were transcribed by the researcher and summaries of the interviews were constructed from the transcripts. Interviewees were emailed a summary of their interview for review and comment.

Follow-up interviews were conducted several weeks after the end of the Fall semester of 2002. Five of the six participants participated in follow-up interviews that were conducted by telephone and were audiotape -recorded. The sixth student declined to participate further without explanation. The follow-up interviews were semi-structured, following a protocol developed both from the protocol previously mentioned (Dirkx et al, 2001) and from information provided by the participant in the initial interview and background survey. A seventh student was offered an invitation to participate in the study to compensate for the participant who declined a follow-up interview. The seventh student accepted the invitation and was interviewed by phone using a modified version of both the initial and follow-up interview protocol. Follow-up interviews ranged from thirty to forty-five minutes in length and were audiotape-recorded.

Two classroom observations were made by the researcher and observations were recorded in field notes. Documents were collected pertaining to the institution, classes, and student life and consisted primarily of printed documents such as college catalogs, course schedules, classroom handouts, and student newspapers.

Data Analysis

Analysis of the data followed qualitative principles. David M. Fetterman (1993) states: "Ethnographic analysis is iterative, building on ideas throughout the study." (p. 359). Huberman and Miles (1994) define data analysis as three linked sub-processes: data reduction, data display, and conclusion drawing/verification, that occur before and during a study, and while writing a final product. Since this study was focused on the perceptions of lived experience of students, data analysis benefited from a phenomenological approach. The methods identified with grounded theory, where theory arises from themes in the data, also guided the analysis (Strauss & Corbin, 1994). Analysis concurrent with data collection included the keeping of a running log of researcher impressions, summaries, and ideas about emerging themes and constructs arising from the data as it was collected and analyzed.

The computer software program *Atlas-ti* was used as a data management and analysis tool. The program allows for the organization of large amounts of data in varying formats, sophisticated methods of data chunking and manipulation, as well as a variety of data display formats and matrices.

In order to maintain confidentiality, the participants chose pseudonyms to be used in the reporting of findings. A pseudonym was also given to the institution and location of the institution. The pseudonyms were applied to all raw data throughout data analysis and in any reports of the findings of the study.

Interviews were transcribed verbatim from audiotape. Field notes, observational schematics, documents and log entries were reviewed. A "grounded" coding scheme—categories, patterns, and themes arising from the data (Miles & Huberman, 1994)—was

generated as data were collected and reviewed. The transcripts were coded using the initial coding scheme, and then repeatedly reviewed. Additional codes were generated during the primary document review sessions and applied to the transcripts.

Profiles of the participants were constructed using interview transcripts as primary documents. The themes emerging from the coding of the data provided a framework for the construction of the profiles. The profiles consisted of thick descriptions of participants' perspectives of technology infused into their educational environment and included extensive quotes from participant interviews.

A cross-case analysis was conducted using the participant profiles, the emerging themes, and coding scheme. The findings of the analysis were organized according to a framework modified from the framework used in constructing the profiles: Perception of Self, Perception of Self in Relationship, and Perception of Technology.

Verification of the data occurred through data triangulation with the varied sources of data (Janesick, 1994), and through the member checks (Seidman, 1991) of student comments on their interview summaries.

Limitations

This study focused on "what is going on here?" (Wolcott, 1977). "Here' was two community college classes at one community college campus. Data were gathered from a small number of informants during a short amount of time. The findings of this study, therefore, are of limited use in understanding what is going on in other classes or in other community colleges. It is hoped, however, that insights emerging from this study may provide a foundation for further research on this topic.

Role of the Researcher

In my former life as a community college educator, I must confess to having been held, as O'Banion describes it, in the "rapture of the technologies" (1997, p. 63). Some of my most rewarding experiences have involved helping students and colleagues discover the value of technology in the educational environment. I have seen the empowering effect of technology in the lives of differently-abled students and colleagues; I have witnessed the excitement of a researcher first experiencing the power of the on-line database; and I have seen the wonder of students making connections with colleagues through email across the world.

On the other hand, I have seen the terror new technology can foster in those unfamiliar with it, the frustration caused by unfruitful encounters with an uncooperative machine, the defeat of a failed computer/human interface. Having worked with populations that span the spectrum of technological literacy, socioeconomic level and education, I worry about the widening breach between technology haves and the have-nots (Galdieux & Swail, 1999; Priest, 1995), especially as it plays out in the community college—an institution dedicated to being the "open door" to higher education (Griffith & Connor, 1994). I see parallels between access to technology and to education and similarities in ways they can be designed to empower or to alienate. With Nardi and O'day (1999), I consider myself a "critical friend of technology" (p. 14).

I am also a friend of the American community college and believe deeply in its mission of becoming a democratic institution of higher education. As a community college counselor I was proud to be a first contact and mentor for many students of diverse backgrounds who were first generation college students and I actively promoted

the community college as an open-door institution and pathway to a better life for its constituents. Yet I also know from my experiences that the mission of the community college can be thwarted by the very institution itself, and that the warnings of such scholars as Dougherty (1994)and Rhoads and Valadez (1996) must lead me to be a "critical friend" of the American community college.

I am an experienced user of technology and I have always enjoyed using technology, especially in the learning environments in which I have been privileged to participate. I believe that technology has increased my access to and participation in society as a whole and that it has facilitated my scholarly and day-to-day activities. My bias then is my belief that technology properly infused into the community college learning environment can do the same for community college students. My hopes are that technology can promote the movement of the community college toward fulfilling its ideal of being a democratic and learning-centered institution.

As a qualitative researcher I am a novice. My training as a counselor—in active listening (Egan, 1982) and person-centered therapy (Meador & Rogers, 1984)—helped to ease my way in the interviewing process, but it was a struggle not to follow a therapeutic path, particularly with some of the participants. As a former career counselor it was particularly difficult while discussing the participants' career goals, and my biases as a career counselor color my findings.

My intent in this study was to be "learner-focused" in data collection and analysis, and to allow the student voices, rather than my biases, guide the study. My view was that each participant brought to her/his learning environment experiences and contexts that helped them make sense of their educational experiences, that formed their learning and

their perceptions. Each participant had a self-constructed story to tell about their experience in the learning environments under study, and it was from these stories that I attempted to identify themes that would help to inform my consideration of my research question. My role and practices as a researcher were guided by the methods of Grounded Theory Methodology (Strauss & Corbin, 1994), and Phenomenology (Holstein & Gubrium, 1994). Using an iterative process I repeatedly returned to the data as I attempted to put aside my biases and my construct about the reality in the learning environment and to allow the stories of the whole of the participants' to emerge as an interpretation of "what was going on" in the technology-infused learning environments under study.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF THE DATA

Research Question

A student's perceptions of his/her educational environment are complex and based on previous life experiences, a person's sense of self, and thousands of student and learning environment interactions. An environment is a system of many agents, none of them existing in isolation nor inactive in affecting an individual's perception of the environment as a whole or any of its parts (Nardi & O'Day, 1999). In this study, a main focus is students' perceptions of the technology infused into learning environments, but these perceptions cannot be examined in isolation. The research question guiding this qualitative study of the use of technology in a community college classroom is:

> How do students participating in a community college learning environment perceive their experience of the infusion of new emerging technologies into their learning environment?

Implicit in this question are questions about how a student's perception of the various parts and subsystems of the learning environment affect a student's perception of technology infused into it. A listing of these parts and subsystems could never be exhaustive, and an attempt was made to allow the data to suggest broad categories of those worthy of focus in this study.

An initial code list for the data was derived from the interview protocols and additional codes emerged as the data were repeatedly examined for recurring themes. The primary documents, code lists, and coding of the data were managed using *Atlas/ti* (Scientific Software Development, 1997) software, a qualitative research software tool.

Atlas/ti allows the user to link segments of data to words or phrases that then can be retrieved and manipulated in many ways. Three categories of student perceptions emerged from data and the codes that emerged were grouped using these categories. The categories were:

- Perception of self
- Perception of technology
- Perception of self in relationship

Student Perspective Categories

In this section an overview of the framework of perspective lenses through which the data were examined is given, with explanation of how they were derived from the data.

Perception of Self

The initial and follow-up interview protocol questions, while mainly focused on the participants' perceptions of technology infused into his or her educational background, also explored the participants' family, educational, and work backgrounds. From the corpus of data, a profile of each participant's perception of sense of self was constructed. A participant's answers to questions about life or educational goals, family and educational background, and interactions with the instructor, classmates and technology, helped to inform constructs of a participant's sense of self.

Perception of Technology

Interview protocol questions focused on the infusion of technology into the

participant's classroom, and also on participant's previous experience with technology in both formal educational settings and in daily life outside the classroom. In this study "Technology" is conceptualized as "other", that is a discrete part of the participants' learning and other environments that is singled out for special examination in this study. The site and participants selected for data collection where chosen in part because of the reportedly high level of technology infusion into the classroom setting. The data were examined for the convergences of participants' perception of self or perception of other and perceptions of technology as they occurred both explicitly and implicitly. Participants' perceptions of the generic "other" were compared to participants' perception of technology and implications were drawn from the similarities and differences.

Perception of Self in Relationship

Data from interview transcripts were examined for participants' perception of self in relationship to "other". "Other" in this study is defined according to systems theory: as a component in the system other than the self (Birnbaum, 1988). A working definition of "other" for this study was conceptualized using the parameters of learning environment as a guide. Discrete entities within the learning environment were identified from the data: instructor, classmates, technology, course content, the school as a whole. In addition, data about participants' background were examined for perceptions of the relationship itself and other, and discrete entities such as family, work, and previous educational environments were added to the working definition of "other".

Participant Profiles

In this section the seven participants in the study are introduced. First, an

overview of the participants' descriptive statistics is given. Second, the stories and perceptions of the participants are presented.

The participants ranged in age from fifty-one years old to eighteen years. Of the seven participants, two were male, and four identified themselves as "Black/African-American Non-Hispanic". The following table presents an overview of the participants' descriptive statistics:

Table 1: Participant Characteristics

Participant	Age at time of interviews	Gender	Ethnicity	Educational Goal
Bubbly	31	Female	White/Caucasian Non-Hispanic	AAS Hospital Pharmacy Technician
Jason	26	Male	Black/African American Non-Hispanic	Business - Own clothing line
John	18	Male	White/Caucasian Non-Hispanic	Medical Degree - Emergency Medicine
LaRue	26	Female	Black/African American Non-Hispanic	Ph. D., Science
Lynn	51	Female	Black/African American Non-Hispanic	Bachelor's Degree - Management
Jennifer	18	Female	Prefer not to answer	Psychology - mental health worker
Sally	18	Female	Black/African American Non-Hispanic	Medical Degree

The following participant profiles are overviews of comprehensive profiles that were constructed during the data analysis from the data provided by the participants on the background surveys and the initial and follow-up interviews. The profiles are presented in alphabetical order of the participants' chosen pseudonym.

A data audit trail is used in the participant profiles as a way for the reader to put

into context quotes from the participants. The auditing scheme takes its structure from the use of the *Atlas/ti* (Scientific Software Development, 1997) software as a data management aid during this study. Participant interview transcripts were assigned primary document numbers by the software and each line in the transcript were numbered. All transcripts were numbered beginning with line 0001 and generally extended into the 0400's. Audit numbers in the participant perspective profiles are in parentheses after each quote and reflect the numbers assigned by the software. Most of the participants in this study participated in two interviews, which are termed an initial interview and a follow-up interview. The indicator used to differentiate the interviews is an "I" for initial interview and a "F" for follow-up interview. For students who participated in only one interview, the notation "I*" is used to indicate that the single interview was conducted with the initial interview protocol or the notation "F*" to indicate it was conducted with the follow-up interview protocol. For example, in the audit notation (2F, 201:203) the reader would interpret a quote as being from primary document 2, which was a follow-up interview, and that the quote was at line 201 to 203 in the transcript.

Bubbly

Bubbly was a 31-year-old White Caucasian female attending Maple City Community College at the urging of her supervisors at work. She was employed at a local hospital as a patient escort and hoped to attain an Associates Degree in Hospital Pharmacy Technology. After graduation she hoped to move into a position at the hospital pharmacy. Bubbly had graduated from high school eleven years ago and this was her first college experience. She tested into the Academic Literacy II class on the college

assessment test and chose to take this particular section because the campus was close to her home. At the time she registered for the course she was unaware that the class would be "computer-assisted". Bubbly knew she faced some difficulties in reaching her academic and vocational goal of becoming a hospital pharmacy technician:

> I'm one of those students who have a little hard time comprehending information, so I need that extra ... one-on-one help to understand the material better. (1I, 15:17).

Bubbly perceived herself as the driving force in achieving anything positive in her life, and she believed that whatever she had accomplished was in fact in spite of most others in her life. She felt resentment at how others in her life had let her down, and she was open about her opinions during her interviews. Toward the conclusion of her initial interview she said "I got a lot of negatives, don't I? Oh well." (1I, 366). However, Bubbly chose a pseudonym with positive connotations because "people" said she had a bubbly personality. And, she was optimistic she could reach her goal:

> ... I thought, I can do this, go back to school, take some classes, get certified, I can do this ... (1 I, 104:105).

Bubbly's family background contributed to her sense of having only herself to rely on. She described her family background as "rough" (1I, 125) in that she came from a divorced home where she was one of four children in the family. Her comments about her family often followed the theme of how unable or unwilling her parents were to care properly for her and how she had to fend for herself:

> I learned from, I learned from growing up not to depend on my parents for anything because there wasn't much money growing up in the family ... (1I, 127:128).

While Bubbly credited her mother with at least offering to help, it was her father who played a key role in her feeling as though she could not depend on her parents: "...

my dad wasn't one for giving, that's for sure ..." (1I, 148:149). The strain of trying to provide for a family of six almost proved too much for her father:

> ... my dad did all the working, and my dad kind of lost his mind in a sense, and became mean, cruel, and abusive and all that." (1I, 130:131)

One of the objects Bubbly's father was stern about was his computer:

> Um, well my dad had computer, but he wouldn't allow anybody to touch his stuff. He was one of those people, you couldn't touch his stuff. But there was a computer in the house but you couldn't touch it. (1I, 209:211).

In her previous educational experiences, Bubbly's feelings of being on her own had negative effects on her learning:

> I never did like high school, it wasn't, I don't know I just didn't fit in, so uh, I think that's why I had a little kind of hard time learning and understanding in high school. (2F, 65:67).

By the end of her first semester at college, Bubbly felt she had changed as a learner:

> And then when I went back to college it was like a totally new experience—like I actually learned something from this class, I actually gained some information I never knew. So, um, it just really, it really changed me. (2F, 67:70).

But Bubbly's perception of herself in her learning environment was not totally positive. On the one hand, she felt as though she fit in more with her classmates at the community college than she had in high school and she responded positively to a question about whether she felt her class was working together as a community of learners. She described the many times she worked with other students in and outside of class. But at times she also felt ignored and rejected by her classmates:

> Um, I would start talking to them, "How was your weekend" or "How is your work coming?", "O it's fine, I'm kinda busy right now." They'd be bothering with the computer than to talk to me! Yeah. (2F, 397:399).
>
> Well, yeah, it's like I was bothering them because I was asking them a question. So I learned on my own, just say forget this, I'll learn some way, and I did." (2 F, 476:478).

Bubbly's perception of her instructor also ranged from the positive to negative. On the one hand, she described Ms. Archer as an educational leader who made sure the class moved through the course content and as a guide who stepped along side to allow students to learn on their own:

> Ms. Archer didn't always, she didn't always, you know, was the leader for us as students. We didn't always follow her, she just gave us the tools and the steps and we just did it on our own. (2F, 736:738).

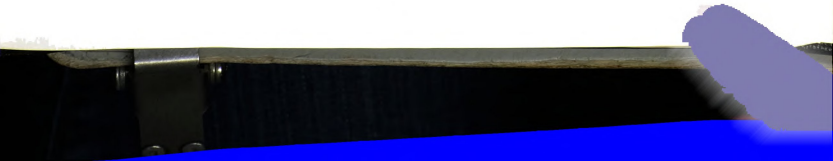
But on a personal level, Bubbly felt neglected and devalued by Ms. Archer:

> I always felt like, you know, I never felt happy after I talked to her. (2F, 209:210).

She thought that Ms. Archer looked on her as a student who just couldn't catch on because she asked so many questions. Bubbly felt she deserved more one-on-one attention from Ms. Archer, but that Ms. Archer did not have the patience to work with her.

Bubbly's relationship with other parts of her educational environment also ranged from the positive to the negative. She had had a bad experience with the counseling department that made her feel as though she was being treated as a second-class student, but found much support in the "Information Commons" where the staff and tutors were always available to help her. The Information Commons was also where Bubbly had the after-class access to computers she needed since she did not have a computer at home. Bubbly felt that the technology tools provided by the college showed how much the college valued its students. She had a sense of pride that as a Maple Community College student she had access to technology tools that the general public did not have:

> And, you know, knowing that you are an MCC [Maple City Community College] student, that kind of gives you, um, a sense of you know, a little bit of pride, you know college students can come and use, can only come and use these computers .... I'm a college student and I can go and use this,



> rather than someone that's just off the street can't just come and do what ever they want in the computer area, you know. So you know what I'm saying, it kind of gives you a burst of ego, you know? (2F, 748:755).

Bubbly was one of the seven participants in this study (out of the twenty-nine who completed the background survey) who marked "very uncomfortable" on the background survey item "How comfortable are you in working with computers?" Her immediate response to a question about computers during the initial interview was "I don't know anything about computers." (1I, 162). Among her descriptor words for computers were "overwhelming" and "stressful."

But by the end of class, Bubbly's perception of computers had changed. In her follow-up interview, Bubbly began with:

> Uh, well, I just told myself the first of the year I'm going to go purchase a computer. (2F, 27) ... uh, because everything is computers now and I just need to know computers, I mean just with my job, my job and to further my education, um it just, I can just see the next you know, twelve thirteen years everything is going to be computers so you are going to have to know it. (2F, 36:40).

Her increased comfort with the technology was very evident during the follow-up interview. She chose herself when asked who in the class benefited the most from being in a computer-assisted course, and her awareness of the usefulness of technology had increased to the point that she considered it as essential: ".... I wouldn't be able to get any of my ideas on paper if I didn't have access to a computer." (2F, 296:297). She even described working on the computer as being a stress-reliever:

> Another positive thing about the computer it was like kind of a stress reliever too. ... I would leave class really uptight, you know, there were a couple times I left the class uptight. And I would go and start up my homework on the computer, and it would be like, "Ahhh" you know. Just by typing and focusing on my work, it was, it made me unstressed. (2F, 274:282).

But despite her increased comfort level with technology, Bubbly saw some

negative effects of technology infusion in her educational environment. Bubbly felt that she and perhaps one other classmate were at the low end of the technology skill scale compared to her classmates. Her classmates were "... like whizzes at it ... " (2F, 591) and she attributed arrogance to some in the class who had good computer skills: "Well, some of them thought they were better than anybody." (2F, 388:389).

Bubbly saw other negatives in her classmates' relations with technology. She saw that for some having Internet access during class was a distraction from learning, because they would be browsing the Internet for what Bubbly considered non-educational purposes. The technology was also a hindrance at times to Bubbly's sense of community because at times her fellow students would decline to converse with her because "They'd be bothering with the computer than talk to me!" (2F, 398:399) and "... everybody did their own thing." (2F, 436).

Bubbly experienced change during her experience in a technology-infused educational environment. Her self-image as a learner was enhanced by feelings of belonging to a community of learners and by the acquisition of technology skills she came to see as essential to academic success. While she clung to her initial assertion that everything she achieved she achieved on her own, she acknowledged the help she had received over the semester from her classmates, her instructor, the school staff, and the technology.

The final question in the follow-up interview asked the participant to imagine what the Academic Literacy II class would be like in twenty or fifty years in the future. Bubbly imagined a class taught by robots, with all the student work done on computer. "Yeah, I figure that everything will be computerized—your books, your teacher, the

college, yeah." (2F, 782:784). And she saw herself as finally catching up to her computer-savvy classmates: "Um, well, I'd be a computer whiz by then!" (2F, 764).

Jason

Jason was a 26-year-old Black/African-American Non-Hispanic male who was in his first semester of attending Maple City Community College. Jason had taken college classes at another institution several years ago but did not continue his education because he was unsure of his educational goals. He enrolled at Maple City with a better idea of why he was attending, though he had not yet declared a major. Jason was focused on obtaining skills he thought he needed to reach his career goals rather than on gaining a particular degree. One of his career goals was to design and sell a line of clothing and he was in school to work on developing his communication skills so that he could attract investors. Also, Jason wanted to be a role model for his two sons. The boys' mother had a degree and Jason wanted one as well so that "... they can say later on, you know, 'my mom and dad went to college.'" (P3, 405;406).

Jason tested into the Academic Literacy II class on the college assessment test and chose the particular section because he lived in a building near to the campus. He was an experienced technology user, having begun using computers in elementary school, and he owned a custom-built computer system that he used for design work and game-play.

Jason thought his fellow students saw him as being at the top of the class, and he wasn't so sure they were wrong. "I mean, I'm not dumb or anything." (3I, 313;314). In his final interview he reported that "I did get the highest grade in the class." (4F, 181). But Jason did not accept this high view of himself without some reservation. In his initial interview Jason expressed some discomfort in his role as one of the top students in the

class:

> ... Ms. Archer, she'll give examples of my papers, and stuff like that, and so everybody in there got the misconception that I'm just like real smart ... (3I, 311:313).

And helping his fellow students was not always easy:

> Yeah, I mean to an extent, cause I don't want to tell them the wrong thing. I mean like criticism, some people can't take criticism well, so, if you say well, you know, you going to have to do this on your paper or something, you know, they might ... sometimes they get a little attitude about it, and then they go to Ms. Archer and she says the same thing, you know sometimes I don't like saying stuff like that because I don't want to hurt people's feelings or something. But like me I can take criticism so if somebody says they didn't like my paper because of this I'll you know revise it or you know, something like that. But you know, some people they don't take criticism well at all. (P3, 319:327).

But usually Jason enjoyed the atmosphere of being in a group learning environment – and he readily acknowledged that while he might have a reputation as "top student" he also learned from his fellow students and his instructor. He felt comfortable with and had a lot of respect for his instructor Ms. Archer. He especially admired her patience and willingness to help her students, and her thoroughness in presenting material. Jason credited Ms. Archer for structuring the class to include a lot of group work:

> The students you know are real nice, she have us get into groups and have a lot of different discussions—get a lot of different opinion on things, I think that's a good thing, because sometimes you have an outlook on one thing, but when you have somebody else talk about it, you have a better understanding or outlook on it, so... (3I, 36:40).

Jason also received help on technological issues from his fellow students. When Ms. Archer assigned the class a project involving a PowerPoint presentation Jason found a fellow classmate to help him because he had never worked with the PowerPoint program before:

> Ms. Archer asked had anybody ever done a PowerPoint, and there was like maybe five people that raised their hand, and I was like, "I know I'm

> gonna need help," I had kind of made a comment and she [a fellow student] said, "Well I'll help you." (4I, 400:402).

Jason enjoyed the extensive use of computer programs such as PowerPoint and others in his class. He had not noticed the class was listed as a "computer-assisted" section when he registered but he believed that the technology in class helped to foster relationships among his classmates:

> Uh, yes. I think that you know working on computers and everything, I think we got a broader outlook on things instead of just focusing on the papers and you know. A lot of our conversations, even when we joke, we'd be on the computers, you know, showing each other how to do this … it really helped us to develop relationships with each other. (4I, 380:386).

Jason saw many other benefits to having technology available in class, for himself and for others. He saw using the computer in class as helpful in remembering things:

> Yeah, I think that if the computer wasn't in the class or whatever, most of the people in the class would have forgotten most of what was being said, you know, [if they] didn't get a chance to work right then, or ask us for help … (4I, 228:230).

When Jason answered the interview question about choosing a metaphor for the computer, he likened the technology to a person:

> Computer is like ... a person, that uh, you kind of like, write things out like you telling a person, like you writing a person a letter, you can kind of write it out even though it can't respond back to you, you know as like sometimes you can write your thoughts down, that's what a lot of times I use my computer, to do things or whatever, and it helps me remember a lot of things, because my memory is kind of like bad, I kind of like try to use my computer, try to remember. (3I, 148: 154).

Technology improved the presentation of material in class:

> Well, she [Ms. Archer] didn't have to write on the board, you know, she got to type it up and show it on the projector, a lot of stuff, it was just faster actually, just writing it out. (4F, 136:138)

And Jason believed the technological skills he gained from his experience in this class

would continue to benefit him:

> It's gonna help me in my next class, it's going to help me when I need to do things at home, and I know a few programs that I want to install that I know are going to be useful for me in the future. (4F, 95:97).

Jason saw no negative effects from the emphasis on technology in the class he took or at Maple City Community College as a whole. He saw the access to technology at the college as fostering community among his classmates and as empowering students who might not otherwise have access:

> Yeah, I think they are really helping a lot of people out, I maybe been in there [Information Commons] like four or five times, I had to finish my Plato, we had to do that there. It seemed to be like a lot of students there typing their papers, you know some people can't afford computers at home, you know, so I think that that's a good thing, they won't always have to go to a friend's home, you know they can take an hour or two out of the day and go up there and use computers, I think that really beneficiary to the students. (4F, 346: 352).

While Jason saw only positive things about the use of technology at Maple City Community College, his view of the future of the human/technology interface was more cautious:

> Yeah, you might like put on a headpiece or something and just thought, I know they got that thing now where you just tell it, but I think then it'll be you just think it, you know, like it probably pick up brain waves or something ... I think that it will be good but it will probably have a negative effect on your brain, you know ... a lot of times, ... something like that, your body starts to get weak in other things, like the hand eye coordination, like you may never learn how to type because you just think things out, like that finger speed that you have, that you been using on like everything, you won't have because you aren't typing. Like with video games, they get so advanced, if they do every get a thing where you do just think it out, that hand eye coordination is just going to be lost. (435:448).

Jennifer

Jennifer was a 19-year-old female who was in her first semester of taking classes

at Maple City Community College. She declined to indicate her ethnicity on the background survey. Jennifer was invited to participate in the study at the end of the semester after another participant chose not to continue. Her participation was limited to the background survey and an interview using the follow-up interview protocol and several questions from the initial interview protocol (Appendix I). The interview was conducted by phone because of time and travel constraints and this could have contributed to Jennifer being uncomfortable with the process. Her comments during the interview were somewhat brusque and brief. Many of the answers to the interview questions included the phrase "I have no clue." (5F*, 167; 171; 322; 336; 351).

Jennifer was attending Maple Community College because she wanted to become a mental health worker or psychologist. While Jennifer answered that she had no clue about many things, she was quite certain that her presence in Ms. Archer's class was a waste of time:

> I think it a waste of time for me but I had to take it but my score was for [Academic Literacy II]. (5F*, 276:277).

She did not know that the class would "computer-assisted" when she registered and was surprised on the first day to see that class was being held in a computer lab. When asked about her best learning experience was in the class, she replied, "Actually? Nothing." (5F*, 272).

> It wasn't too bad. I mean you know, the students were fine, the teacher was good, the computer was OK. And that's it. (5F*, 117:118).

Despite Jennifer's statement that everything was OK she admitted that her instructor, "Sometimes, she makes no sense, sometimes." (5F*, 239).

Jennifer wavered between taking the technology in her educational environment for granted and saying it should be banned from the classroom:

> It would be the same thing to have the computer or not have the computer, because you still have to go home and type the homework, so it wasn't very important to have computers in the class. (5F*, 176:178)

Jennifer felt herself very skilled in using computer technology and stated that she often gave technology assistance to her fellow classmates:

> Oh yeah, especially from me, because I took computer for six years. And I work at a computer place right now too. (5F*, 203:204).

> Oh yeah, you know, how to save, how to open a file, you know. And other stuff. (5F*, 212:213).

Jennifer's estimation of her classmates' technology skills was not high. She estimated that half of her classmates had never used a computer before, and that those students were the ones who most benefited from being in a technology-infused classroom. For Jennifer, any time the class spent on learning how to use the technology was a waste of time for her, and she saw that her fellow students were sometimes distracted by the Internet access in the classroom. The "chatting" she mentions in the following quote refers to an online Internet chat room.

> I think you shouldn't have computer in the classroom ... I don't know, I just don't like it. Cause we do, ... we would splitted and stuff, I don't like it. And the students was chatting and stuff too. (5F*, 385:391).

Jennifer chose the words "like the human brain." when she answered the interview question about choosing a metaphor for the computer. (5F*, 61). "Yeah! I mean it's a smart thing, I like computers." (5F*, 65). She did not have much to say about the future of computing in education other than to say that the classes will look the same with "You know, more new stuff, more technology." (5F*, 413).

John

John was a 19-year-old male White Caucasian who was in his first semester at

Maple City Community College. John was a pre-medicine major and he was hoping to go into emergency medicine. In explaining his choice of colleges, John stated: "I had to come over here pretty much ..." (6I, 51). He was following in the footsteps of several family members, including his mother, who had attended the school in the past. The family history made the school a comfortable fit for John. However, the primary reason he was attending a community college rather than a university was that he had to pay for his first year, and the relatively low tuition and the fact that he could live at home made this choice the most affordable. John saw living at home as somewhat distracting from his studies but he was resigned to being at home and going to a "commuter' school": "... it's good enough, I have to pay for my first year, so good enough." (6I, 5:6).

John enjoyed the sense of community and open learning environment he felt in his Academic Literacy II class:

> Um, it was kind of laid back and I think it was kind of a open environment, we had a lot of open conversations. (7F, 40:41).
>
> I mean, people would sit next to you and ask questions if they needed help, it was pretty open that way. (7F, 120:121).
>
> Um, that class, I definitely felt like we were all, it was kind of a community learning together (7F, 381:382) ...

He felt that Ms. Archer was: "... a leader, but she's one of those leader people who steps along side you and helps you when you need it." (7F, 73:74).

John enjoyed using the technology in the classroom, especially being able to look up facts on the Internet during group discussions:

> I mean let's say you're having a discussion and somebody brings up a point and you are not sure if it was true we'd turn around and look it up online or whatever and just double-check your point. (7F, 52:54).
>
> He thought that having the technology in the classroom made things more

interesting, was a time saver for both students and instructor, and increased his learning: "Definitely I would say that having computers made learning a lot easier." (7F, 301:302).

While John considered himself to be technologically literate, he felt that a major benefit of having technology integrated into the classroom was the impact it had on the many of his classmates who were not.

> ... there's like some kind of older people who kind of really haven't used the computer before and they're kind of like struggling ... (6I, 366:367).

> I mean some of them just didn't know how to use the computer, it was a great learning tool for that, it was good for them to step into that and now they have tools to maneuver their way around ... (7F, 101:103).

John thought the disparity in computer skills among the class created opportunities to interact and fostered a feeling of communal learning among his classmates:

> I'd almost say that with the computers people are more open to ask for help and stuff like that, then there aren't really that much chances to ask for help or kinda interact like that ... not knowing something at a computer is not as embarrassing as when you're not using a computer when you have a question like that. (7F, 228:231, 236:237).

John had almost always had technology in his life, in large part due to his parents. His father worked as a computer analyst who worked with technology all day and wanted little to do with it when he came home. Still, when John was eight years old, his father brought a computer home to the family. John remembers an orange and black screen and a computer version of the game "Wheel of Fortune." His mother and sister were the family members who encouraged John to use the computer and the Internet for schoolwork, and he later helped to guide his younger siblings in using the computer.

John described his view of the computer as "... it's like a tool. I mean, it's kind of like a toy almost ... it's more of a fun thing but there's also like work you do with it ... (6I, 217:228). At home, John family had two computers, one that had Internet access was

located in a common area and another computer without Internet access was located in his room. John did not do much with the computer in his room, since it held mostly games for the younger children in his family.

Along with using the computer for schoolwork, John used it to run a small construction business. He used the computer to make business cards and invoices for work completed but not for keeping track of his business finances. For that he preferred to use a ledger book, since he saw the setup and maintenance of finance software on the computer as not worth the time and effort.

In his personal dealings John also had reservations about using the computer. Rather than use email to contact his fellow students, he preferred to call them. He valued the face-to-face contact with his instructor, and said he would never consider taking an online course because of the lack of personal contact with the instructor and classmates.

John also saw some negative aspects to having technology in the classroom. In contrast to his perception that the technology helped to foster interaction among students John suspected that the computers in his learning environment may have displaced some of the personal contact opportunities between the students and instructor. He speculated that had he been in a class section without computers in the classroom:

> Maybe it might have been, a little more personal, maybe it'd be more interacting with the teacher, instead of like working on computers. (7F, 204:205).

John also observed that there classmates who were distracted in class by easy access to the Internet and that Ms. Archer

> ... had this thing that turned the computer screens black anyway, so it kind of helped her out. And everybody would just turn around. (7F, 182:183).

John himself was able to resist the lure of the Internet during class, "...cause I was kind

of intent on listening to what she had to say, and learning that." (7F, 169:170).

John valued the personal contact with his instructor and classmates during class time, but his speculations about the future of education included more technology and less personal contact:

> Well, I mean you'll get to a point where like, there are no teachers, or and you're just learning from a computer, almost like online classes ... (7F, 371:372).

LaRue

LaRue was a female, African-American student whose enrollment in Maple Community College marked a return to school after an eight years absence. She was 26 years old at the time of her interview and working the third shift as a laboratory assistant doing blood testing. LaRue was very clear about her reasons for coming back to school – she wanted to obtain a Ph.D. and return to the community college to teach, but she was less sure about the exact subject she wanted to teach: "... probably in science." (8I, 76). She was glad to be in an academic literacy class because she believed she needed the review of reading and writing skills in order to be successful in college and beyond, to "... to better my life education-wise." (8I, 68). She felt the discipline of attending classes was good for her, and she often came to campus straight from her job since she knew that if she went home she would go to bed and not get up in time for class. LaRue's honest and wry assessment of herself was that "I really prefer to be in school, cause I'd be lazy at times." (9F, 426).

LaRue's wry attitude also extended toward her classmates: "I liked my class though I couldn't stand a couple of people." (9F,442), LaRue said with a laugh in her follow-up interview. Things worked out well by the end of the semester, however, and

LaRue ended up feeling as though her class was a learning community where she received support:

> The group, the group. Like when we would go into groups and proofread our work, and brainstorm and come up with ideas. (9F, 368:369)

LaRue felt Ms. Archer was both a leader and a helper in class. She took control when the class needed direction but gave opportunities for peer interaction. She valued Ms. Archer's expertise and guidance:

> She cared. She ... was very knowledgeable in her profession, and with the technical part of writing, which I had never really experienced. (9F, 40:42).

LaRue had not noticed that the class was listed as "computer-assisted" when she enrolled and she felt a little overwhelmed when her return to school after eight years brought her to a classroom computer lab. LaRue had a history with technology that stretched back to elementary school, she was heavily into computers as a hobby five years ago, but when she began a full-time job she only worked with specialized computer technology related to her work and did not continue with home computing as a hobby. When she returned to school she was amazed at the developments in computer technology available to students and a little worried she would have a difficult time catching up.

> ... it's like when I start to use the computer again it's like so much has changed, somehow and I might not be able to grasp it, like with the Internet, you know, with the Internet, instant chat, you know, it was kind of basic when I was using it at first but now its, like one of the girls yesterday or Tuesday was talking about a chat area line and I was, well what is that, you know, and you know you can make like your own personal web page now, my goodness it's gotten too fancy for me. [laughs].(8I, 145:151).

But, "Everybody loves computers." (9F, 220) stated LaRue, and she saw many benefits to having the technology immediately available in the classroom rather than sequestered

somewhere off in a separate lab:

> You know, like before, it being a lab, now they have them in the classroom, which I think is good, because for that time period, you have access to the computer. (8I, 543:545).

LaRue saw the availability of the Internet in the classroom as a great benefit to improving her research skills, and as a motivating factor for her fellow students:

> Well, as far as being able to go online, as far as newspaper articles, being able to do the research, um, as opposed to having to go to the library, look up the papers, microfiche, you go right on line and just print off the articles. (9F, 132:134).

> With the, with the research. A lot of people don't like to do research, it takes a lot of time. So, people probably would be stuck in that [without the technology], you know the research part. (9F, 209:211).

Having Internet access had its downside, however, both for LaRue and for her classmates, in that it sometimes lured them from their work. Moments after LaRue stated how it was an advantage to have Internet access in the classroom, she said:

> I don't think the Internet should be ... in the classroom. It did distract some people, sometimes me, sometimes you know, I would want to go online instead of doing my work. (9F, 174:176).

But LaRue also saw other personal benefits from the use of technology in her educational environment. One was being able to organize her thoughts and ideas by using the "Inspiration" software Ms. Archer had introduced to the class. She also felt she benefited from the work she did reviewing her literacy skills with PLATO software.

LaRue's choice of a metaphor to describe technology reveals that she saw technology skills not only as a help to her and her fellow classmates in school, but also as an essential skill for success in society as a whole:

> I will say money...like money. I mean it's because like ... you need it ... in society right now, because everyone, even on my job, they use computers, everything is computers, and if you're not .... taking part in using it, then you are kind of losing out. Just like money, if you don't have it, you kind

of lose out. (8I, 364:369).

LaRue was uncertain of the future of technology in the community college
onal environment, but she was certain it would play an important role: "There will
y be a computer teaching us," (9F, 384). LaRue envisioned students in the future
e taking all their classes at home, but she wasn't sure that was such a good thing
e personally found coming to class and interacting with classmates and the
or a source of motivation for her. She thought that instructors would become the
mers of the new teaching computers.

don't know, it will probably be interesting. After all the kinks be worked
out. It'll be like "Total Recall", or one of those science fiction movies. (9F,
392:393).

At 51-years of age, Lynn, an African/American female, was the oldest participant
udy and indeed the oldest member in her Academic Literacy II class. Lynn was
l as a result of her participation in a program that helped non-traditional students
school after an absence. She had worked for many years as a cosmetologist but
open her own day care center in the future. Lynn saw herself as experienced in
but lacking in the communication skills necessary in order to raise capital to
own business. Her goal was to earn a university degree in management and she
such a degree would earn her credibility in the business world.

ynn described herself as being like the community college she attended: "...it's
e my personality, laid back." (10I, 50:51), but during her interviews she was
l emotional and often referred to her frustrations with "... being fifty-one and
he kids..." (10I, 121), with not being able to keep up with the coursework, with

struggling with the computers, and with dealing with her past.

Lynn saw many of her frustrations as the lingering effects of a difficult childhood home life. Early in her first interview, she emotionally described herself in one sentence: "I come from a divorce." (10I, 97). She and her siblings were placed in foster care and stayed "...in the system for a year." (10I, 111). The family breakup:

> ... helped, affect my schooling because when I, it was just, at a crucial time when I just began to go to school and I wanted to work hard to show my dad you know, only a kid, you know ... be the individual he expected of me ... it was devastating. (10I, 117, 120).

Lynn's difficulties at school continued through junior and high school.

> I had issues coming up that I experienced in junior high as well as high school, so, I quit and never wanted to return because it was uncomfortable, it was frustrating ... (10I, 28:30).

Now that she was back in school after an extended absence, Lynn noted limitations she attributed to her past:

> I know that I am, lower and it takes more work, and I do, I do a lot of work. For this one class, this one paper, it takes me like, I mean we're talking about hours [pauses] and it can be so very .... (10I, 361,363).

But though Lynn struggled, she was committed to succeeding in school. She felt as though at Maple Community College she had found a place where she could flourish:

> I felt that if I started back at a level where it's more mature individuals, maybe I could regain the confidence I need and the help that I need to start this process and to remain." (10I, 31:34).

> "I made up my mind ... to just get through it, no matter what comes out of it." (10I, 126:128).

Lynn saw around her a network of support and help. Though her family was broken by divorce and there were troubles with her siblings in the past, she now relied heavily on them:

> I have help .... I have people in my life who have pushed me to better

myself, always motivating, you know, to reach for my dreams, no matter what the results, because sometimes failure is something that you have to do in order to get what you need ... (10I, 130:133).

n also found support at Maple Community College.

> Well, I want to comment to the fact that the school and how it provided me with so many extra tools that I never expected ... until I learned how to reach out by listening to the instructors and you know taking the advice telling me to ask if I didn't understand, and that inspired me. And the class I just took, Ms. Archer, oh, she was just an angel in disguise. She went over and beyond her call of duty as a teacher, as an instructor, to try to provide the information, the information so that we would be successful in her class. (11F, 17:23).

And, though Lynn initially felt out of place because of her age and being "with all the kids" (10I, 125)

> ... as time went on, I felt a part of, because they kept making me feel a part of, you know, the class, because I *was* part of the class, just because of the age difference, you know, it was minor, we're still [here for] ... reason. (11F, 70:73).

Lynn learned that she could rely on others, despite her previous experiences with her parents' divorce, troubles with her sister, her school history, and the age differences between her and her classmates. While she used to be afraid to ask questions, she would now ask anyone for help: "I used to be kind of afraid to be wrong. I'll never know if I don't ask.". (10I, 292:293). By the end of the semester Lynn felt her class was a community of learners, all supporting each other:

> ... learners, working together ... I loved that course because we were put into groups so we can hear others, other group's insight into the same topic but different views, so it was more broader. (11F, 349, 351).

Lynn felt herself nested in a web of support that helped her deal with the tensions she felt from her past history and from being back in school at her age. The technology used in the Academic Literacy II class was at first a part of her tension, but later it became a support for her self-esteem and a valuable tool to help her succeed:

> Cause I know, I don't want to fail, and I'm unsure of myself and what was expected of me—could I cut the mustard ... [the computer helped] ... Yes it did, because I could be more sure of myself, be more accurate. (11F, 274:279).

Some of Lynn's first computer experiences were in classes she took at Maple City mmunity College the two previous semesters. In her first semester she learned that her k of computer skills would impede her progress and on the advice of her instructor she olled in a keyboarding class the next semester. After she began school at Maple mmunity College Lynn decided that she needed her own computer and she went to a vnshop and purchased a laptop computer. She was largely self-taught on the computer she learned by playing:

> Well, I just follow the rules, you know. Cut it on, you know, I'll see, if I don't know, you know, I just try and learn, playing with it. I don't know if it's good or not, you know. ((10I, 431:433).

n also used her network of support in order to learn about computers. Many of her ly members owned computers, including her mother. She had a brother who was a puter expert, but at times his explanations of computer procedures overwhelmed .

Lynn used the word "tool" as a descriptor and metaphor for the computer several in her interviews: "... it's a vital, vital tool now. I can't live without it now, you ." (10I, 266:267). Lynn saw the computer as a resource and repository of edge, something to help her in her schoolwork by being more accurate in fact ing, but also to help her complete tasks in her daily life, such as paying bills, ing her credit report, and seeking job information.

Though working with the technology could be a source of frustration to Lynn, access to computers and the Internet during class was also a way to increase her

lf-esteem and her comfort in class. She relied on the technology in order to increase her edibility in discussions, to help her organize her thoughts and to learn independently of e instructor.

> Yes, because any information you need, you can always pull it back up. Like a lot of time we, were like looking for a conjunction, and you can pull it right up. And you don't have to ask a whole lot of people, you can do it on your own. (11F,l 262:264).

Lynn saw the technology as instrumental in fostering interactions between her assmates and thereby increasing her feelings of belonging to the class:

> I don't believe we would have had as close a relationship at the end of the semester without the computer, the use of the computer. So the class had more togetherness.(11F, 253:255).

ıe attributed some of the increased interaction fostered by the technology to the mix of perts and novice computer users in the class:

> Well, I can say that we all ... that it enhanced us in some way even if it wasn't nothing but to give us a chance to help others, you know. Cause some was more advanced, and we could go to them and ask, you know.(11F, 167–169).

Lynn's response to a question about the future of technology in the community llege learning environment was limited to saying that things would be "faster" and that yone without access would be lost.

lly

Sally limited her participation in this study to the background survey and the tial interview at the beginning of the semester. The Academic Literacy II class at ıple City Community College was her first college class. Sally had graduated high ıool the year before and had not wanted to move from her parents' home to attend a versity. She planned on attending the community college for two years. She was the

st in her family to attend college and her goal was to get a medical doctor degree, with ossible specialization in pediatrics. Sally liked the small classes and one-on-one ention she received at Maple Community, and was glad she enrolled. She chose Maple y Community for no particular reason:

> Um, just one day I was deciding on what, um, school I wanted to go to and I knew that I wanted to do a community college first, for two years, and I just said Maple City, just a random out the hat kind of. (12I*, 48:50).

y tested into Academic Literacy II on the basis of the Maple City Community College ement test and enrolled in the particular section of the class because it was the only with openings for new students. She did not know that it was a computer-assisted on until she entered the classroom on the first day.

Sally seemed to feel that her instructor was attentive to her and a good guide igh the course. She also appreciated the staff in the Information Commons and their ulness.

> I've seen this one here and the one upstairs and they're nice, they have comfortable chairs and if you ask somebody they'll answer a question for you, they're nice. (5F*, 258:260).

Sally was impressed as well by the technology available to her as a Maple City nunity College student:

> Yeah, yeah, they're up to date, they aren't, you know, old dinosaurs, so they're up to date. (12I*,264:265)

Sally saw technology all around her:

> ... everywhere you go ... to the library—it's computers, everywhere you go it's a computer. To the store ... (12I*, 292:294).

Sally saw limitless opportunities in the use of technologies. She called the er an "information station" but it was clear from her enthusiastic responses that computers and the Internet as much more than an information retrieval system:

A computer is like, like information station, I would say. Cause you can do anything on it. There's the Internet, you can talk coast to coast, or country to country, so I think it's like an information station. (12I*, 154:156).

A computer is like endless opportunities, you can do this, talk to your friends, you know, wherever in the country, you can do so much—you can go to the doctor, even that's on the computer, about everything you do now has something to do with a computer—even school now. (12I*, 160:163).

Cross Case Analysis of the Data

In this section themes derived from the data are presented through the lenses of ıree perspectives of self, technology and self in relationship. According to systems y nothing can be truly examined outside of its context, but there is value in ifying particular elements of systems and focusing on them (Nardi & O'Day, 1999; e, 1990). In this analysis participant perspectives of self and technology are ined first and then perspectives of self in relationship to the technology-infused ng environment are considered.

ption of Self

The interviews, background surveys and researcher observations provided ient data for researcher-constructed profiles of the participants that give a sense of rticipants' past histories, family lives, life and career goals, and their perceptions of elves in the context of their daily lives. The focus of this study is the participants' otions of their experiences in their learning environment and the general profiles of rticipants help to inform an examination of the roles the participants felt they in their learning environment.

Self as Student

It is no surprise that in their interviews five of the participants—Bubbly, Jason, John, Jennifer, and Lynn—referred to themselves or their fellow classmates as "students", and this term is used in the course catalog and other official documents of Maple City Community College to describe the participants in its learning environment who are not instructors or administrators. The term "student" carries with it many connotations, especially as it relates to the student in relationship with instructors in a learning environment (Brookfield, 1995; Freire, 1990), and the perceptions of participants with a focus on themselves as students in these relationships are examined in a subsequent section.

One of the perceptions the participants had of themselves as students was that of learner, of taking on the role of a student going about the tasks of learning:

> To better my life, education wise ... yeah. (8I, 68).
>
> You know, just coming to class and listening to Ms. Archer and you know, getting myself comprehend what I need to know and do. (1I, 71:72).
>
> I'm just trying to do my best, pass this class and go on to the next one. (1I, 32:33).
>
> Well, we had to take a placement test and on one part of the placement test I didn't do so well, so I had to take this class, I had to take this class before I could move on to [the next course]. (3I, 21:23).

While the data do not support an in-depth analysis of the participants' concepts of what it meant to "learn" the quotes above suggest that the participants saw their task as learners to comprehend the material presented in class so as to acquire the skills needed in order to move on to other courses.

How well the participants perceived they were doing in their roles as learners varied from thinking they were at the top of the class to being "... one of those students

who have a little hard time comprehending information ..." (1I, 15:16). Somewhat sheepishly, Jason took his cue that he was a top student from his classmates—who continually asked him for help; and from his instructor—who held up his work as exemplars. Bubbly understood herself as being "...one of those students who have a little hard time ..." (1I, 14:15). Her assessment of herself as a slower student was reinforced by what she perceived to be the impatience of her instructor and classmates with her when she asked questions. Lynn also saw herself as a slow student, something she attributed in part to her age:

> I know that I am, lower and it takes more work, and I do, I do a lot of work. For this one class, this one paper, it takes me like, I mean we're talking about hours ... (10I, 361:363).

Other participants perceived themselves to be somewhere in between the range of top learner and slow learner. Jennifer considered the course a waste of her time, LaRue saw herself as being where she needed to be: "I knew that I needed [a] refresher course ..." (8I, 99).

Future Self as Professional

While the participants had perceptions of themselves as learners that ranged from top student to slow student, each of the study participants attending the Academic Literacy II class at Maple City Community College had educational goals that would lead to professional careers,. some of them involving many years of study. Table 1 lists the participants and the educational or life goal they hoped attending Maple City Community College would help them achieve. At least four of the seven study participants had as educational goals degrees or careers that required study beyond that offered at the community college level, and three participants had advanced graduate degrees as goals.

Two of those participants, John and Sally, hoped to attain medical doctor degrees, and LaRue hoped to obtain a Ph.D in some sort of science. Only one participant, Bubbly, was attending the community college in order to obtain a two-year associate's goal in order to qualify for the corresponding occupation in her work setting. Two participants, Jason and Lynn, were attending to improve their communications skills, in hopes of becoming entrepreneurs and business owners. None of the participants were undecided about their goals, each answered interview questions about their reasons for attending the community college without hesitation. The Academic Literacy II class in which the study participants were enrolled was a prerequisite to College Composition I, requiring that students do a semester's work before moving on to college level courses. One of the participants had previously completed several semesters of pre-college level work in which she had taken the Academic Literacy I course twice. At least three of the participants, according to the background surveys they completed, were also enrolled in pre-college level math courses, entailing at least one semester of work before the first college level math courses offered at Maple City Community College

Perception of Technology

A unique aspect of the learning environment under study was that it was infused with technology. The course was listed in the Maple City Community College course offerings as a "computer-assisted" course and the class was held in a computer lab. The participant interviews, background surveys and researcher observations provide data rich enough to examine the participants' perceptions of "technology" in general. The analysis of participants' perceptions of technology in general helps to inform the analysis of participants' perceptions of technology in the context of their learning environment.

"Everything is computers": The Ubiquitousness of Technology

During the interviews several of the participants voiced opinions with the theme that "everything is computers." (8I, 367; 2F, 37). Lynn, Bubbly, LaRue and Sally saw technology everywhere they looked—at home, at work, at school, and in taking care of their daily tasks:

> *Lynn:* [If] I want some information I will [browse the Internet]. On um, ok, about my car, which, uh, my credit report. I pay my bills online. Uh, any information you want. (10I, 279:281)

> *Bubbly*: Well, I go on the Internet finding an article, finding out what's offered on programs, just you know finding movie tickets, whatever, you know, just Internet. Going learning how to find it, ordering it on computer. (1I, 382:384).

> *Sally:* ... about everything you do now has something to do with a computer—even school now. (12I*, 162:163).

> *LaRue*: Yeah, I mean basically it have everything on it. I always remember, um, I can't think of what it was called, I think it was computer man, he was the man that stayed in the house and ordered everything... remember that, and he did everything on the computer. So, I mean that's how I kind of see it, you know eventually, to me, everything is going to be based on computer. (

They felt a need for technology skills in order to understand their world, and the world of the future:

> *Bubbly:* ... because everything is computers now and I just need to know computers, I mean just with my job, my job and to further my education, um it just, I can just see the next you know, twelve, thirteen years everything is going to be computers so you are going to have to know it. (2F, 36:40).

> *LaRue*: I mean it's because like, because to me, you kind of, to me, you need it ... to and to in society right now, because everyone, even on my job, they use computers, everything is computers, and if you're not .... I guess, taking part in using it, then you are kind of losing out. Just like money, if you don't have it, you kind of lose out. (8I, 365:369).

> *Jason:* Oh yes. They probably will have something so fast you will just think about it and it will pop up. But um, well, I mean, um, everyday, you

> know every couple of minutes a new technology pops up. I think, you know, the computers we're using now will be like the Apples we used to use in like '85, '86 or whatever. You know, the students ... will probably be a little more smart on computers, because you know the people grow up now with computers in their homes, you know, you got them all day, you know when probably me and you was growing up we didn't have computers in the house, you know so. I mean when we was real young. So I think in twenty years the students will be much more computer smart. (4F, 421:430).

Computer Metaphors: Computer as Object

One structured question in the interview protocols asked students to fill in the blank in the following sentence: "A computer is like _____." Several of the participants used some variation of the word "tool" to either complete the sentence or find some other way to describe how they saw technology. John said: "... it's a great learning tool." (7F, 102) and Lynn called the computer "... a resourceful tool ..." (I10, 265). John also described technology as a "toy" (6I, 233) and Sally used the phrase "information station" (12I*, 154):

> *John:* I mean you can play around on the Internet, you can play games, you can do a lot, you can put more money into it, I mean it's like a game. (6I, 217: 219).

> *Sally*: A computer is like, like information station, I would say. Cause you can do anything on it. There's the Internet, you can talk coast to coast, or country to country, so I think it's like an information station. (12I*, 154:156).

Sally also saw technology as "endless opportunity" (12I*, 160). while LaRue said technology was like "money" (8I, 36)—both referring to the importance of being able to use technology in order to succeed in today's technological world. In contrast, Bubbly's choice in completing the sentence during the interview was to say that computers were "Very overwhelming" and "kind of stressful" (1I, 221).

Most of the metaphors for computers offered by the participants revealed a

perspective on technology as an object to be used by them to accomplish tasks or succeed at attaining goals. Two other metaphors offered by participants hinted at a consideration of technology and its potential as something more than as an object to be used:

> *Jason*: Computer is like ... a person, that uh, you kind of like, write things out like you telling a person, like you writing a person a letter, you can kind of write it out even though it can't respond back to you ... (3I, 148:150).

> *Jennifer:* Like technology. I don't know. Like the human brain [laughs] .... Yeah! I mean it's a smart thing, I like computers. (5F*, 61:65)

The Third Literacy

The participants enrolled in the particular sections of Academic Literacy II because the campus it was held on was conveniently located or the time it was offered fit into their schedule. None of the participants enrolled in the Academic Literacy II classes because of the "Computer-Assisted" notation listed in the Maple City Community College course schedules. In fact, some of the participants were surprised at the computer hardware when they walked into class the first day:

> *Bubbly*: I'm like, oh my God a computer. I'm like, my God, we're going to be working on computers, I don't know anything about computers ... (1I, 229:230).

Jennifer also said she was "surprised" (5F*, 94) to see computers, and though LaRue noticed the notation "computer-assisted" she chose the class only because it fit her schedule:

> Ummm, at first I didn't realize, until when I was looking in the brochure, I thought maybe we was just going to be using computers, but as far as what is going to help you, no, I didn't know it at first. (8I, 112:114).

Some of the participants came to Maple City Community College with few computer skills, and there was no formal effort by the college or instructor to assess the

participants' technology skill level.

> *Bubbly*: Ms. Archer didn't really ask about our computer knowledge, she just said turn them on and then we would work with her, but, and I would ask questions frequently, how do you do this and how do you do that, and then she reco ... said maybe you should take a computer class while you're here, so that's what she said, that's what she said. So. (1I, 235:239)

LaRue agreed that no one asked her before she enrolled if she knew how to use a computer, but : "I knew the basics...:" (8I, 498). Lynn's lack of computer skills hindered her progress in her first semester and caused her to have to retake the Academic Literacy I class:

> By me not having any computer skills, the last part of program, you know, the course, I found out that I needed to have computer skills, and I took an incomplete. So, I, you know, went through the whole process and I re-enrolled, and I took a computer, a keyboard class. (10I, 61:64).

Lynn expressed the belief held by several other participants that being technologically literate was essential for success in school and success in society in general.

> Well, any way they [the school] could find out how, how, you know, where a person is at, what level they are ... at, in their computer skills, because without THOSE tools, you know, they going to be lost, later on, in the class. I don't care how bright you are .... (10I, 321:324).

> *LaRue*: I mean it's because like, because to me, you kind of, to me, you need it ... to and to in society right now, because everyone, even on my job, they use computers, everything is computers, and if you're not .... I guess, taking part in using it, then you are kind of losing out. Just like money, if you don't have it, you kind of lose out. (8I, 364:369).

> *Sally:* ... about everything you do now has something to do with a computer—even school now. (12I*,162:163).

Several participants felt that the technology skills they gained or improved as a result of attending the Academic Literacy II class would help them attain their educational and life goals:

> *Jason*: It's gonna help me in my next class, it's going to help me when I need to do things at home, and I know a few programs that I want to install that I know are going to be useful for me in the future. (4F, 95:97).

> *Lynn:* Well, it has enhanced, and I have been playing more with my computer and I'm learning more about the computer. It's intriguing. It's exciting knowing, learning new things and tools that I can do with, you know, tools that I can use that will help me in everyday life—the computer. (11F, 29:32).

> Bubbly: Well, it helped me pass my class! .... Well, that presentation that I had to do? It was called Powerpoint. Well, I never learned Powerpoint ever, until I learned it in just the last sixteen weeks. And without learning Powerpoint I would have never been able to do my final and pass the semester. And, I you know I do my homework on the computer, I did my papers on the computer. (2F, 253:257).

Though none of the participants were seeking a computer-assisted class when they enrolled for the semester, by the end of the class they acknowledged the importance of the access to technology and the development of their computer skills to their academic success.

> *Bubbly:* Uh, yeah, the class actually made me make the decision [to buy my own computer], uh, because everything is computers now and I just need to know computers, I mean just with my job, my job and to further my education, um it just, I can just see the next you know, twelve, thirteen years everything is going to be computers so you are going to have to know it. (2F, 36:40).

The increased sense of technological literacy Bubbly and others developed in the educational environment of the Academic Literacy II class enhanced their assessment of themselves as learners and at the same time opened up to them new possibilities for learning.

> *John*: Definitely I would say that having computers made learning a lot easier. Just for like lecturing and looking at the notes and stuff like that. (7F, 301:302).

> *Bubbly:* Yeah, it did, cause I got the chance to kind of like have a little free time one night before class started and I was just playing on the computer and I was just like wow, like this had a lot of... opened my mind

up really big, you know, wow it's like all this information I can know about, you know, I mean, like go beyond your horizons, you know what I'm saying? It was interesting. (2F, 93:98).

Jason: I think it has shown me other angles to do things, you know, she give us little brochures or handouts that on how to get to certain things that I never thought about getting to before, you know sometimes things can be real tricky—you be looking for something, you got to be direct, you put one thing that's wrong and it send you to a whole 'nother area, you know. She's pretty good at showing us how to get to certain things, so... but I wasn't expecting to use a computer as much as we do in class. (3I,277:283).

Lynn: whenever we were learning, we can always learn more if we put it in the computer and or we had any doubts we could put in the computer and it would broaden, you know, give us more information so that we have the more information, the more ways you have to, you know, to see and utilize whatever it is. (11F, 360:364).

Lynn also felt that the technology skills she gained in the Academic Literacy II class helped her to be an independent learner.

Lynn: Well, it helped me when I know she [Ms. Archer] was busy and I had to, you know, some knowledgeable things she taught me how to go to the source and to the dictionary, so you know it helped her, me with not having come and interrupt her .... the computer has so much knowledge, and to, you know, it's just about learning the resources, how to get the knowledge.(11F, 220:223, 233:234).

Lynn: ... because any information you need, you can always pull it back up. Like a lot of time we, were like looking for a conjunction, and you can pull it right up. And you don't have to ask a whole lot of people, you can do it on your own. (11F, 262:264).

Both John and Lynn commented on the advantage of having the technology available in class:

John: And even when she wanted us to look up a word you just turned around and looked it up right away .... the looking things up in conversation, how backing things up, and that way yes .... I mean I really like it being at my fingertips during the class. (7F, 16:17, 46:47, 96:97).

Lynn: I don't want to fail, and I'm unsure of myself and what was expected of me—could I cut the mustard. [The computer helped]I could be more sure of myself, be more accurate ... (11F, 279).

While the participants were enrolled in the class on the basis of the Maple City Community College test of academic literacy, and the course was intended to help students improve two literacy skills—reading and writing—the students gained skills in a third literacy of technology that they felt would help them reach their academic and life goals.

Perception of Self in Relationship

In this section the scope of the analysis is widened to examine participant perceptions of the self and technology in the context of the learning environment and in relationships with "other" as defined earlier in this chapter. Participant perceptions of self in the learning environment as a whole are examined, and in particular participants' perceptions of the influence of technology on self in the learning environment are discussed when it appeared in the data.

Community of Learners

"Comfortable" was a word used by several of the students to describe how they felt in the learning environment:

> *Jason*: Oh, I felt comfortable, everybody in there was real nice. They didn't have like bad attitudes, or what ever, everybody always asked everybody for help and everything, I really felt comfortable in the class. (4F, 39:41).

> *Jason*: ...Ms. Archer, she made me feel real comfortable and the student made me feel real comfortable ... (4F, 243:244).

> *Lynn:* ... made me feel more comfortable, and it made me feel more comfortable when I was called on ... by being in small groups I had a chance to express myself, I HAD to express myself and put some input, where I normally sit back and listen, I had to put more into it, the class and I found out that I, also had something to say that they didn't see, you know, or wouldn't know if I hadn't put something in with it. (11F, 83:89).

John used a slang expression to describe his comfort in the learning environment:

> ... it was kind of laid back and I think it was kind of ah open environment, we had a lot of open conversations. (7F, 40:41).

Even Bubbly, who had many complaints about her treatment at Maple City Community College expressed her comfort: "... I just felt like I fit in with the other, uh, people that went there." (2F,83:84).

Though Jason thought his fellow students considered him the top student and Bubbly thought they looked on her as a slow student, they and the other participants perceived their learning environment as a community were they learned from each other. Jennifer described the class as "... a group all together .." (5F*, 364).

> *John*: ... that class, I definitely felt like we were all, it was kind of a community learning together, so ... (7F, 381:382).

> *Lynn*: ... learners, working together ... I loved that course because we were put into groups so we can hear others, other groups' insight into the same topic but different views, so it was more broader. (11F, 349:351)

> *Bubbly*: Yeah, cause we would get in small groups before we would get on the computer, and talk, it's called peer review—and everybody would help each other out, and then after we would get our ideas and thoughts out, then we would all go to our computers and go do what we had to do. So, and it was you know a learning thing, you know, Ms. Archer didn't always, she didn't always, you know, was the leader for us as students. We didn't always follow her, she just gave us the tools and the steps and we just did it on our own. (2F, 732:738).

> *LaRue:* Everybody working together. Everybody, we got in our groups, we discussed a lot of things, you know, we talked outside of class, about you know work and stuff, I think we really got together and tried to help each other out.

> *Jason:* Everybody, we got in our groups, we discussed a lot of things, you know, we talked outside of class, about you know work and stuff, I think we really got together and tried to help each other out. (4F, 368:370)

The open and sharing atmosphere in the Academic Literacy classes was apparent during two site observations conducted by the researcher. The two three-hour classes

observed were composed of short large-group sessions where the instructor presented or reviewed material. A large portion of the class-time was devoted to structured small-group interaction, where groups of five or six participants met with a peer facilitator while other students devoted themselves to individual work-time at computer stations.

The tenor of collaborative learning in the classrooms seemed in large part to be due to the teaching style of Ms. Archer. Her emphasis on group and individual work rather than lecture and presentation appears to have led to an environment where the students were encouraged to help each other and use the technology in order to do their academic work.

> *Jason*: The students you know are real nice, she [Ms. Archer] have us get into groups and have a lot of different discussions—get a lot of different opinion on things, I think that's a good thing, because sometimes you have an outlook on one thing, but when you have somebody else talk about it, you have a better understanding or outlook on it, so... (3I, 36:40).

Jason echoed Bubbly's comment that "... Ms. Archer didn't always, she didn't always, you know, was the leader for us as students. We didn't always follow her ..." (2F, 736:737):

> I think she's a leader, but she's one of those leader people who steps along side you and helps you when you need it. (7F, 73:74)

Jennifer, in discussing Ms. Archer and her roles as leader and helper, said, "Well, actually she was a little bit of both." (9F, 107). Ms. Archer would take the lead when the class seemed to need direction:

> *LaRue*: I mean she, sometimes the class would get out of hand and then she would get us back on track, and then if we had questions, she always answered them and helped us. (9F, 111:113).

> *Bubbly*: ... she was a leader, she led us through the class. You know, taught us what we needed to learn. (2F,228:229).

Several of the participants were also impressed with Ms. Archer's caring attitude

toward her students. Lynn waxed poetic:

> ... Ms. Archer, oh, she was just an angel in disguise.(11F, 20:21).
>
> Oh, she displayed leadership, she displayed um, ability to, um understanding, you know, cause a lot of times a lot of teachers get frustrated when you ask the same, you know, the same thing over and over, um, she put a lot of love into the course. You know, you could see that she loved what she was doing cause she never displayed frustration with us, always willing to give us extra time, even during her lunch break—I've seen her countless of times, not only during my class, I had went to her, to her classroom after I got through with my tutor session, and she was in there helping students, you know. And another thing that I observed, she gave all of her students time, she wouldn't, you know, have one special student, she would cut it up so everybody would have a chance. (11F, 120:129).

Jason and LaRue agreed with Lynn about Ms. Archer's caring attitude toward her students:

> *Jason*: Ms. Archer was a little more personal with me. You know, she really was real patient, you know if I really needed help she sat with me and talked.(4F, 31:32).
>
> *LaRue:* She, uh, she cared. She, um, and she knew, she was very knowledgeable in her profession, and with the technical part of writing, which I had never really experienced. (9F, 40:42).

Besides LaRue, other participants commented about Ms. Archer's expertise and teaching technique:

> *John*: I mean she was a very good teacher, very knowledgeable and that aspect. (7F, 67:68).
>
> *Lynn:* Well, uh, she was really knowledgeable of the programs, she showed us how to utilize, and she demonstrated them as she introduced them to us, so it was helpful, and if she had to go back she would always be willing to go back and stop, even stop, so that we can grasp and ask questions, so that no one would be left out. (11F, 134:138).

Some of the participants thought the technology infused into the classroom acted as a catalyst for student interaction; that people felt comfortable asking for help with a computer problem because, as Jason—the participant with the custom-built computer

system—observed: "... don't nobody know everything about computers..." (3I, 97:98).

John commented that:

> People might be a little more that ... not knowing something at a computer is not as embarrassing as when you're not using a computer when you have a question like that. (7F, 235:237).

The participants felt that communication increased because of difficulties encountered by their classmates in working with the technologies.

> I think that I wouldn't have as much conversation because a lot of times they would call on me about the computer, about the papers and stuff like that if they was typing, or whatever, without the computers in the class they would have been doing it at home then, you know I wouldn't have had as long a conversation as I had. (4F,161:166).

Several participants recalled instances of helping or being helped with technology by a fellow student during class:

> *Bubbly*: Yeah, Lynn had a hard time, me and Lynn and I were kind of like on the same wavelength when it came to stuff like that, really didn't know how to use the computer either, so then I would show her, told her I'm learning how to do it, so ... (2F,604:609).

> *Jason:* ...like this was my first time doing a Powerpoint, there was this girl in there, she was showing me how to do it, and you know showing me how to do the sounds and that stuff, yeah, it really helped us to develop relationships with each other. (4F, 383:386).

> *Jennifer*: Oh yeah [they got help], especially from me, because I took computer for six years. And I work at a computer place right now too ..... Oh yeah, you know, how to save, how to open a file, you know. And other stuff. (5F*, 203:213).

> *John*: Yes. I mean, people would sit next to you and ask [computer] questions if they needed help, it was pretty open that way. (7F, 120:121).

Lynn summed up the experience of working with technology together with her classmates this way:

> Yes, we were able to, you know, laugh ... and it brought us closer .... Well, I don't believe we would have had as close a relationship at the end of the semester without the computer, the use of the computer. So the class had

more togetherness. (11F, 249: 255).

But some of the participants questioned the role of technology in fostering a sense of community in their educational environment. Bubbly stated that at times her classmates would ignore her attempts at conversation and "They'd be bothering with the computer than to talk to me! Yeah." (2F, 398:399). John, speaking of the negative effects of having computers so readily available in the classroom commented that "... maybe in the long run you may have more computers than you have ... human interaction otherwise." (7F, 366:367).

Bubbly saw other instances of technology as being a distraction in the learning environment from the work of learning. In commenting on seeing some classmates surfing the Internet for what she considered purposes not related to the class she said:

> ... you know, you're not learning anything. You are supposed to focus on the teacher and what you are learning, you're not learning. I mean, the Internet's always going to be there, you know. You can take at least just an hour to learn, you know? (2F, 334:337).

Jennifer stated flatly: "I think you shouldn't have computer in the classroom." (5F*, 385).

> I don't know, I just don't like it. .... And the students was chatting [in on-line computer chat rooms] and stuff too. (5F, 389:391).

LaRue also commented on students being distracted during class time:

> Ah, a couple of girls, one was [name], um, I think it was [name] ... I can't think of the other one's name, there were a couple that I seen that were distracted by the Internet. .... Yeah, that were doing the Internet, yeah, we had things to type and they weren't doing it—it put them behind a lot. (9F, 274:281)

And while the participants enjoyed a camaraderie with their classmates and often commented on the relaxed and collaborative environment that was their classroom, the data also suggests that the participants in this study often felt superior to their classmates, especially in their perception of their own computer skills compared to those of their

classmates. The assessment participants made of their fellow classmates' computer skills were not high:

> *John:* ... there's like some kind of older people who kind of really haven't used the computer before and they're kind of like struggling, and so... (6I, 366:367).
>
> *John*: I mean some of them just didn't know how to use the computer ... (7F, 101).
>
> *Jason:* ... a lot of people are computer illiterate (4F, 335).
>
> *Jennifer*: Some of them didn't know how to use the computer at all. (5F*, 199).
>
> *LaRue:* ... some people were kind of, uh, remedial when it came to using computers. (9F, 150:151).
>
> *Lynn*: I can't even think of her name right now, one of my fellow classmates, she was kind of computer illiterate, and I seen her get kind of frustrated ... (11F, 294:296).

Jason was one of the few participants who related being helped by a person other than the instructor when it came to computer skills. More participants related instances where they were the person helping others. In some cases this was a source of pride, and for others just a matter of fact:

> *Jason*: I mean I think there's a lot of people who get a better understanding of computers, cause some people be asking me a lot of stuff in class, like this this, this ... (3I, 303:305).
>
> *Jennifer*: Oh yeah, [they got help] especially from me, because I took computer for six years. And I work at a computer place right now too. (5F*, 203:204)

Even Bubbly, who considered herself at the bottom of the technology skill continuum, saw herself as being the helper to a fellow classmate:

> Yeah, Lynn had a hard time, me and Lynn and I were kind of like on the same wavelength when it came to stuff like that, really didn't know how to use the computer either, so then I would show her, told her I'm learning how to do it, so ... (2F, 604:609).

Several participants commented on the campus of Maple Community College outside the classroom, particularly the "Information Commons", formerly called the library. It was there that students went before or after class to work in small groups or, for some participants, to access technology that they did not have at home.

> *Bubbly:* Yeah, we even went up to the library to the computer lab, she was sitting at a computer and we would work together. (2F, 619:620).
>
> *Bubbly:* Oh yeah, I spend all my time there. Well, that's where I get most of my computer access, so. (1I, 325:326).
>
> *Jason:* I think they are really helping a lot of people out, I maybe been in there like four or five times, I had to finish my Plato, we had to do that there. It seemed to be like a lot of students there typing their papers, you know some people can't afford computers at home, you know, so I think that that's a good thing, they won't always have to go to a friend's home, you know they can take an hour or two out of the day and go up there and use computers, I think that really beneficiary to the students. (4F, 346:352).
>
> *LaRue:* I go to the [public] library. I really don't use the computer at home. Cause my dad, I mean he's good with computers, but he's got too much stuff on his desktop [laughs] ... But other than that I go to the library, or here [Information Commons]. (8I, 424:432).

Participants described the staff in the Information Commons as very helpful:

> *Jason*: ... they probably got to go help a lot of people out, getting them started with this or getting started with that, that's probably the only negative for the staff, but they are very nice, I mean I never seen them getting mad at someone or get frustrated, so ... (4F, 356:359).
>
> *Bubbly*: very, very good. About fair, you know, about equal. Very good, I have to admit. Yes. Whenever I needed something I got help. (1I, 320:321).

The participants perceived the availability of technology in the Information Commons to be indicative of how much the college valued them as students and cared for their success:

> *Bubbly*: ... I don't think anybody off the street could come and just go use the [computers], you know what I'm saying, I'm a college student and I

can go and use this, rather than someone that's just off the street can't just come and do what ever they want in the computer area, you know. So you know what I'm saying, it kind of gives you a burst of ego, you know? (2F, 751:755).

Computer as Teacher

The participants not only saw technology integrated though out their lives, they also believed that technology integration would increase as they got older. Some of them envisioned educational environments dominated by technology rather than humans. A final interview question in the follow-up protocol asked participants to envision the community college classroom of the future:

> *Bubbly*: Um, I don't think we'd have a teacher any more, I think we'd just have a computerized instructor—it'd be like one of those robots you see. And that would be teaching the class. And then we'd just be doing our work on our computers, to be honest with you. It'd be computerized instructors. (2F, (769:772).
>
> *John:* Well, I mean you get to a point where like, there are no teachers, or and you're just learning from a computer, almost like online classes .... so. (7F, 371:372).
>
> *LaRue*: There will probably be a computer teaching us [laughs] .... I don't know, it will probably be interesting. After all the kinks be worked out. It'll be like *Total Recall*, or one of those science fiction movies. (9F, 384:394).

Three of the seven participants saw a classroom where technology displaced a human as an instructor. Jason saw a direct human/computer interface in the future, with detrimental effects:

> … you might like put on a headpiece or something and just thought, I know they got that thing now where you just tell it, but I think then it'll be you just think it, you know, like it probably pick up brain waves or something ... I think that it will be good but it will probably have a negative effect on your brain, you know, um, a lot of times, you uh, try the [???] thing or something like that, your body starts to get weak in other things, like the hand eye coordination, like you may never learn how to type because you just think things out, like that finger speed that you have,

> that you been using on like everything, you won't have because you aren't typing. Like with video games, they get so advanced, if they do ever get a thing where you do just think it out, that hand eye coordination is just going to be lost. (4F, 435:448).

Summary

The participants in the study perceived the infusion of technology into their learning environment as a necessary and normal process that enhanced their learning and their sense of moving toward attaining their high educational and life goals. They saw all around them the influence of technology in their daily lives and deemed technological literacy as an essential element for success in school and in society at large. They credited their school, their instructor, their fellow classmates, and themselves for creating a learning community enhanced by enabling technology. Their perception of the technology infused into their learning environment was that of enabling tool and resource, bent to the service of their learning by the human inhabitants of the learning environment.

CHAPTER FIVE

CONCLUSIONS AND IMPLICATIONS

Overview of the Study

The American community college has adopted the concept of the "Learning College" as its ideal and it has invested large sums in the promise of technology as a transformative agent in order to reach this ideal (Milliron & Miles, 2000; O'Banion, 1997). Proponents see technology infusion into the community college as a force that will revitalize the democratizing mission of the community college for a new age and result in increased access and opportunities for the American public. While technology proponents have heralded the transforming effects of technology in education, other scholars caution that the infusion of technology into environments can also have unexpected and unwanted consequences—such as decreased access and opportunities (Burbules & Callister Jr., 2000; Hauptman, 2001; Resnick, 2000). While research has been conducted on the effects of technology in education, much of it has focused on the use or non-use of technology by teaching faculty, or attempts to measure the "difference" between learning with technology and without. Little research exists on the effects of technology in the educational environment from the student perspective. If the community college is going to indeed become the learning college, an understanding of the effects of the technology from the perspective of its key constituents—its learners—is needed.

This study is an attempt to add the voices of the community college student to the discussion of the effects of technology in educational environments. The primary research question guiding this study was: "How do students participating in a community

college learning environment perceive their experience of the infusion of new emerging technologies into their learning environment?"

The study was conducted using a qualitative design and data were collected at two points during one semester at a community college located in a metropolitan area in the Midwest United States. Seven students from two classes, both classes facilitated by the same instructor, were interviewed at the beginning and end of the Fall semester in 2002. The interview protocols were semi-structured and the interviews were audiotape-recorded and transcribed. The transcripts and other data—background surveys, field notes of site visits, and collected documents—were analyzed for common themes related to the research question. These themes were categorized into three broad perspectives: Perception of Self, Perception of Technology, and Perception of Self in Relationship. Participant profiles were constructed using the framework of the three broad perspectives and using extensive quotes and rich thick descriptions drawn from the interviews and other data. A cross case analysis of the profiles was conducted and a summary of the perceptions of the participants about the infusion of technology into their learning environment was constructed.

The students in this study perceived the infusion of technology into their learning environment to be consistent with the ideal of the community college as a democratic, learning-centered institution. The technology infusion, guided by the human actors in the environment, served to enhance their access to higher education, the course content, and society as a whole. They saw the technological literacy they developed in their educational environment as essential to their academic success and their full participation in American society as a whole.

However, while technology was indeed instrumental in the shaping of the learner-centered environment, it was primarily the "high humanity" involvement of the instructor, school staff, and classmates and the ways they used "high technology", that guided its formation.

Conclusions

Student Perceptions of Technology Infused Into Their Learning Environment

The primary research question guiding this study was: "How do students participating in a community college learning environment perceive their experience of the infusion of new emerging technologies into their learning environment?"

The participants in this study perceived the technologies as an essential part of their educational environment and as an opportunity to learn the technology literacy skills they deemed essential to their academic success. They believed that the infusion of technology into their educational environment reflected the ubiquitousness of technology in the greater society.

They often repeated the mantra "Everything is computers". Their belief in this mantra was reinforced wherever they looked in their daily lives, at work, at home and at school. While many of them learned some technology skills in informal ways through family members, work colleagues, or just playing on their own, the community college educational environment offered them a unique opportunity to learn to bend technology into the service of helping them achieve academic success.

High Technology and High Humanity

> *Bubbly*: I don't think it's necessarily always the computers. It's the people—the teachers, the counselors. The computers are just there to be another resource to learn or buying something. (2F, 696:698).
>
> *Jason*: ... the computers probably didn't have any effect on me wanting to come to class, it was more, you know, I wanted to get a good grade. She made me feel real comfortable, Ms. Archer, she made me feel real comfortable and the student made me feel real comfortable, so, I don't like to uh, be absent I want to be there, you know everyday. (4F, 241:245).

The participants in this study had a positive experience in a classroom environment characterized by a feeling of community and collaborative learning. The environment, while infused with technology they found enabling, was less shaped by the hardware and software than by their instructor, their classmates, and themselves. Ms. Archer facilitated the class in a manner that emphasized group work, collaboration, and personalized instruction, supported by technology. The students themselves felt a camaraderie in working to overcome technical difficulties. The college staff in the Information Commons were a human infrastructure to the library, now overrun with computers. The participants saw the school's investment in technology as a vote of confidence in their value as students, and they saw their instructor's infusion of technology into their learning environment as evidence of her caring about their success. It was the "high touch" of human interaction that shaped the participants' perception that the technology infused into their learning environment helped to foster a learner-centered environment.

Student Perceptions and the Learning College

While the participants were relatively unaware of the educational jargon

surrounding the concept of "The Learning College", "learning communities", and "learner-centered institutions", they were very aware of Maple Community College as the college that focused its resources on them as students and their efforts to reach their goals. The participants were appreciative of their educational environment, their instructor, the staff in the Information Commons, and the technology resources made available to them. They understood that Maple City Community College was a learning college because of what they had experienced during the semester.

Student Perceptions, the Learning College, and the Promise of Technology

A thorough understanding of the role of technology and its efficacy as a means in reaching the ideal of the learning college as envisioned by O'Banion (1997) and others (Milliron & Miles, 2000) requires the insights of some of the most important key constituents of the community college—its students. Such insight can be gained by an evaluation of the educational environment at Maple City Community College according to O'Banion's (O'Banion, 1997, p. 45) six principles of the learning college through the lenses of the perspectives of the participants in this study. This examination can help lead to insight about how the promise of technology was being realized in the educational environment they inhabited during the Fall semester of 2002.

The learning college creates substantive change in individual learners.

This study benefited from a two data collection point design. Interview data were collected from students at the very beginning of an educational experience and a few weeks after the experience had concluded. It was therefore possible to examine the data for evidence of change. O'Banion provides an explanation of how the principle of

creating substantive change should be an embedded value in the learning college that drives all its processes. He sums up his definition of substantive change in this sentence: "Learners will be exploring and experimenting with new and expanded versions of what they can become." (O'Banion, 1997, p. 49). Some of the participants did perceive substantive change in themselves, and for some of the participants, the change had to do with the possibilities they saw with the technology skills they gained during the class. One such participant was Bubbly, who was transformed from a person "overwhelmed" by the computers she saw on her first days of class to a person who, by the end of the semester, found technology so essential that she was going to purchase a system for her very own. Another participant, LaRue, became excited by the possibilities of some of the software she encountered in the educational environment, and saw potential for harnessing her creativity through the software. These learners were "... exploring and experimenting with new and expanded versions of what they could become" (O'Banion, 1997, p. 49), enhanced by the technology they learned to use at school.

The learning college engages learners as full partners in the learning process, with learners assuming primary responsibility for their own choices.

In O'Banion's ideal learning college, learners are met by a host of services that help them construct personal profiles that "... illustrate what this learner knows, wants to know, and needs to know." (p. 50). This profile is then used to help learners develop goals and action plans, and to put them in charge of their own learning, with each participant following custom paths and timelines to achieve their educational and life goals. In O'Banion's scenario, technology takes on the task of coordinating the enormous amount of administrative overhead such an enterprise would entail. Technology also

changes the role of faculty in ways that suit the learning college:

> In the learning college, the instructor no longer has to be the sole knowledge expert trying to keep up to date with an exploding field of information. Information is simply there. It is readily available to everyone, immediately accessible, easily compiled, and creatively presented. The instructor in the learning college is now free to become a learning facilitator, assisting learners in accessing and organizing information, and, more importantly, assisting them in analyzing and using that information for their personal learning. (O'Banion, 1997, p. 75)

Few community colleges in the United States have realized the dream of a system that completely customizes learning experiences for its constituents. The participants at Maple City Community College were assessed and placed into the Academic Literacy II classes based on their performance on a placement test. Typically, beginning community college students have no choice but to take the courses required as prerequisites based on their performance on the institution's placement test, and in fact the course catalog of Maple City Community College states that "The College reserves the right to administratively drop students from courses for which they do not meet the requirements." While this system does serve to customize a student's educational program somewhat, it certainly does not allow for customization to the degree O'Banion envisions.

Maple City Community College does offer further customization of a student's study path though the use of technology, however. One of the course requirements in Ms. Archer's Academic Literacy II classes was that students spend time with the PLATO Learning System (PLATO Learning Inc, 2003). The PLATO website page for "Two and Four Year Colleges" describes its product as follows:

> With an increasingly diverse student population, these institutions are presented with many challenges, including how to provide individualized instruction to meet specific needs.

> Whether your learners are recent high school graduates or adults continuing their education, a growing number will need to improve their basic skills before they can proceed with their studies.
>
> Our learning technologies can assess skills and prescribe quality, self-paced, interactive instruction that allows learners to acquire the competencies they need. (PLATO Learning Inc., 2003).

The PLATO courseware at Maple City Community College was available to students in its Information Commons. Also available in the Information Commons was access to other types of educational software, as well as Internet access.

The learning college creates and offers as many options for learning as possible.

O'Banion relies heavily on technology in his description of how the learning college will offer options for learning. He describes

> Stand-alone technological expert systems that respond to the idiosyncrasies of a specific learner, guiding and challenging the learner through a rich maze of information and experiences. (p52).

According to O'Banion, technology will also be the management system that tracks all the learners taking advantage of all the options.

Among the learning options at Maple City Community College were the PLATO software system and other learning options provided through technology in the Information Commons. Another of the learning options available at Maple City Community College is distance education through online courses. "... the College offers a variety of distance learning opportunities to students who need, or want, an alternative to the traditional classroom experience." (college catalog). Online education has created a fervor in the literature, with proponents heralding it as the death knell of higher education as we know it (Perelman, 1992) to those who see it as the path to efficiency and transformation of higher education. (Collis, n.d.; Mendenhall, n.d.; O'Banion, 1997).

O'Banion sees online education as one of the ways the learning college fulfills its mission of providing "... educational experiences for learners anyway, anyplace, and anytime." (O'Banion, 1997, p. 70). The participants in this study, however, were not so sure. John and LaRue were quite certain they would not enjoy taking online classes because of what they perceived as a loss of human contact in the educational environment. To them interaction with an instructor was a very important aspect of their educational environment.

Implicit in this principle of the learning college is an answer to critics who question the role of technology in creating a digital divide (Galdieux & Swail, 1999; Warschauer, 2000). The participants in this study overcame barriers to physical access to technology in many ways, from purchasing a laptop at a pawnshop to going to their local public library, but primary among their sources was the technology provided at Maple City Community College. And, perhaps even more importantly, the other barriers to access, such as those of technological literacy and context (Warschauer, 2003), were lowered by the participants' involvement in the educational environment at Maple City Community College.

The learning college assists learners to form and participate in collaborative learning activities.

The study participants did participate in collaborative learning activities through the peer review groups and the ways that they worked together informally during class. Novices found experts and students moved from novice to expert and back, depending on the situation. The role of technology in promoting collaborative activities as envisioned by O'Banion (1997) and others (Gay & Grosz-Ngate, 1994; Huynh, 1999; Moeller,

1995), however, was not realized in the Academic Literacy II classes in this study. In these two classes technology served to make the participants part of a learning community, not because of the ways it facilitated communication and collaboration, but because of the difficulties the students faced in using it. In some instances, the students had to collaborate with each other, with Ms. Archer, and with the staff in the Information commons in order to overcome the technology. The perception was that everyone has trouble with technology from time to time and there was no shame in asking for help in overcoming a computer related problem. As Jason commented: "... you know I don't know everything about it, don't nobody know everything about computers ..." (I3, 97:98).

The learning college defines the roles of learning facilitators by the needs of the learners.

"Everyone employed in the learning college will be a learning facilitator." (O'Banion, 1997, p. 45). O'Banion's vision of instructors at the learning college are people who have many roles, ranging from the traditional lecturer to guide, tutor, coach, to the nurturer of interpersonal relationships (p. 58). In the educational environments in this study, Ms. Archer did indeed vary her facilitation of participant in ways that were dictated by the need of the learners or of her need to get content out to the class. Participants saw technology as making part of Ms. Archer's life as a teacher easier. Lynn used the technology and her classmates as a content experts, and felt she did not have to "bother" Ms. Archer as often for questions on content. In a similar way, John and Jason saw that the way Ms. Archer used technology to present content freed her up from having to rewrite material for every class. They also enjoyed the access to the Internet and other resources during class that they could use to consult if they had questions. These

participants saw Ms. Archer freed up by technology to spend more time giving students personalized instruction.

Another way participants saw technology help Ms. Archer assume her changing roles as an instructor was through her use of the computer software "Synchroneyes" (SMART Technologies Inc, 2003). This software allowed her to seize control of the entire classroom network and each student's computer. While the software has many capabilities, Ms. Archer used it primarily to gain the attention of the class by blanking the screens of the student's computer and displaying the message "Eyes to the Front Please." One participant found this very annoying:

> That's stupid. That is so stupid. I mean, you're in college, you have to put that on there? I mean if it's that serious, then they shouldn't have the computer in there. (8I, 585:587).

Others, realizing the lure of the computer screen, saw the technique as a useful way to get the class on to the business at hand.

The learning college and its learning facilitators succeed only when improved and expanded learning can be documented for its learners.

O'Banion states that the framework for assessing student learning can be stated by asking two questions: What do learners know and what can they do? O'Banion sees many options in the future of documenting expanded learning, such as student contracts and portfolios. Examining documentation of expanded learning in the learning college is beyond the scope of this study, but it is clear from the data that students did perceive expanded learning as a result of their experience in the educational environment. A significant part of their learning, they felt, was in their use of technology and their discovery of the opportunities it offered.

Summary

The examination of O'Banion's (1997) six key principles of the learning college through the lenses of the perceptions of the participants in this study demonstrates that the participants perceived some aspects of the ideal of the learning college to be realized in the classes they attended at Maple City Community College during the Fall of 2002. Further, they perceived the technology infused into the environment to be an important aspect of and contributor to that learner-centered environment. Of significance, however, is that they valued the contribution of "high humanity" over "high technology" in the environment. It was not the technology that helped to create the learner-centered environment, but the people who facilitated and interacted in it.

Student Perceptions and Unexpected or Unintended Consequences

Scholars such as Hauptman (2001), Kirsch (1988), Nardi & O'Day (1999), Tenner(1996) and many others have argued that the infusion of technology into any environment often carries with it unexpected or unintended consequences. While the participants in this study perceived mostly positive effects from the infusion of technology into their environment, analysis of the data did highlight some aspects of the effects that warrant further scrutiny

Camaraderie of the Troubleshooters

One of the proposed advantages of networked computers via the Internet or local networks in the educational environment is the use of the computer as a collaborative technology (Laurence, 2002/2003). The dream is that such networked technologies would foster increased collaborative work and communication between students and instructors

and help to create a learning community.

However, in the educational environment under study, a large part of the collaboration that occurred or was fostered by the available computer technology can be classified as the camaraderie of the troubleshooters. Students felt that communication increased because of difficulties encountered by their classmates in working with the technologies, rather than because of the academic work:

> People might be a little more that, not knowing something at a computer is not as embarrassing as when you're not using a computer when you have a question like that. (7F, 235:237).

But this type of collaboration—not about the content but because of the context—is the same as that which would be experienced by students in a sewing class, where students struggle with the sewing machine to get it to do a complicated stitch. The potential collaborative work on content was not fully realized or fostered by the technology. Collaborative academic work did occur in the class, but it primarily came about as a result of working groups set up by the instructor, with the work directed by peer facilitators:

> ... we would get in small groups before we would get on the computer, and talk, it's called peer review—and everybody would help each other out, and then after we would get our ideas and thoughts out, then we would all go to our computers and go do what we had to do. (2F, 732:734)

Technology Displacing Human Interaction

The participants perceived some negative consequences caused by the infusion of technology on their relationship with others in the environment. John commented on human interaction being displaced by technology and hinted that his interactions with Ms. Archer may have increased had there not been technology in the classroom:

> Maybe it might have been, a little more personal, maybe it'd be more

> interacting with the teacher, instead of like working on computers. (7F, 204:205).

But Lynn saw this in a positive light, having a computer to consult gave her independence:

> Well, it helped me when I know she [Ms. Archer] was busy and I had to, you know, some knowledgeable things she taught me how to go to the source and to the dictionary, so you know it helped her, me with not having come and interrupt her. (11F, 220:223)

Work at the computer stations was often viewed as work in isolation, where students perhaps consulted on computer problems but rarely on academic work. Two participants commented that the presence of technology may have hindered the feeling of being in a learning community, in that students sometimes chose interacting with the computers over interacting with classmates. Bubbly stated that at times her classmates would ignore her attempts at conversation and:

> They'd be bothering with the computer than to talk to me! Yeah. (2F, 398:399)

John, speaking of the negative effects of having computers so readily available in the classroom commented that

> ... maybe in the long run you may have more computers than you have ... human interaction otherwise. (7F, 366:367).

Technology as Distraction

Several participants mentioned the lure constant access to technology in class had for some of their classmates to engage in what they considered non-instructional activities. These included constant checking of email, engaging in instant chat and messaging, and visiting websites unrelated to the tasks at hand:

> Yeah, a lot of them a lot of them would just go on the Internet too, some of them were on the Internet during class, that wasn't the right thing to do

> either. Some of them abused the purpose.... Well, you know, you're not learning anything. You are supposed to focus on the teacher and what you are learning, you're not learning. I mean, the Internet's always going to be there, you know. You can take at least just an hour to learn, you know? (2F, 323:327).
>
> Ah, a couple of girls, one was [name], um, I think it was [name] ... I can't think of the other one's name, there were a couple that I seen that were distracted by the Internet. (9F, 274:276).

Computer as Teacher

In contrast to the participants' valuing of the high humanity that shaped the infusion of technology into their educational environment is the future vision of several of the participants. In responding to the interview question about what they thought a community college classroom such as theirs might look like in twenty or thirty years, two of the seven participants responded that they believed that computers would replace human instructors in the future, and one thought students might be connected directly from brain to computer. One of the three commented further that the uses of current technology probably cut down on "unnecessary instructors" (11F, 326:327). The very participants who valued high humanity above high technology in their educational environment envisioned a future without the human touch.

Implications

The American community college has traditionally seen its mission as providing access to educational opportunities for a wide variety of learners. As society at large increasingly adopts new technologies in every aspect of life, the community college must react by equipping its learners with the tools, skills and knowledge required in order to be about the business of "... exploring and experimenting with new and expanded versions

of what they could become." (O'Banion, 1997, p. 49). The integration of high technology into the lives of all that it serves, must be done with the high humanity that has traditionally been a part of the community college environment. The participants in this study believed in the promise of technology, for their daily lives as well as for their academic success. It is clear that while at the start of the semester they were not focused on honing their technology skills, by the end of the semester they considered that work to be integral to becoming academically successful. The implications for the American community college are many. If technological literacy has become "the third literacy" that is required for a citizen to be able to fully participate in society, as the participants in this study perceived it to be, it is the duty of the community college to make the technological literacy of its learners a priority.

At Maple City Community College placement testing for its students was required in reading and math—the "Academic Literacy", and students who scored below certain levels were required to attend developmental classes in order to bring their skills up to college-level. However, there was no formal attempt to assess students' technological literacy. A third literacy implies that a third evaluation should be done, and those falling below minimum should be required to attend remedial technology literacy courses.

While Ms. Archer, her students, and the staff at Maple City Community College did an admirable job of integrating the technology into the educational environment, the question that must be asked is how much material can be covered in one class. For some of the students, the time spent on technological literacy was time they considered wasted. This is not to argue that technological literacy should be sequestered only into a sequence of courses, but there will be some students who will benefit from such courses.

The integral part that technology does play in the realization of the learning college suggests that technology, and technological literacy, should permeate every aspect of and every learning opportunity provided by the learning college. This is not to argue that a learner-centered educational environment is not possible without technological integration. But it has been argued that faculty resistance to utilizing new technologies in their teaching practice is sometimes related to resistance to implementing the new pedagogies embraced by proponents of the learning college (Hirumi, 2002; McKinney, 1996). And instructional staff who neglect the resources of technology neglect a large number of the learning options envisioned by the proponents of the learning college. But the resources of technology are being neglected by many community college staff. The selection of a site for this study was hindered by the few developmental classes in the community colleges around the state that met the criteria of a technologically-infused educational environment. In Maple City Community College itself the two classes facilitated by Ms. Archer were unique in the way technology was infused.

The technology infused into the educational environments under study fostered interaction among the students because of the difficulties they had in getting the technology to do what they wanted it to do. Perhaps this was just a stage in learning of a complex set of tools. However, many critics have argued that much of the technology in use today has been designed for the designers rather than the users (Minasi, 2000; Norman, 1998; Tenner, 1996) and it was clear that the technology in the environments under study did not create a "connected community" through technological collaboration tools envisioned by proponents. Designers of technology must move beyond the "one

user, one machine" mentality and come up with technologies that support learning communities and collaboration. One screen, one keyboard, one seat works to restrict interaction and must be balanced, as it was in Ms. Archer's class, with opportunities for face-to-face interaction. Designers should seek ways technologies can be developed that will support this interaction in the educational environment in transparent ways that do not add a layer of complexity to subject areas that students already find challenging.

Technology is powerful. It has caused sweeping changes in today's society and is doing the same in our educational institutions (Burbules & Callister Jr., 2000; Ellul, 1964; Rochlin, 1997). Some of these changes are obvious, such as the ubiquitousness of personal computers in homes and businesses, and institutions of higher education (Grabow, 1996; Green, 2001; Rosenberg, 1992). Some changes are less obvious, as Sclove comments:

> Sometimes technologies shape behavior and relationships less through brute compulsion than via subtle, psychological inducement. (Sclove, 1995, p. 13).

From where does the vision of the study participants of a future educational environment dominated by technology arise? Some theorists would argue that our society's worship of capitalism and efficiency drives everything that happens and the replacement of human learning facilitators with computerized ones would logically follow (Rochlin, 1997). Others argue that the development of technology is heading in the direction of artificial intelligence and the development of such sophisticated hardware and software that it will challenge humans for the jobs where cognizance is required, just as technology has displaced human workers in other types of jobs (Baase, 1997; Bailey, 1996; Emerson & Forbes, 1989; Kizza, 1996).

The participants with future visions of computers as teachers may have been

watching too many science fiction movies, but their vision had echoes in the unwanted consequences experienced by the participants who saw fellow students choose to interact with the computer screen rather than with them, and who saw students choosing to interact with their email or instant chat rather than joining with their classmates in engaging the course content. The lure of Internet access in class is a growing problem (Schwartz, 2003) and Ms. Archer's use of the "Synchroneyes" (SMART Technologies Inc, 2003) program is one solution, albeit an inelegant one. Internet surfing and email checking is a high technology form of doodling, an age old problem, and seizing control of a student's computer through computer network control seems to amount to a high technology seizing of a student's pencil and paper. The challenge then is for designers, of both technology and instruction, to develop strategies and technologies that honor the principles of the learning college, that engage the learner, and put responsibility for learning with the learners.

Finally, though the technology's expected and promised (Microsoft Corporation) role in fostering collaboration was not evident in the learning environment under study, students freely shared their expertise and their ignorance about computers. The willingness of students to admit that, as Jason said, "... don't nobody know everything about computers ...." (3I, 97:98) should give those instructors hesitant to integrate technology into their learning environments because of their own lack of skills courage to add the third literacy to their curricula.

Summary

Technology is powerful enough to be technology-centered rather than learner-centered (Rochlin, 1997) and its infusion into any environment should be examined with

caution (Eriksson, 1996). The American community college, then, while embracing the benefits of technology for achieving the transformation into the learning college, should institute an ongoing and formal evaluation program of the effects of technology on its educational environment and its inhabitants. The standard against which technology should be held, as should every object and process in the learning college, is learner-centeredness. As Murphree (1980) argues, technology may sacrifice humanity for a variety of reasons, but humanism [or learner-centeredness] will never sacrifice humanity for any reason.

Future Research

As the technology now infused into educational environments matures, topics for further research will certainly never be exhausted. If technology does reach the level of artificial intelligence, a whole new area of what it means to learn, to know and to be, will be created. What this would mean for the learning college, for higher education, and indeed for humanity as a whole would mean new areas of inquiry in every discipline. Already there are those who argue whether such a future exists and what it may mean (Bailey, 1996; Dietrich, 1994; Eriksson, 1996; Kizza, 1996; May, 1996). If technology does not reach such levels of intelligence, it will reach levels of such sophistication that will require constant inquiries into its effects on human societies, including higher education (Rochlin, 1997).

While the future will hold numerous areas of study on the effects of technology infusion into educational environments, the areas in need of focus that will shape that future are present now. There is a great need for those in education to understand all aspects of technology infusion in order to be able to guide its development and infusion

(Sneiderman, 2002; Talbott, 1995; Tang, 1991). This study focused on student perspectives of technology infusion, but the investigation in this area leaves much to be explored. Studies of larger numbers of students, enrolled in different classes, and in different types of community colleges would serve to deepen the understanding of their important perspectives. An interesting focus would be the future visions for education of the participants and the sources of belief about technology, education, and learning that shaped those visions.

The almost exclusive focus on student perspectives in this study was important in that it may have quieted the traditionally louder voices in the literature of faculty and administrators so that the voices of students could be heard. But the narrow focus may also serve to limit the value of this study in understanding the educational environment as a whole. The literature would benefit from a similar inquiry into the perspectives of instructors and their understanding of technology infusion into the educational environment of their learners.

Finally, this study has brought to light the importance of an investigation into technological literacy as the third literacy for community college students. While increasing numbers of incoming community college students come with a history of technology infusion into their lives, educators can not assume that experience with technology means literacy. Helping students with this issue of access to higher education fits in perfectly with the mission of the American community college as learning college.

Conclusion

The vision of the American community college reaching toward its ideal as a democratic institution by transforming itself into the learning college has made clear the

importance of understanding the perspectives of its key constituents—its students. Technology and its power to transform is seen as a major mechanism for achieving this transformation, but the power of technology—while immensely powerful and potentially transformative—can have unforeseen and unexpected effects. This study examined the effects of technology infusion in an educational environment from the perspective of the students inhabiting the environment and explored their experiences of technology and the learning college in action.

The study found that students valued the inclusion of technology into their environment and saw technological literacy as essential to their academic success and their full participation in American society as a whole, a democratic ideal (Dewey, 1916). The student perspectives revealed that technology infusion did promote the principles of the learning college and helped to contribute to the creation of a learner-centered, collaborative educational environment. However, while technology was indeed instrumental in the shaping of the learner-centered environment, it was primarily the "high humanity" involvement of the instructor, school staff, and classmates and the ways they used the technology, that guided its formation. The student perspectives also revealed some unwanted and unexpected consequences of technology infusion into their educational environment. These consequences were effects that worked against the realization of the principles of the learning college and the creation of a learner-centered learning community, but they were outweighed by what the participants saw as the positive effects of technology infusion.

The participants in this study perceived the infusion of technology into their educational environment as a democratizing and empowering force that enhanced their

access to learning, to self-understanding, and to participation in higher education and in American society. From the student perspectives, the negative effects of technology infusion were few, and those that did appear were outweighed by the positive effects. In the educational environments in this study, the "Promise of Technology" (O'Banion, 1997) was at least partially being fulfilled.

High technology in the service of high humanity is the primary lesson to be learned from this study. Technology can be used to foster more democratic educational environments, but it must be guided by humanity. Community college students need technology skills, it is true, but for so many of them, it is the human touch that will help them through democracy's open door.

APPENDICES

APPENDIX I

BACKGROUND SURVEY

INTERVIEW PROTOCOLS

BACKGROUND SURVEY

I am conducting a study about student's experiences with computers in school and I am hoping to learn how community colleges can use computers to best help students. I am looking for about eight students who are willing to participate in my study. A student participating in this study could expect to be interviewed twice by me (about 45 minutes per interview), read a summary that I write about his or her interview and give comments on it, and be observed during a class session.

No one has to participate in this study, and anyone participating in this study does not need to be a computer expert at all. Students chosen for this study who complete the requirements will be paid a small stipend of $20 for their time.

Thank you for filling out this survey.

Name:		
Date		
Best way to contact you (please include Tel no/ email address, etc.)	Email ?Phone ?	
Name of this course		
In what year did you first begin using a computer?		
How comfortable are you in working with computers? (Circle One)	*(Very uncomfortable)* 1 2 3 4 5 6 7 *(Very comfortable)*	
Do you use a computer for: (Circle one: 1 = a little, 4 =	College work:	(a little)1 2 3 4(a lot)
	Work:	(a little)1 2 3 4(a lot)
	Fun:	(a little)1 2 3 4(a lot)
Where do you usually use a computer? (circle all that apply)	Home Classroom at school School library School computer lab Work Public Library Other (please write in) _____	

If you have a computer at home, how old is it? (fill in the blank or circle don't know)	_____ years old Don't know
Do you have Internet access at home? (circle one)	yes no If yes, who pays for the access?

How many hours a week do you use computers for the items listed? Write 0 for an item if you don't use computers for the item.

	hrs		hrs
Games		Desktop publishing	
Word-processing		Data Search &	
E-mail		MUD / MOOS / IRC	
Chat rooms, instant messaging		Spreadsheets & databases	
Browsing the Internet		Other (please write below)	
File sharing via the Internet			
Web page design			

Are you Male or Female? (circle one) Male Female

In what year were you born? _____

Are you (circle):

1) White/Caucasian Non-Hispanic
2) Black/African American Non-Hispanic
3) Chicano/Mexican American
4) Hispanic
5) American Indian/Alaskan Native
6) Asian/Pacific Islander
7) Note: if you are multiracial, please circle number 7 and the number of the ethnic/ racial group you most identify with or the ethnic/racial group to which you are usually regarded in the community as belonging. For purposes of this question you are multiracial if you have parents from more than one of the categories listed above.
8) Prefer not to answer.

Are you currently working? Yes No	If you are working what is your occupation? (Write below)

What classes are you taking this semester? (Write in titles and Course numbers).

Do you have a college major? Yes No If yes, what is it? _____

What are your reasons for attending this school?
Write any other comments you would like to make in the space below.

Thank you for filling out this survey. Any information you give will be kept private to the maximum extent of the law and used only for the purposes of reporting the findings of this study.

INITIAL INTERVIEW PROTOCOL

Introduction

I am conducting a study about student's experiences with computers in school and I am hoping to learn how community colleges can use computers to best help students.

I wanted to meet with you just to talk a bit about what's it like for you to be in this class and to go to school here. With your permission, I'd like to tape record this so that I don't have to worry so much about taking notes while we talk. I'll keep what you tell me as confidential as possible and I won't put your name or any other identifying comments you might make on any reports. If you prefer not to answer a question, feel free to tell me.

Interview Questions

1. Tell me what it's like to be a student at this school? What's a typical day for you like?
2. What courses are you taking and what have you taken so far?
3. How did you come to be at this school and in this class?
4. Describe your family background for me.
5. What is your family's experience with computers?
6. What kind of a neighborhood do you live in?
7. What experiences do the people in your neighborhood (friends, schoolmates) have with computers?
8. When did you first use a computer? What was it like for you?
9. Finish this sentence for me. "A computer is like _____." Explain what you mean by that.

10. What kinds of uses do you see for computers?
11. If you need to use a computer outside of class time, what do you do? What if you need to use the Internet?
12. What do you expect from using computers in this class?
13. What advice would you give the teacher to help you in using computers for this class?
14. What advice would you give the school to help you in using computers for this class?
15. Are there any comments you would like to make about what we have talked about so far? About anything else?

FOLLOW-UP INTERVIEW PROTOCOL

1. -Inform participant that this interview is being tape recorded.

2. Ask participant's preferred pseudonym.

3. Ask for address and if personal check presents a problem.

Interview Questions

1. Are there any changes you would like to make regarding your first interview?

2. Now that the semester is over, what are your thoughts about the use of computers in the class you just completed?

3. In what way, if any, was this experience different from other educational experiences you have had?

4. What would you say the overall atmosphere of the class was like? How did you feel most of the time during the class? Did having computers in the class have anything to do with that feeling?

5. What word would you use to describe Ms. Archer? A helper, a leader, a manager, a dictator, ... your own word. What does that word mean to you? What effect do you think her use of computers in the class has on your choice of words?

6. What were some positive benefits for you of using computers in class this semester? What do you think were some of the benefits for your fellow students? For your instructor?

7. What were some negative things for you about using the computers? What do you think were some of the negatives for your instructor? for your fellow students?

8. How do you think having computers in class changed your relationship with your

teacher? How would that have been different had you not been in a computer assisted course?

9. How do you think having computers in class changed your relationship with your fellow students? How would that have been different had you not been in a computer assisted course?
10. How do you think having computers and other technology what you got out of this class?
11. How do you think having computers in the class changed the way you felt about coming to class?
12. Who do you think benefited the most from being in a computer assisted class?
13. Who do you think was disadvantaged the most by being in a computer assisted class?
14. Oakland Community College calls itself a learning and student centered college. What does that mean to you? How do you think the college uses computers in order to be learning and student centered?
15. You attended class in a computer lab, and the Information Commons looks more like a computer lab than a library. What do you think it does to the college to have such an emphasis on computers? What are the positives and negatives?
16. In the class you just finished, did you feel as though you were part of a community of learners working together, or did you feel like a group of students being led by a teacher? What effect did the technology that you used have on your feeling that way?
17. Do you have any other thoughts that relate to the use of technology in the class you just finished?
18. What do you think the community college classroom will look like in 20 or 50 years?

What do you think the future will be like?

19. Closing comments.

APPENDIX II

PARTICIPANT CONSENT FORMS

Informed Consent for Background Survey

If you have questions about this project please contact:

Arend A. Vander Pols, Michigan State University

(email: vande118@msu.edu or Tel: 616/475-6954.

or my advisor: Dr. John M. Dirkx (email: dirkx@msu.edu or Tel: 517/353-8927)

Your Name _____

Thank you for considering participation in my study. This sheet is about your rights as a participant in my study. It should be signed by if you agree to participate. The signed copy should be returned to me but I will give you a second copy in case you have questions later.

I am conducting a study about student's experiences with computers in school and I am hoping to learn how community colleges can use computers to best help students. You must be eighteen years old or older in order to participate in this study.

I am asking you to fill out a background survey that asks about your personal and school background, your experience with computers, and your experiences in this class. Your answers to the survey will be kept confidential.

Based on your answers to the survey, I may ask you to participate further in my study. Further participation would involve being interviewed two times for forty-five minutes each time. Students who participate in both interviews will be paid a small stipend for their time.

No one has to participate in this study, and anyone participating in this study can withdraw at any time during the study without explanation or consequence.

Your participation in this study will result in no cost to you, nor will it harm or

benefit you in any way as a student at this community college.

Your privacy during this study will be kept to the maximum extent allowed by law. The information you give during this study, and any observations made during this study will be shared with my advisor and research committee, but in any reports or articles about this research, your name and school name will be changed so that specific information can not be linked directly to you.

If you have any questions about your rights as a human subject and you do not wish to contact me or my advisor at the numbers listed above, you may contact—anonymously if you wish:

Ashir Kumar, M.D.

Chair, University Committee on Research Involving Human Subjects

Tel: 517/355-2180 · fax: (517)432-4503 e-mail: UCRIHS@msu.edu

Your signature below indicates that you are eighteen years old or older and voluntarily agree to participate in this study by filling out a background survey.

Your signature _____

Today's Date _____

Informed Consent for Audiotaped Interviews

If you have questions about this project please contact:

Arend A. Vander Pols, Michigan State University

(email: vande118@msu.edu or Tel: 616/475-6954.

or my advisor: Dr. John M. Dirkx (email: dirkx@msu.edu or Tel: 517/353-8927)

Your Name _____

Thank you for considering further participation in my study. This sheet is about your rights as a participant in my study. It should be signed by if you agree to participate. The signed copy should be returned to me but I will give you a second copy in case you have questions later.

I am conducting a study about student's experiences with computers in school and I am hoping to learn how community colleges can use computers to best help students. You must be eighteen years old or older in order to participate in this study.

I am asking you to agree to be interviewed by me two times. Each interview will be about forty-five minutes long. In the interviews I will ask about your personal and school background, your experience with computers, and your experiences in this class. The interviews will be audio-tape recorded.

In between the two interviews, I will send you a summary of the first interview for you to read, and ask you to comment on the summary in our second interview.

Students who participate in the two interviews will be paid a stipend of $20 for their time. Students who participate in one interview will receive a $5 payment.

No one has to participate in this study, and anyone participating in this study can

withdraw at any time during the study without explanation or consequence.

Your participation in this study will result in no cost to you, nor will it harm or benefit you in any way as a student at this community college.

Your privacy during this study will be kept to the maximum extent allowed by law. The audio-tapes of the interviews will be kept in a secure location. The information you give during this study, and any observations made during this study will be shared with my advisor and research committee, but in any reports or articles about this research, your name and school name will be changed so that specific information can not be linked directly to you.

If you have any questions about your rights as a human subject and you do not wish to contact me or my advisor at the numbers listed above, you may contact—anonymously if you wish:

Ashir Kumar, M.D.,

Chair, University Committee on Research Involving Human Subjects

Tel: 517/355-2180 · fax: (517)432-4503 e-mail: UCRIHS@msu.edu

Your signature below indicates that you are eighteen years old or older and voluntarily agree to be interviewed for this study and that you understand that the interviews will be audio-tape recorded.

Your signature _____ Today's Date _____

REFERENCES

Alexander, J. O. (1999). Collaborative design, constructivist learning, information technology immersion, & electronic communities: A case study. *Interpersonal computing and technology: An electronic journal for the 21st century*, *7*, 1-2. Retrieved September 15, 2003, from http://jan.ucc.nau.edu/~ipct-j/1999/n1-2/alexander.html

Alfino, M., & Pierce, L. (2001). The social nature of information. *Library Trends, 49* (3), 471-485.

American Association of Community Colleges. (2001a). *Community Colleges Past to Present*. Retrieved September 15, 2003, from American Association of Community Colleges Website: http://www.aacc.nche.edu/Content/NavigationMenu/AboutCommunityColleges/HistoricalInformation/PasttoPresent/Past_to_Present.htm

American Association of Community Colleges. (2001b). *National Community College Snapshot*. Retrieved September 15, 2003, from American Association of Community Colleges Website: http://www.aacc.nche.edu/Template.cfm?Section=Statistical_Guide&template=/ContentManagement/ContentDisplay.cfm&ContentID=4776&InterestCategoryID=244&Name=Statistics&ComingFrom=InterestDisplay

Baase, S. (1997). *A gift of fire: Social, legal, and ethical issues in computing*. Upper Saddle River, NJ: Prentice Hall.

Bailey, J. (1996). *After thought: The computer challenge to human intelligence*. New York: Basic Books.

Bebko, P. R. (1998). Influences upon higher education faculty use of distance education technology. (Doctoral dissertation, Florida Atlantic University, 1998). *Dissertation Abstracts International, 59-02A,* 427.

Bird, M., & Gill, G. (1987). Individual differences and technology attributes: An examination of educational technology considerations related to trade and industry training. *Australian Journal of Educational Technology, 3* (2), 108-118.

Birnbaum, R. (1988). *How colleges work : The cybernetics of academic organization and leadership* (1st ed.). San Francisco: Jossey-Bass.

Blake, J. (1997). *The virtual global village: The World Wide Web, instructional technology and the "Communicative" language classroom*. Retrieved September 30, 2003, from Middle Tennessee State University, Mid-South Instructional Technology Conference Proceedings Website: http://www.mtsu.edu/~itconf/proceed97/village1.html

Boggs, G. R., & Michael, D. G. (1997). The Palomar College experience. In T. O'Banion (Ed.), *A learning college for the 21st century* (pp. 188-210). Phoenix, AZ: ACE/Oryx.

Brookfield, S. D. (1995). *Becoming a critically reflective teacher.* San Francisco: Jossey-Bass.

Bruffee, K. A. (1993). *Collaborative learning: Higher education, interdependence, and the authority of knowledge.* Baltimore: Johns Hopkins University Press.

Burbules, N. C., & Callister Jr., T. A. (2000). *Watch IT: The risks and promises of information technology for education.* Boulder, CO: Westview Press.

Burks, O. I. (1996). A virtual classroom approach to learning circuit analysis. *IEEE Transactions on Education, 39*, 287-296.

Carstens, R. W., & Worsfold, V. L. (2000). Epilogue: A cautionary note about online classrooms. In R. E. Weiss, D. S. Knowlton & B. W. Speck (Eds.), *Principles of effective teaching in the online classroom* (pp. 83-87). San Francisco: Jossey-Bass.

Christie, A. A. (1996). Using email within a classroom based on feminist pedagogy. *Journal of Research on Computing in Education, 28* (5), 146-176.

Clagett, C. (1998). Technology defined. Maryland Community Colleges Technology Council. (ERIC Document Reproduction Service No. ED 415920)

Collis, D. (n.d.). *New business models in higher education.* Retrieved October 3, 2003, from EDUCAUSE Website: http://www.educause.edu/ir/library/pdf/ffp0101s.pdf

Cooper, A. (1999). *The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity.* Indianapolis, IN: SAMS.

Cooper, L. (1999). Anatomy of an online course. *THE Journal, 26* (7), 49-51.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom.* Cambridge, MA: Harvard University Press.

Davis, M. (1997). Fragmented by technologies [1]: A community in cyberspace. *Interpersonal Computing and Technology: An Electronic Journal for the 21st Century, 5* (1-2), 7-18.

de Vry, J. R., & Hyde, P. (1997). Supporting faculty exploration of teaching with technology. *Cause/Effect, 20* (3), 45-48.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education.* London: Collier-Macmillan.

Dietrich, E. (Ed.). (1994). *Thinking computers and virtual persons: Essays on the intentionality of machines.* San Diego: Academic Press.

Dirkx, J. M., Kielbaso, G., Mishra, P., Smith, R. O., & Vander Pols, A. A. (2001). [Development and field testing of interview and "Think-aloud" protocols for studying epistemological beliefs of teachers and students in information technology rich instructional environments in community colleges career and technical education programs]. Unpublished research project, East Lansing: Michigan State University.

Do, J., & Lee, I. (1997). World wide web in the virtual classroom. *Compute-Ed, 3.* Retrieved September 30, 2003, from http://pandora.nla.gov.au/nph-arch/O1998-Dec-3/http://www.education.uts.edu.au/projects/comped/Vol3/do.html

Doucette, D. (1993, Spring). Transforming teaching and learning using information technology: Community college leadership in higher education. *The College Board Review, 167,* 18-25.

Dougherty, K. J. (1994). *The contradictory college: The conflict origins, impacts, and futures of the community college.* Albany: State University of New York.

Duderstadt, J. J. (1997). The future of the university in an Age of Knowledge. *Journal of Asynchronous Learning, 1,* 2. Retrieved September 30, 2003, from http://www.aln.org/publications/jaln/v1n2/v1n2_duderstadt.asp

Egan, G. (1982). *The skilled helper: Model, skills, and methods for effective helping* (2nd ed.). Monterey, CA: Brooks/Cole.

Ehrmann, S. C. (1995). Asking the right questions: What does research tell us about technology and higher learning? *Change, 27* (2), 20-27.

Ellul, J. (1964). *The technological society.* New York: Random House.

Ellul, J. (1990). *The technological bluff* (G. W. Bromiley, Trans.). Grand Rapids: William B. Eerdmans.

Elsner, P. A. (1997). Becoming a learner-centered college system at Maricopa. In T. O'Banion (Ed.), *A learning college for the 21st century* (pp. 167-187). Phoenix, AZ: ACE/Oryx.

Emerson, A., & Forbes, C. (1989). *The invasion of the computer culture: What you need to know about the new world we live in.* Downers Grove, IL: Intervarsity Press.

Eriksson, I. V. (1996). Computer or humans: Who are in control? In J. M. Kizza (Ed.), *Social and ethical effects of the computer revolution* (pp. 80-97). Jefferson, NC: McFarland & Company.

Evelyn, J. (2001, January 15, 2002). A community college offers directions for the road of life. *Chronicle of Higher Education, 48,* A14-A16.

Fenstermacher, G. D., & Soltis, J. F. (1992). *Approaches to teaching* (2nd ed.). New York: Teachers College.

Fetterman, D. M. (1993). Finding your way through the forest: Analysis. In C. Conrad, A. Neumann, J. G. Haworth & P. Scott (Eds.), *Qualitative research in higher education: Experiencing alternative perspectives and approaches* (pp. 359-368). Needham Heights: Ginn.

Finkelstein, M. J., Frances, C., Jewett, F. I., & Scholz, B. W. (Eds.). (2000). *Dollars, distance, and online education: The new economics of college teaching and learning.* Phoenix, AZ: The Oryx Press.

Frank, C. E. (2000). Facilitating courses by computer-mediated communication and the role of the teacher: The community college teacher's perceptions. (Doctoral dissertation, University of Toronto, Canada, 2000). *Dissertation Abstracts International, 61-11A,* 4348.

Freire, P. (1990). *Pedagogy of the oppressed.* New York: Continuum.

Galdieux, L. E., & Swail, W. S. (1999). *The virtual university and educational opportunity: Issues of equity and access for the next generation.* Washington, DC: The College Board.

Gay, G., & Grosz-Ngate, M. (1994). Collaborative design in a networked multimedia environment: Emerging communication patterns. *Journal of Research on Computing in Education, 26* (3), 418-432.

Gilbert, S., & Geoghegan, W. (1995, March-April). An "online" experience: Discussion group debates why faculty use or resist technology. *Change, 27,* 28-45.

Gordon, J. (1996). Tracks for Learning: Metacognition and learning technologies. *Austrailian Journal of Educational Technology, 12* (1), 46-55.

Grabow, P. C. (1996). La Technique: An area of discourse for computers in society. In J. M. Kizza (Ed.), *Social and ethical effects of the computer revolution* (pp. 298-312). Jefferson, NC: McFarland & Co.

Graves, W. H. (1997). "Free trade" in higher education: The meta university. *Journal of Asynchronous Learning, 1* (1), 97-108.

Gray, S. (1998). Maintaining academic integrity in Web-based instruction. *Educational Media International, 35* (3), 186-188.

Green, K. C. (2000). *Campus computing 2000: The 11th national survey of computing and information technology in American higher education.* Encino, CA: The Campus Computing Project.

Green, K. C. (2001). *The campus computing project.* Encino, CA: The Campus Computing Project.

Griffith, M., & Connor, A. (1994). *Democracy's open door: The community college in America's future.* Portsmouth, NH: Boynton/Cook.

Hagen, S. L. (2001). The effects of computer-assisted instruction and cognitive style on sight playing among university group piano students. (Doctoral dissertation, The Florida State University, 2001). *Dissertation Abstracts International, A62-05,* 1767.

Hauptman, R. (2001). Technological implementations and ethical failures. *Library Trends, 49* (3), 433-440.

Hirumi, A. (2002). Student-centered, technology-rich learning environments (SCenTRLE): Operatonalizing constructivist approaches to teaching and learning. *Journal of Technology and Teacher Education, 10* (4), 497-537.

Hollenbeck, J. A. (1997). Democracy in computer-mediated communication. (Doctoral dissertation, University of Wisconsin-Madison, 1997). *Dissertation Abstracts International, A 57-12,* 5036.

Holstein, J. A., & Gubrium, J. F. (1994). Phenomenology, ethnomethodology, and interpretive practice. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 262-272). Thousand Oaks, CA: Sage.

Huberman, M. A., & Miles, M. B. (1994). Data management and analysis methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 428-444). Thousand Oaks, CA: Sage.

Huynh, M. Q. (1999). A critical study of computer-supported collaborative learning. (Doctoral dissertation, State University of New York at Binghamton, 1999). *Dissertation Abstracts International, A60-04,* 1222.

Jacobs, A. (1995). The costs of computer technology. *Community College Journal, 66* (2), 34-37.

Janesick, V. J. (1994). The dance of qualitative research design. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 209-219). Thousand Oaks, CA: Sage.

Johnson, L. F. (2000). Into the breach: A national study of computers and the "at risk". In M. D. Milliron & C. L. Miles (Eds.), *Taking a big picture look @ technology, learning and the community college* (pp. 247). Mission Viejo, CA: League for Innovation in the Community College.

Joseph, E. C. (1988). Education and curriculum futures: Impacts from technological advances and global trends. In E. L. Harlacher (Ed.), *Cutting edge technologies in community colleges* (pp. 3-11). Washington, DC: American Association of Community and and Junior Colleges.

Jowett, B. (1911). Introduction to the Phaedrus. In B. Jowett (Ed.), *The dialogues of Plato* (Vol. 1, pp. 517-532). New York: Charles Scriber's Sons.

Kirsch, B. G. (1988). The sociological implications of the new technology. In E. L. Harlacher (Ed.), *Cutting edge technologies in community colleges* (pp. 13-18). Washington, DC: American Association of Community and and Junior Colleges.

Kizza, J. M. (Ed.). (1996). *Social and ethical effects of the computer revolution.* Jefferson, NC: McFarland & Co.

Kulik, C.-L. C., & Kulik, J. (1991). Effectiveness of computer-based instruction: An updated analysis. *Computers in Human Behavior, 7* (1-2), 75-94.

LaRose, R., Gregg , J., & Eastin , M. (1998). Audiographic telecourses for the web: An experiment. *Journal of Computer-Mediated Communication, 4*, 2. Retrieved October 1, 2003, from http://www.ascusc.org/jcmc/vol4/issue2/larose.html

LaTour, B. (1995). Mixing humans and nonhumans together: The sociology of a door-closer. In S. L. Star (Ed.), *Ecologies of knowledge: Work and politics in science and technology* (pp. 257-277). Albany: SUNY.

Laurence, C. L. (2002/2003). Communication technology to develop collaborative skills. *Journal of Educational Technology Systems, 31* (2), 191-204.

League for Innovation in the Community College. (2001). *The learning college project.* Retrieved October 1, 2003, from http://www.league.org/league/projects/lcp/

Lever-Duffy, J. (2000). The evolution of distance education. In M. D. Milliron & C. L. Miles (Eds.), *Taking a big picture look at technology, learning, and the community college* (pp. 251-274). Mission Viejo, CA: League for Innovation in the Community College.

Lockee, B. B., Burton, J. K., & Cross, L. H. (1999). No comparison: distance education finds a new use for 'no significant difference'. *Educational technology research and development, 47* (9), 33-42.

Mateas, M., & Lewis, S. (1996). A MOO-based virtual training environment. *Journal of Computer Mediated-Communication, 2*, 3. Retrieved October 1, 2003, from http://www.ascusc.org/jcmc/vol2/issue3/mateas.html

May, W. D. (1996). *Edges of reality: Mind vs. Computer*. New York: Plenum.

McCabe, R. (2000). *Underprepared students*. Retrieved October 1, 2003, from National Center for Public Policy and Higher Education Website: http://measuringup.highereducation.org/2000/articles/UnderpreparedStudents.cfm

McCabe, R. H., & Day, P. R. (1998). Access and the new America of the twenty-first century. In R. H. McCabe & P. R. Day (Eds.), *Developmental education: A twenty-first century social and economic imperative* (pp. 3-10). Laguna Hills: League for Innovation in the Community college.

McClenney, B. (1997). The community college of Denver creates a climate for learning. In T. O'Banion (Ed.), *A learning college for the 21st century* (pp. 211-224). Phoenix, AZ: ACE/Oryx.

McKinney, K. (1996). Technology in community colleges. (ERIC Document Reproduction Service No. ED399992)

Meador, B. D., & Rogers, C. R. (1984). Person-centered therapy. In R. J. Corsini (Ed.), *Current psychotherapies* (3rd ed., pp. 142-195). Itasca, IL: F.E. Peacock.

Mendenhall, R. W. (n.d.). *Technology: Creating new models in higher education.* Retrieved October 3, 2003, from National Governors Association Website: http://www.nga.org/cda/files/HIGHEREDTECH.pdf

Microsoft Corporation.*Microsoft Education: Word and the Writing Process*. Retrieved April 1, 2004, from http://www.microsoft.com/education/?ID=WordTutorial

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage.

Milliron, M. D. (1998). *Testimony to the Subcommittee on Technology: Committee on Science Community Colleges in the Twenty-First Century: Tackling Technology.* Retrieved August 22, 2003, from http://www.house.gov/science/milliron_07-21.htm

Milliron, M. D. (2000). Internet vision: Unleashing the power of the internet in the higher education enterprise. In M. D. Milliron & C. L. Miles (Eds.), *Taking a big picture look at technology, learning, and the community college* (pp. 317-331). Mission Viejo, CA: League for Innovation in the Community College.

Milliron, M. D., & Miles, C. L. (Eds.). (2000). *Taking a big picture look @ technology, learning, and the community college*. Mission Viejo, CA: League for Innovation in the Community College.

Minasi, M. (2000). *The software conspiracy: Why software companies put out faulty products, how they can hurt you, and what you can do about it.* New York: McGraw-Hill.

Moeller, B. (1995, February). Collaborating online: LANs as a group learning tool. *Electronic Learning, 14,* 16-18.

Molnar, A. R. (1997). Computers in education: A brief history. *T.H.E. Journal, 24* (11), 63-68.

Monsma, S. V. (Ed.). (1986). *Responsible technology: A christian perspective.* Grand Rapids, MI: William B. Eerdmans.

Moore, K. M. (1995). "Universitas". *The Review of Higher Education, 18* (4), 467-482.

Moskus, J. (1997). Lane changes: Transformation at Lane Community Colleges. In T. O'Banion (Ed.), *A learning college for the 21st century* (pp. 150-166). Phoenix, AZ: ACE/Oryx.

Murphree, W. A. (1980). The necessity of humanism in the computer age. In W. M. Mathews (Ed.), *Monster or messiah? The computer's impact on society* (pp. 175-184). Jackson, MS: University Press of Mississippi.

Nardi, B. A., & O'Day, V. L. (1999). *Information ecologies: Using technology with heart.* Cambridge: MIT Press.

Neal, E. (1998, June 19). Using technology in teaching: We need to exercise healthy skepticism. *The Chronicle of Higher Education, 44,* B4-5.

Norman, D. (1998). *The invisible computer: Why good products can fail, the personal computer is so complex , and information appliances are the solution.* Cambridge, MA: MIT Press.

O'Banion, T. (1995-96). A learning college for the 21st century. *Community College Journal, 66* (December/January), 18-23.

O'Banion, T. (1997). *A learning college for the 21st century.* Phoenix, AZ: ACE/Oryx.

O'Banion, T. (1999). *The learning college: Both learner and learning centered.* Retrieved October 1, 2003, from http://www.league.org/publication/abstracts/learning/lelabs0399.html

Okpala, A. O., & Okpala, C. O. (1997). Faculty adoption of educational technologies in higher learning. *Journal of Instructional Psychology, 24* (Dec.), 262-267.

Olsen, F. (2001, November 9). Survey documents increased spending by colleges on information technology. *The Chronicle of Higher Education,* p. A53.

Pelton, J. N. (1996). Cyberlearning vs. the university: an irresistible force meets an immovable object. *The Futurist, 30* (6), 17-20.

Pepi, D., & Scheurman, G. (1996). The emperor's new computer: A critical look at our appetite for computer technology. *Journal of Teacher Education, 47* (3), 229-236.

Perelman, L. J. (1992). *School's out: Hyperlearning, the new technology, and the end of education.* New York: William Morrow.

Phillippe, K. A., & Valiga, M. J. (2000). *Faces of the future: A portrait of America's community college students.* Washington, DC: American Association of Community Colleges/ACT.

PLATO Learning Inc. (2003). PLATO [Computer software]. Bloomington, MN: PLATO Learning Inc.

PLATO Learning Inc. (2003). *Two- And Four- Year Colleges.* Retrieved October 3, 2003, from http://www.plato.com/colleges/index.asp

Priest, W. C. (1995). *Equity and the public hand: Presentation to the Harvard Computer Society.* Retrieved September 30, 2003, from Media Literacy Online Project, College of Education, University of Oregon Website: http://interact.uoregon.edu/MediaLit/mlr/readings/articles/equity.html

Raineri, D. M., Mehrtens, B. G., & Hubler, A. W. (1997). CyberProfTM - An intelligent human-computer interface for interactive instruction on the World Wide Web. *Journal of Asynchronous Learning, 1*, 2. Retrieved October 1, 2003, from http://www.aln.org/publications/jaln/v1n2/v1n2_raineri.asp

Reed, W. M., Spuck, D. W., & Bozeman, W. C. (1996). Summary of special issue on assessing the impact of computer-based learning since 1987. *Journal of Research on Computing in Education, 28*, 554-556.

Reiser, R. A. (2001a). A history of instructional design and technology: part I: A history of instructional media. *Educational Technology Research and Development, 49*, 1. Retrieved February 5, 2002, from FirstSearch Wilson Select Plus database.

Reiser, R. A. (2001b). A history of instructional design and technology: part II: A history of instructional design. *Educational Technology Research and Development, 49*, 1. Retrieved February 5, 2002, from FirstSearch Wilson Select Plus database.

Resnick, D. (2000). The virtual university and college life: Some unintended consequences for democratic citizenship. *First Monday, 5*, 8. Retrieved September 29, 2003, from http://www.firstmonday.dk/issues/issue5_8/resnick/

Rhoads, R. A., & Valadez, J. R. (1996). *Democracy, multiculturalism, and the community college: A critical perspective.* New York: Garland.

Rochlin, G. I. (1997). *Trapped in the net: The unanticipated consequences of computerization.* Princeton, NJ: Princeton University Press.

Roschelle, J. (1995). *What should collaborative technology be? A perspective from Dewey and situated learning.* Retrieved October 1, 2003, from http://openacademy.mindef.gov.sg/OpenAcademy/Learning%20Resources/EPSS/c14_a8.htm

Rosenberg, R. S. (1992). *The social impact of computers.* San Diego, CA: Academic Press.

Roueche, J. E., & Roueche, S. D. (1999). Keeping the promise: remedial education revisited. *Community College Journal, 69* (5), 12-18.

Russell, T. L. (1999). *The no significant difference phenomenon.* Montgomery, AL: International Distance Education Certification Center.

Russell, T. L. (2002a). *The no significant difference phenomena.* Retrieved September 30, 2003, from http://teleeducation.nb.ca/nosignificantdifference/

Russell, T. L. (2002b). *The significant difference phenomenon.* Retrieved October 1, 2003, from http://teleeducation.nb.ca/significantdifference/

Sankaran, S. R. (2000). Effect of student attitude to course format on learning performance: An empirical study in Web vs. lecture Instruction. *Journal of Instructional Psychology, 27* (1), 191-198.

Schutte, J. G. (1996). *Virtual teaching in higher education: The new intellectual superhighway or just another traffic jam?* Retrieved October 1, 2003, from http://www.csun.edu/sociology/virexp.htm

Schwartz, J. (2003, January 2). Professors Vie With Web for Class's Attention. *New York Times.*

Scientific Software Development. (1997). Atlas/ti (Version WIN 4.2 Build 058) [Computer software]. Thousand Oaks, CA: Scolari.

Sclove, R. E. (1995). *Democracy and technology.* New York: Guilford Press.

Seidman, I. E. (1991). *Interviewing as qualitative research: A guide for researchers in education and the social sciences.* New York: Teachers College.

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization.* New York: Doubleday.

Serafini, F. (2002). Dismantling the factory model of assessment. *Reading and Writing Quarterly, 18* (1), 67-85.

SMART Technologies Inc. (2003). Synchroneyes [Computer software]. Calgary, Canada: SMART Technologies, Inc.

Smith, A. B. (1994). Teaching for learning: Instructional development and change in two-year colleges. In G. A. Baker III (Ed.), *A handbook on the community college in America: Its history, mission, and management* (pp. 205-217). Westport, CT: Greenwood Press.

Smith, K. L. (1997). Preparing faculty for instructional technology: From education to development to creative independence. *Cause/Effect, 20* (3), 36-44,48.

Sneiderman, B. (2002). *Leonardo's laptop*. Cambridge, MA: MIT Press.

Sotillo, S. M. (1997). English-as-a-second-language learning and collaboration in cyberspace. *The Technology Source*. Retrieved October 1, 2003, from http://ts.mivu.org/default.asp?show=article&id=497

Speck, B. W. (2000). The academy, online classes, and the breach in ethics. In R. E. Weiss, D. S. Knowlton & B. W. Speck (Eds.), *Principles of effective teaching in the online classroom* (pp. 73-81). San Francisco: Jossey-Bass.

Strauss, A., & Corbin, J. (1994). Grounded theory methodology. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 273-285). Thousand Oaks, CA: Sage.

Talbott, S. L. (1995). *The future does not compute: Transcending the machines in our midst*. Sebastopol, CA: O'reilly and Associates.

Tang, J. C. (1991). Involving social scientists in the design of new technology. In J. Karat (Ed.), *Taking software design seriously: Practical techniques for human-computer interaction design* (pp. 115-126). Boston: Academic Press.

Tenner, E. (1996). *Why things bite back: Technology and the revenge of unintended consequences*. New York: Alfred A. Knopf.

Thorpe, E. T. (1997). Changes in teaching behavior and teacher attitudes toward computer technology: A grounded theory (Diffusion of innovation). (Doctoral dissertation, Texas A&M University - Commerce, 1997). *Dissertation Abstracts International, 58-12A,* 4534.

Tisdell, E. J. (1993). Feminism and adult learning: Power, pedagogy, and praxis. In S. B. Merriam (Ed.), *An update on adult learning theory* (pp. 91-103). San Francisco: Jossey-Bass.

Turoff, M. (1997). Costs for the development of a virtual university. *Journal of Asynchronous Learning, 1*, 1. Retrieved October 1, 2003, from http://www.aln.org/publications/jaln/v1n1/v1n1_turoff.asp

Twigg, C. A., & Oblinger, D. G. (1996). *The virtual university: A report from a joint Educom/IBM Roundtable, Washington, D.C. November 5-6, 1996.* Retrieved October 1, 2003, from http://www.educause.edu/ir/library/html/nli0003.html

University of California- Berkeley. (2003). *WISE: The Web-based Inquiry Science Environment.* Retrieved September 30, 2003, from http://wise.berkeley.edu/

Van Dusen, G. C. (1997). *The virtual campus: Technology and reform in higher education.* Washington, DC: The George Washington University, Graduate School of Education and Human Development.

Walker, K. P. (2001). Opening the door to the baccalaureate degree. *Community College Review, 29* (2), 18-28.

Warschauer, M. (2000). Technology and school reform: A view from both sides of the tracks. *Educational Policy Analysis Archives, 8.* Retrieved October 1, 2003, from http://epaa.asu.edu/epaa/v8n4.html

Warschauer, M. (2003, August). Demystifying the digital divide. *Scientific American, 289,* 42-47.

Weeks, D. F. (2000). A study of the effect of a Web based computer game on national certification examinations for dental hygiene students at Valencia Community College. (Doctoral dissertation, University of Central Florida, 2000). *Dissertation Abstracts International, 61-07A,* 116.

Wolcott, H. (1977). *Teachers vs. technocrats: An educational innovation in anthropological perspective.* Eugene, OR: University of Oregon Press.

Yaverbaum, G. J., & Nadarajan, U. (1996). Learning basic concepts of telecommunications: An experiment in multimedia and learning. *Computers & Education, 26* (4), 215-224.

Zuga, K. F. (1999). Addressing women's ways of knowing to improve the technology education environment for all students. *Journal of Technology Education, 10,* 2. Retrieved October 1, 2003, from http://scholar.lib.vt.edu/ejournals/JTE/v10n2/zuga.html