



Technology and teaching : the adoption and diffusion of technological innovations by a community college faculty
by Arlene Hazel Parisot

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University
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Abstract:

Current practices of faculty members of a public community college were described in relation to the adoption and diffusion of technology as an instructional tool. Data were collected from faculty of Bellevue Community College between December 1994 and February 1995.

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This study concluded that the faculty at Bellevue Community College were teacher-centered rather than learner-centered and that technology can be a catalyst for faculty to reflect upon practice and can stimulate a move toward a learner-centered teaching methodology. It also concluded that factors which encourage use of technology are role modeling, faculty involvement in decision-making, provision of training for support personnel, and technical support. Factors which discourage adoption are time and attitudinal barriers. There were implications that adoption of technology would be enhanced if faculty could be assured that the use of technology would have a positive impact upon student learning. Finally, it was concluded that not all faculty would adopt technology.

Recommendations were made in the two general areas of new knowledge which has implications for educational practices and knowledge which is confirmed from the existing literature.

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DIFFUSION OF TECHNOLOGICAL INNOVATIONS
BY A COMMUNITY COLLEGE FACULTY

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Arlene Hazel Parisot

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Arlene Hazel Parisot

This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

4/20/95
Date

Guy J. Conti
Chairperson, Graduate Committee

Approved for the Major Department

4/21/95
Date

Duane Mallig
Head, Major Department

Approved for the College of Graduate Studies

5/7/95
Date

R. Brown
Graduate Dean

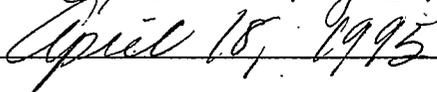
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Date



I would like to dedicate this thesis to my mother, Hazel M. Taylor, who was my role model, my friend, and my sustenance.

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ABSTRACT

Current practices of faculty members of a public community college were described in relation to the adoption and diffusion of technology as an instructional tool. Data were collected from faculty of Bellevue Community College between December 1994 and February 1995.

Teaching style information was collected using the Principles of the Adult Learning Scale (PALS) to determine the frequency with which respondents practice an action that a teacher of adults might exhibit in a classroom. Learning style information was collected using the Learning Styles Inventory (LSI) to determine the dominant mode of learning. Qualitative information was collected through interviews based on naturalistic inquiry and guided by Everett Rogers' model of diffusion of innovation to characterize the respondents' use of technology, perceived impact on the teacher's role, and factors which encourage or discourage use of technology. Student learning outcomes and technology became a secondary issue raised through the interview process. The PALS instrument was completed by 20 respondents, 21 completed the LSI, and 27 were interviewed.

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This study concluded that the faculty at Bellevue Community College were teacher-centered rather than learner-centered and that technology can be a catalyst for faculty to reflect upon practice and can stimulate a move toward a learner-centered teaching methodology. It also concluded that factors which encourage use of technology are role modeling, faculty involvement in decision-making, provision of training for support personnel, and technical support. Factors which discourage adoption are time and attitudinal barriers. There were implications that adoption of technology would be enhanced if faculty could be assured that the use of technology would have a positive impact upon student learning. Finally, it was concluded that not all faculty would adopt technology.

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CHAPTER 1

INTRODUCTION

Technology and ChangeInstitutions of Higher Education

During the past decade, higher education has been confronted with an acceleration of instructional technologies designed to increase efficiency, expand productivity, and ultimately enhance the student's total learning experience. Maintaining currency with technological change characterized by new media, new methods, and new materials is a challenge for all institutions of higher education. "We are challenged daily with rapid technological change. . . . Change itself has become the rule not the exception" (Gibson, 1992, p. 167)." Yet, this change has not been aggressively embraced by higher education. It has been suggested that General Motors has not entered into more partnerships with colleges and universities because "their speed is deceptive . . . they are slower than they look" (Roueche, 1993, p. 4).

Adding to the challenge of technological change, higher education is also serving a learner whose lifestyle has changed. "Learners increasingly attend on a part-time basis and view learning as a lifelong imperative" (Gibson, 1992,

p. 167). Educational institutions are faced with changing roles. The new roles focus on facilitating learning rather than content, providing a flexible environment, and developing delivery methodology reflective of the learner's goals (Gibson, 1992). To address these issues as well as those raised by the introduction of technology into the teaching and learning process, it will be necessary to be forward thinking in development of a technology plan compatible with mission, resources, and learner needs. This is the challenge which higher education faces.

The Community College and the Challenge of Technology

As a viable member of the higher education system, the community college has taken a strong lead in attracting students. Recent data indicate that 43% of all American postsecondary students taking courses for college credit and 51% of all first-time American college students are enrolled in community colleges (Boggs, 1993-94, p. 4).

This influx of students into the community college system is attributed to the decrease in access to a college or university due to prohibitive costs or enrollment caps. This occurs at a time when the need for education and training is a necessity to obtain viable employment. To remain competitive in a global economy, 80% of the population must be provided with the "basic reading, writing, computational, information processing, teamwork, and learning skills that

will allow them to continuously adapt to the press of new technology and knowledge" (Roueche, 1993, p. 4).

The 1,300 community colleges of today evolved from the junior college of the early 1900's with a major part of their mission to prepare students to complete a four-year degree program. The relevance of this mission must be measured in terms of the issues facing America today such as the escalating costs for higher education, the need for job training, and the changing demographics of our population. This is a time for America's community colleges to reposition themselves as the ultimate problem solvers in a nation struggling with complex societal problems (Wynne, 1993). This repositioning effort is occurring when community colleges are "grappling with eroding budgets, demographic shifts, and diversity," and it is a time for community colleges to "get serious about technology's role on our campuses--its place in relation to curricula and how it will impact those of us who teach those who learn" (Phelps, 1994, p. 25).

Community colleges of today view themselves as a cost-effective alternative in providing the education and training necessary to enter today's competitive technology-driven job market. This view necessitates that community colleges also revisit their academic structure to determine its effectiveness in meeting the needs of the population it serves. "Can we really be on the cutting edge of economic recovery and economic development as long as we cling to what may be

described as an outmoded academic model--a model more suited to the convenience of the institution than to business, industry or the student returning to acquire new job skills?" (Phelps, 1994, p. 25). Integrating technology into the instructional delivery process has the potential to promote modeling of the competencies and skills expected of the employee in today's technologically driven employment market.

Teaching With Technology

Instruction in higher education is experiencing a metamorphose. The introduction of technology has stimulated new ideas about teaching and learning. Instruction on the higher education campus has followed traditional formats based on pedagogical methodology emphasizing techniques utilizing lecture, assigned readings, and audiovisual productions in the delivery of content. Higher education has relied on instructional approaches encompassing the lecture followed by group discussions, a lecture followed by a hands-on laboratory, seminars or small-group discussions for more advanced topics, and the typical library assignment, paper writing, and examination (Apps, 1988). The introduction of educational technology could conceivably revolutionize this process and change the perception and practice of teaching in higher education. The model for implementing these new instructional technologies comes from the business world and not from education, and higher education has done little to

learn about teaching and learning. Moreover, the university's instructional mode has scarcely changed over the past 50 years (Apps, 1988). Business and industry have learned that adults can learn in a multitude of ways through diverse technological formats. Higher education should take the lead of business and industry and encourage the integration of technology into instruction. As this direction could subsequently impact traditional methodologies, the issue of designing faculty development programs to encourage the use of new instructional approaches would need to be addressed.

For the faculty member faced with the challenge of integrating technological applications into a changing teaching methodology, integration may represent diverse levels of complexity. Technological application may be as simple as using a computer to as complicated as making technology resources central to the teaching process. Within the past decade, computers have become the norm rather than the exception in the arena of learning and teaching. Currently, instructional use of computers encompasses "enhancing traditional teaching techniques to supporting entirely new modes of learning" (Berger, 1993, p. 5).

The Impact of Technology on Instructional Approaches

As computer technologies expand and as these technologies are increasingly employed as viable instructional tools, the teaching style of faculty interacting with these technologies

will need to be re-examined. Teaching style is the behavior that the teacher demonstrates in the classroom and is a "pervasive quality that persists even though the content that is being taught may change" (Conti, 1985, p. 7). The faculty member who has used a traditional methodology successfully may question the effectiveness of teaching and learning via the electronic medium. The standard approach that educational institutions have initiated to integrate complex instructional technologies into the classroom has been to buy these technologies and simply make them available to the educator. From this view, "there is little more to be done except to let teachers get on with practicing their craft as they have always done" (Moore, 1993, p. 6). The expectations are that conventional classroom methodologies can be reproduced to incorporate new delivery mediums. This approach may be destined to failure because the technology used in a new delivery mechanism may change the way in which both teacher and learner interact, thereby altering the teaching and learning transaction.

Many studies have cited faculty resistance to instructional technology as a primary barrier to the continued growth of technology utilized as an instructional tool (McNeil, 1990). The "attitudinal issues--how people perceive and react to these technologies--are far more important now than structural and technical obstacles in influencing the use of technology in higher education" (p. 2). This can be

evidenced by the scenario that has taken place in secondary schools across the nation time and again. When a new technology was introduced into a system, "teachers would be lauded; the principal singled out for praise; the school would be featured in newspapers and magazines. But such noteworthy praise and articles only have underscored how rarely teachers have used machines in their classrooms since the 1920's" (Cuban, 1986, p. 51). The problems may lie in the individuals themselves; that is, it may be with teachers and principals hostile to technology or with the clogged bureaucracy which stifles the most persistent innovator. What has been true for the secondary educational system may also be true of higher education.

Technology and in particular the computer as an instructional tool have become a part of the fabric of higher education, but assuring acceptance by those who are expected to use the technology may not necessarily be effortless to accomplish. Integration of new technologies into the instructional process by faculty may equate to the success or failure of integrating and diffusing technology throughout the instructional realm. In order for technology to become an integral part of the instructional environment, these attitudinal issues--how people perceive and react to the use of technology--will need to be confronted.

Adoption and Diffusion Process

Everett M. Rogers' (1983) theory of diffusion of innovation suggests that the presence or absence of certain characteristics can predict whether or not an innovation will be adopted and can also predict the rate of diffusion of an innovation throughout the system. It is this rate of adoption of the innovation which determines the success or failure of the effectiveness of the technology being introduced. Rogers suggests that for an innovation to be adopted it must be perceived to be better than its predecessor (relative advantage), compatible with the needs and value system of the adopters (compatibility), relatively simple and easy to understand (complexity), able to be tested and tried prior to commitment (trialability), and able to be seen prior to adoption (observability) (p. 211).

In terms of adoption and use of new approaches to the delivery of instruction in higher education, faculty training and development are primary concerns. It has been suggested by Lindquist (1978) that the role of ownership and values and the extent to which the innovation fits the environment are important considerations for adoption and, therefore, for diffusion to occur. These concepts were formulated following a series of case studies involving innovations in higher education. Lindquist identified five components necessary for successful change: (a) ownership by those whom it affects; (b) linkage to both informational and interpersonal resources;

(c) leadership that is guiding, involving, and initiating rather than authoritarian, influential, and dogmatic; (d) an actively open environment that seeks out and listens to disparate opinions; and, finally, (e) material and psychic rewards that foster self-esteem and personal development. Both Rogers and Lindquist have presented criteria to be considered in predicting adoption and diffusion of an innovation within diverse environments and the components necessary to effect change.

Issues Related to Change

The criteria set forth by Rogers and Lindquist have comparable expectations. For an innovation to be accepted, it must involve ownership and be meaningful to the adopter; it should be achievable, thereby promoting self-esteem throughout the learning process; and it should be initiated by facilitory leadership. In view of these criteria and in the process of evaluating how innovation can be introduced into a system, it is important to examine the issues related to behavioral change.

"Learning means change" (Kidd, 1973, p. 15). This statement embodies the essence of learning and implies that as learning occurs, change will also occur. As a reaction to the fear of change, the learner may be reluctant to engage in new learning tasks. The learner's reluctance to enter into a new situation may be a response to the real or practical limit of

one's ability or potential capacity, or it may be a response to the psychological barriers which individuals design for themselves. Human beings are adept at constructing limiting beliefs that say such things as "you can't teach an old dog new tricks" and "you can't change human nature."

Transforming the teaching and learning processes as a result of the introduction of technology as an instructional tool implies a change for both teacher and learner, but for the teacher it is a dual challenge. Adapting to technology may require a flexibility not only in teaching style but also in learning style. Learning style is the characteristic way in which a learner operates within the learning situation (Bonham, 1988). A certain kind of content calls for one learning style over another (p. 12). As an example, math requires a sequential approach, but art requires a holistic approach to the learning process. Reluctance by faculty to learn how to use a new technology may be a result of an incompatibility of learning style to the task.

Motivation

The barriers to learning correlate to the attitudinal issues of how people accept change within the work and/or organizational setting. Introducing technology into the workplace demands change of work behaviors and orientation. What can motivate the adult learner to engage in tasks which require such changes? "Recent research on motivation has

focused especially on how certain thoughts, perceptions, and meanings of the situation to the person affect how or whether the person will invest time or talent" (Maehr & Braskamp, 1986, p. 35).

Cognitive theories of motivation argue that what is important are the thoughts, perceptions, and feelings that an individual has at the moment of behaving. Present thought and past experience related to the situation are critical to the outcome. These thoughts are of two kinds: (a) thoughts about self and (b) thoughts about the situation (p. 36).

When examining the motivational components necessary for the adult learner to engage in situations which require change, it is important to analyze the thoughts that the individual constructs regarding the self and the situation. Thoughts about self center on the judgment of significant others, feelings of self-confidence, and self-determination. Thoughts about the situation focus on whether it is considered a viable option and whether it is acceptable in relation to the individual's value system and the social environment in which the situation would occur. The thoughts and perception the individual holds toward himself or herself as well as the situation are important considerations in regard to designing activities to promote faculty acceptance of technology as a instructional tool.

Statement of the Problem

Change is a pervasive force in current postsecondary educational institutions. As these institutions position themselves to adapt to rapid technological change which impacts both the teaching and the learning environment, little has been done to understand the changing role of faculty in adapting to technology and to the psychological and physical environment in which adoption of these new technologies could occur. Yet faculty are the pivotal element in implementing any new technological change. Therefore, the examination of the experiences of faculty members as they accept or reject this new role in regard to the delivery of instruction is necessarily beneficial to the future design of faculty development programs for integrating instructional technology into the teaching process.

Purpose of the Study

The purpose of this study was to describe the current practices of faculty members of a public community college in relation to the adoption of technology as an instructional tool and to the diffusion of this innovation throughout the educational institution. This process was examined in relation to the faculty's demographic characteristics, learning style, teaching style, perceptions of technology as

a viable instructional tool, and conditions or influences which would encourage or discourage use of technology.

Research Questions

The following research questions directed this study:

1. What are the demographic characteristics of faculty interviewed regarding their use of technology as an instructional tool?
2. What are the learning styles of faculty interviewed regarding their use of technology as an instructional tool?
3. What are the teaching styles of faculty interviewed regarding their use of technology as an instructional tool?
4. What influence does integration of technology into the instructional environment have in regard to the role of the teacher in the classroom?
5. What conditions or influences would encourage use of technology as an instructional tool?
6. What conditions or influences would discourage use of technology as an instructional tool?
7. How is technology being used by faculty interviewed for this study?

Assumptions

The assumptions upon which this study was based related to the integration of technology into the educational arena. It was assumed that the Information Age has become a way of life and has created an ever increasing demand to integrate technology into many facets of society. This is also true for higher education. The challenge to higher education will be

to integrate technology throughout the instructional environment as a means to meet the diverse needs of the population it serves and also to be economically efficient in the process.

The growth of technology in education will place additional demands upon institutions to provide the resources and training necessary to assure faculty acceptance of technology as a viable instructional tool. Faculty acceptance will be the key to successful integration of technology into the teaching and learning process. Additionally, new technologies will provide alternative instructional delivery mechanisms that will have the potential to change the teaching and learning process.

Delimitations of the Study

This research was limited to the technologies utilized by the faculty of Bellevue Community College, the setting of this study. These technologies included personal computers (MAC and DOS/Windows) with a variety of software packages, multimedia with CD-Rom drives, authoring software such as powerpoint and toolbook, graphics calculators, and specialized technologies pertinent to specific disciplines such as music, art, and physical education.

Definitions

Adopter Categories are the five classifications of the members of a social system on the basis of innovativeness:

(a) Innovators, (b) Early Adopters, (c) Early Majority, (d) Late Majority, and (e) Laggards (Roger, 1983, p. 22).

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are new ideas (Rogers, 1983, p. 5).

Change Agent is an individual who influences clients' innovation decisions in a direction deemed desirable by a change agency (Rogers, 1983, p. 28).

Communication Channel is the means by which messages get from one individual to another. Interpersonal channels are more effective in forming and changing attitudes toward the new idea and thus in influencing the decision to adopt or reject a new idea (Rogers, 1983, p. 17).

Innovation is an idea, practice, or object perceived as new by an individual or other unit of adoption (Rogers, 1983 p. 11).

Innovation-Decision Process is the mental process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation (Rogers, 1983, p. 20).

Learning Style is the characteristic way in which a learner operates within the learning situation (Bonham, 1988, p. 12).

Opinion Leadership is the degree to which an individual is able to influence other individuals' attitudes or overt behavior informally in a desired way with relative frequency (Rogers, 1983, p. 27).

Teaching Style is the distinctive qualities of behavior that are consistent through time and carry over from situation to situation (Fischer & Fischer, 1979, p. 245).

Technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a designed outcome; it usually has two components: (a) a hardware aspect, consisting of the tool that embodies the technology as material or physical objects, and (b) a software aspect, consisting of the information base for the tool (Rogers, 1983, p. 12).

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

In a keynote address at the 1991 Leadership 2000 conference, Terrel Bell, former U.S. Secretary of Education, argued that almost no progress had been made in improving our schools since the 1983 publication of Nation at Risk, primarily because teachers were not provided with the tools they needed to make a difference--instructional technology. (Doucette, 1994, p. 202)

Bell viewed technology as the catalyst for improving student learning by helping teachers to individualize instruction and empower students. "While a decade of experimenting with computer-related technologies to improve instruction has yielded a thousand points of innovation and initiative, technology has yet to transform teaching and learning in the community college or anywhere else" (p. 202).

Several areas are related to understanding the process by which faculty at a community college adopt technology as an instructional tool and the diffusion of that technology throughout the educational institution. These include (a) the use of technology in higher education and its impact on the teaching and learning process; (b) examining diffusion theory in regard to adoption and diffusion; and (c) delving into

learning, attitudinal, and motivational issues related to behavior change in using technology as an instructional tool.

Technology in Higher Education

You are invited to step into what well could be the most important decade of human history--the 1990's. It is the end of a century, the end of a millennium, and the end of many aspects of our current way of life. The 1990's will introduce us to the new age of technology, the new learning age, and it will bring rich possibilities as well as challenges for colleges and universities. (Parnell, 1990, p. 3)

The New Learning Age

The 1990's have given society a new technological base upon which the nature of work will be transformed and in turn the nature of the educational system with the inherent responsibility to prepare its citizenry for this new work environment. Higher education is faced with the challenge to blend technology into the fabric of the teaching and learning process.

Dale Parnell (1990) has explored the impact of technology upon higher education and believes that "for education the technological breakthrough of the century will likely arrive in the form of simulated learning utilizing a new technology like the interactive compact disc" (p. 240). Parnell sees simulation learning as a reachable reality and not as a futuristic dream. It is already a part of the education and training program of business and industry and is particularly

used by the military. The Army National Guard has used a Synthetic Flight Trainer for helicopter pilots. This program simulates problem-solving situations which do not endanger the life of the pilot. For Parnell, the impact of this type of learning through technology is that it simulates a learning situation in which the student can apply knowledge to a real-life experience.

Christopher Dede (1987) views this technological evolution as one in which data processing and information systems will be replaced by sophisticated devices for "knowledge creation, capture, transfer, and use" (p. 23). The concept of "cognition enhancers" (p. 23) helps learners to understand how they can use emerging technology. The cognition enhancer combines the complementary strengths of a person and an information technology. Cognition enhancers are of two categories: empowering environments and hypermedia. Empowering environments divide human labor and therefore enhance human accomplishments. The machine handles routine tasks while the human attends to higher-order thinking activities. Examples of empowering environments include such things as databases, spreadsheets, spell checks, and desktop publishing. Hypermedia is "the framework for creating an interconnected, web-like representation of symbols (text, graphics, images, software codes) in the computer" (p. 24). The result is similar to human long-term memory as people

store information in the form of symbolic, temporal, and visual images that are related by association.

With the introduction of such enhancers, the implications for curriculum and the teaching/learning process are profound. As a result of the widespread use of cognition enhancers, Dede (1989) believes that a partnership between people and an enhancer (tool) will allow the machine to take over the basic cognitive skills (routine tasks) and free the individual to engage in higher level thinking skills such as creativity, flexibility, decision making, and evaluation/synthesization. Assessment of achievement will concentrate on higher-order skills; "learning-while-doing" (p. 25) will become more significant in occupational education; and an emphasis on group task performance, problem solving, as well as collaborative learning will also become more important.

Dede (1989) sees workplace skills shifting toward an emphasis on group task performance, problem solving, and collaborative learning. If this is true, education must take the responsibility to teach these skills in the instructional environment. "Students in conventional classroom settings have few opportunities to build skills of cooperation, compromise, and group decision making; shifts in teaching must occur so that computer-supported collaborative learning becomes a major type of student interaction" (p. 25).

Perelman sees the 1990s not as the Learning Age but as the Knowledge Age and views the technological revolution as

having the potential to "render education obsolete" (Roe, 1994, p. 8). This new era--the Knowledge Age--requires that workers and managers sort through multitudinous data, make connections, and create new solutions; that is, they will use group task performance and higher level thinking skills to solve problems. Perelman believes educational institutions are not organized for learning. "To the extent that learning does occur, it is often the wrong kind for most people. As an example, total teamwork is required for cooperative problem solving in business, while teamwork in American education is most often viewed as cheating" (p. 9). Perelman does not believe that the concept of learning as practiced by educators today fits with what the "Knowledge Age economy really wants people to do" (p. 9). Perelman's views are supported by the rapid change taking place in technology, production techniques, computers, robotics, and telecommunications. Dale Parnell (1990) in Dateline 2000 estimates the half-life of new knowledge is between 5 and 10 years and the skills needed in business and industry are changing as rapidly.

The challenge to higher education is to recognize that "education's very stock in trade--knowledge--has fundamentally changed, and with it, society's needs and expectations for its colleges and universities also have changed" (Roueche, 1993, p. 4). Higher education must examine its mission and make the adjustments necessary to meet the needs of the society it serves.

Technology, Teaching, and Learning

Have you ever wondered why it took twenty years for the overhead projector to make it from the bowling alley to the classroom?

Anonymous

"We seem to persist in the notion that technology will eventually make some profound difference--if we can only figure out what computers have to do with students and teachers" (O'Bannion, 1994, p. 201). If applied in creative ways, information technology has the potential to revolutionize the educational process. This could occur if information technology were used to "increase the number of students an individual faculty member can teach;" if "colleges were to provide sophisticated, organized learning experiences driven by information technology for large numbers of students that are monitored or supported by a teacher or teacher's aide;" and if "colleges were to design and provide sophisticated, organized learning experiences driven by information technology for large numbers of students that stand alone without any assistance from teachers or teacher's aides" (p. 17). "Only those activities that actually change the nature of the interaction between students and faculty qualify as transformational" (p. 215).

O'Bannion (1994) echoes the sentiments of the 1980s description of new educational technologies for the future which predicted "formal instruction will no longer be the result of a course prepared exclusively by an individual and

delivered by a program or institution to a group of students. Rather, courses will be developed by teams and delivered in a variety of ways to individual consumers" (Strange, 1981, p. 15).

As technology becomes an integral part of the instructional environment, it is important to not lose sight of the human factor and to assure that "the design of technology systems works for learners, rather than to require learners to adapt to the requirements of technology" (Gooler, 1987, p. 72). Concern is expressed in respect to the trend toward knowledge transfer being managed by technology rather than human teachers. "There is enormous potential as well as huge dangers in this type of learning. The dangers will inevitably dominate unless we see technology as part of an overall system rather than permitting it to develop in terms of its own dynamics" (Theobald, 1994, p. 21). Again, focus should be on the design of technology in meeting the needs of the learners and not on learners adapting to meet the needs of technology. It is the responsibility of instructional designers to protect the integrity of the learner as the learning and teaching process is transformed through technology.

Project Odyssey "re-engineered" the teaching and learning process by combining a "radically different, but sound, pedagogy with an effective use of technology" (Privateer & MacCrate, 1992, p. 76). Project Odyssey "offered a

pedagogically determined, technological solution that better reflected the learning process" (p. 76). The goal of this project was to "transform Humanities 110, an introductory interdisciplinary general education course with 120 students per semester, from a disenfranchised lecture class with average attrition and attendance rates (25% to 30%) into an active, self-directed learning experience based on an Information-Problem Solving-Applications (IPA) strategy" (p. 76). This project essentially transformed the course from an instructor-centered, one-dimensional mode of presentation to a student-centered, multi-dimensional, active learning environment. By joining a student-centered pedagogy with a complementary technology, Project Odyssey may have rehumanized the learning experience.

What will ensure that a project of this quality and relevance will persist and spread throughout an instructional environment? According to MacCrate of Project Odyssey, "Right now we depend on the technological entrepreneurs on the faculty to take the lead. You can't expect all faculty members to drop everything they have done for years and adopt a new technology. But some elements of instructional technology would certainly blend with their teaching style" (Watkins, 1991, p. A26).

Teaching Style

What is teaching style? Teaching style can be defined as a hypothetical construct which is associated with various identifiable sets of teacher behaviors (Conti, 1985). It is a useful tool to "understand and perhaps explain certain important aspects of the teaching-learning process" (Fischer & Fischer, 1979, p. 254). Teaching style refers to the traits and qualities that a teacher displays in a classroom that are consistent in various situations (Conti, 1989). There are alternative views regarding the phenomenon of teaching style and how it is conceptualized into practice. Some view teaching style as an "external teacher characteristic" (Conti, 1989, p. 3), which includes modeling ideal teacher behavior, choosing strategies based on desired student outcomes, and linking dimensions of teaching style to equivalent dimensions of learning style.

The alternative view is that teaching style is internal in nature (Conti, 1989). This internal characteristic is determined by the values which the teacher brings to the instructional environment and molds the teacher's beliefs about the purpose of education, the structure of curriculum, the role of the teacher, and the nature of the learner (p. 4). These beliefs are based upon basic philosophies regarding "the way in which education should be conducted and the general principles that guide practice" (Beder, 1991, p. 37). Teaching style as an external characteristic is defined

through the strategies and methods which are utilized; teaching style as an internal characteristic is defined through the "range of behaviors in which the teacher can operate comfortably according to a certain value system" (Conti, 1989, p. 4).

Teaching Style and Technology

As the tools of information technology become more available within the classroom environment, new ways of generating and exchanging information have emerged. As technology becomes a part of instructional methodology, does this change how teachers perceive their role in the classroom?

There are common factors related to the use of technology in the classroom (Florini, 1989). "Technology-based instruction is essentially mediated-instruction, therefore the technology is interposed between student and teacher and student to student" (p. 49). Teacher independence may be impacted due to the need to interface with technicians and program developers. Some degree of collaboration and cooperation may be needed to successfully utilize technology thereby requiring the teacher to take a team approach in the delivery of instruction. This may impact teacher independence. Loss of flexibility may result as the technology may demand longer planning timelines and may not be conducive to spontaneity. Each technology may have its own idiosyncracies which make it more or less applicable for

particular uses. What are the implications for teaching style and technology?

A personally constructed model can help teachers make effective instructional use of information technology without sacrificing important aspects of their teaching style. The development of this model would require that teachers recognize their own teaching style; become familiar with the medium's characteristics, understand the specific institutional circumstances in which the technology is used; and develop a sense of appropriate use of the technology" (Florini, 1989, pp. 51-52).

Diffusion of Innovations

The gee-whiz futurists are always wrong because they believe technological innovation travels in a straight line. It doesn't. It weaves and bobs and lurches and sputters. (Naisbitt, 1982, p. 41)

The Tradition of Diffusion Research

In reviewing diffusion research, it would be advantageous to ask the questions which Everett Rogers (1983) also asked in his treatise on diffusion. Where did diffusion research come from? How did it grow to prominence, recognition, and use?

Diffusion research has a long and varied history. This tradition is associated with Gabriel Tarde, a French social psychologist as well as a judge who was prominent at the turn of the century. Tarde made several generalizations regarding diffusion of innovation and is best known for his concept of the "Laws of Imitation" and the "S Curve-Rate of Adoption." Tarde noticed that adoption would take off in an S curve when "opinion leaders" in a system accepted the idea. It was his

observation that adoption occurred first with an individual closely associated with the new idea, and then it would spread from higher- to lower-socio status individuals. Ideas that were similar to ones already accepted were the more likely to be adopted. These insights relating to the concept of diffusion of innovation have been validated by subsequent research.

The British and German-Austrian diffusionists who followed Tarde's footsteps and were anthropologists by training had similar viewpoints. It was their claim that all innovation spread from the original source. This idea argued against the concept that there was an existence of parallel inventions. That parallel inventions occurred throughout history has been demonstrated. It was not the concept of original source that gave this group prominence. Rather, it was that their actions brought attention by social scientists and anthropologists to the theory of diffusion. These are the roots of diffusion research.

Rogers (1983) viewed the rise of diffusion research traditions as a major breakthrough in the way of looking at something. It represented a revolutionary paradigm. The traditions include a foundation in anthropology, sociology, education, medical sociology, communication, marketing, and geography.

Diffusion research grew from the methodology used in anthropological investigation. The anthropologist had the

advantage of seeing a phenomenon from the respondent's viewpoint, could gather data over time, and primarily examined cross-cultural diffusion rather than diffusion within a social system. The tradition referred to as "Early Sociology" (Rogers, 1983, p. 50) was primarily concerned with innovation which contributed to social change and utilized quantitative analysis using primary and secondary sources.

Rural sociology formed the intellectual paradigm for diffusion research and was primarily agricultural research. In 1964, 45% of diffusion research was in rural sociology, but by 1981 this represented only 8%. As the United States has transformed from an agrarian-based economy to one that is service and information oriented, so has diffusion research. A classic rural sociology diffusion study on hybrid corn by Ryan and Gross led later diffusion scholars toward such research questions as: (a) What variables related to innovativeness? (b) What was the rate of adoption of an innovation? (c) What factors explained this rate? This paradigm also established the methodology of "one-shot" interviews for gathering data (Rogers, 1983). As a result, rural sociology diffusion studies led to insight into the communication strategies necessary to diffuse new ideas rapidly throughout a system. It also asked the hard question of what are the consequences of technological innovations in relation to the impact on the societal structure? This

question focuses on the need to be technologically responsible and considerate of the human factor.

Education was not a late-comer in the diffusion research tradition, but has been limited in its impact upon this field of knowledge. In the 1920-30s, Dr. Paul Mort (1953) conducted a study which looked at local control over school finances as opposed to federal or state control and upon its influence on innovativeness. This study pointed to the educational cost per pupil as being the best predictor of innovativeness and indicated that there was a definitive time lag for widespread adoption. Schools typically would lag 25 years behind an innovative practice. Carlson (1965) analyzed the spread of modern math which diffused over a period of five years, a relatively short timespan in relation to the rate of adoption of most innovative practices. This study focused primarily on interpersonal networks and the importance of opinion leaders.

Education diffusion publications numbered 23 in 1961 (5% of all diffusion work), 71 in 1968 (6%), and 336 in 1981 (11% of all diffusion publications (Rogers, 1983, p. 62). Education's contribution to the field has been distinctive in that the studies project an organizational view rather than an individual. Teachers belong to the educational organizations and often make "collective and/or authority innovation-decisions" (p. 62) or individual decisions which are influenced to some degree by the organization.

Contributions of Diffusion Research

What is the appeal and value of diffusion research? Diffusion research embodies a conceptual paradigm that crosses many disciplines. Tracing the spread of an innovation through a system gives "life" to a behavioral change process (Rogers, 1983, p. 89). Because innovation is occurring throughout modern society, applications of diffusion theory and research are found in many places, and knowledge regarding diffusion of innovations has come to be regarded as a useful field within the social sciences (Rogers, 1983, p. 90).

Criticism of Diffusion Research

Diffusion research has suffered from "pro-innovation bias" (p. 92) which implies that an innovation should be adopted and diffused by all members of a social system. It assumes that the innovation is good for all members of the system and does not account for individual perceptions of the innovation nor understands the individual's situation, problems, or needs. Rogers (1983) indicates that this criticism of diffusion research can be overcome if the researcher does not always think of diffusion research as a backward look, but rather investigates the process as it is occurring. A researcher could investigate the broader context in which an innovation diffuses by looking at the environment in which it occurs as well as the existing practice(s) it might replace. It is also important to understand the

motivations for adopting an innovation by asking the question, "Why?" The diffusion investigator should see an innovation through the eyes of the respondent. These are the steps that could be taken to avoid pro-innovation bias (Rogers, 1983, pp. 95-98).

The Innovation-Decision Process

The innovation-decision process is "the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of the decision" (Rogers, 1983, p. 163). This process is conceptualized in five stages as illustrated in Figure 1, Rogers' Model of Innovation-Decision Process (p. 165).

Rogers' (1983) Model of Innovation-Decision Process begins with the Knowledge Stage when the individual (or unit) is made aware of the innovation and gains some understanding of its function. This event may occur as happenstance or by design depending upon the innovation and/or the situation in which it is presented. There is argument as to whether this stage is a passive activity or whether it is more active in that the individual (or unit) seeks information regarding the innovation. During this phase, the information that is sought is of three types: software information which answers such questions as "what is the innovation and how does it work?";

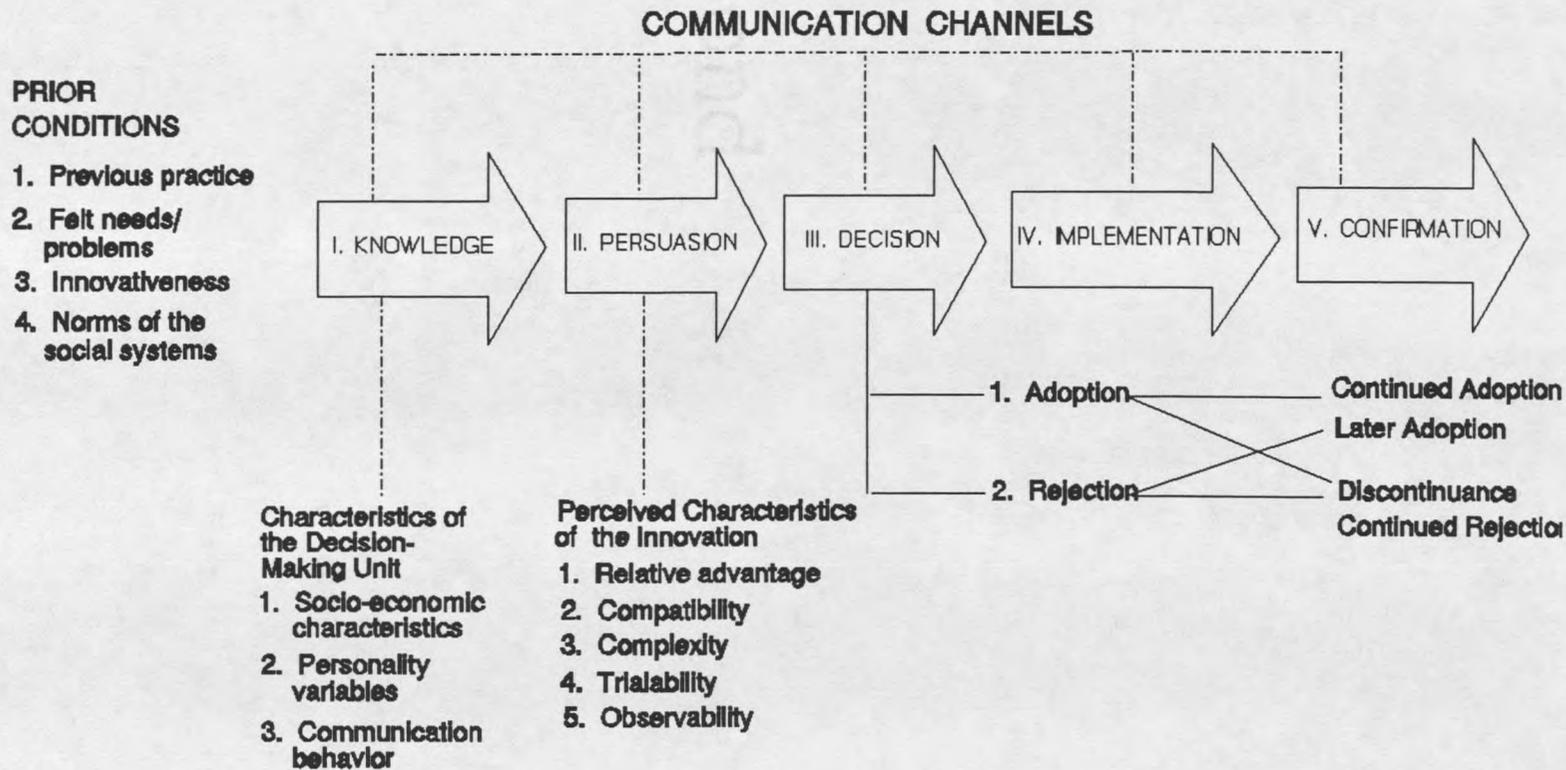


Figure 1. A Model of Stages in the Innovation-Decision Process.

how-to-knowledge which consists of information necessary to use an innovation properly; and principles knowledge which provides the underlying functioning principles of how the innovation works (p. 167).

Another aspect of this stage focuses on the characteristics of those categorized as "early knowers of an innovation" (Rogers, 1983, p. 168). Early knowers tend to have more education, higher economic status, more exposure to mass media and interpersonal communication channels, more contact with change agents, and more social participation, and to be more cosmopolite (pp. 168-169). A change agent is an individual who influences clients' innovation decisions in a direction deemed desirable by a change agency (p. 168).

In the Persuasion Stage, the individual (or unit) forms a favorable or unfavorable attitude toward the innovation. It is at this point that the attitude toward the innovation is affective rather than cognitive, as it is in the Knowledge Stage. The important questions asked at this stage are: (a) What are the innovation's consequences? and (b) What will its advantages and disadvantages be in my situation? It is at this point that an overt behavioral change will occur (Rogers, 1983, pp. 169-171).

The Decision Stage occurs when the individual (or unit) takes steps toward making a choice to adopt or reject the innovation. Most individuals do not adopt an innovation without trying it first. Although for some individuals, trial

by a peer can substitute for the individual's own need to try the innovation prior to adoption (Rogers, 1983, pp. 172-173).

The Implementation Stage is the point at which an individual (or unit) puts an innovation into use. This stage implies overt behavior as the new idea is implemented. This stage is important in that it is one thing for adoption to occur but quite another to actually use the innovation. The questions asked during this phase include: (a) Where do I obtain the innovation? (b) How do I use it? and (c) What operational problems am I likely to encounter, and how can I solve them? It is at this time that the change agent has a responsibility to provide the support necessary to ensure success. This stage ends when the innovation becomes institutionalized or a regular part of the adopter's day to day operation (Rogers, 1983, p. 174).

The Confirmation Stage is the terminal stage in the innovation-decision process. At this stage, the individual (or unit) seeks reinforcement for the innovation-decision already made, but risks reversing the decision if conflicting information about the innovation is received. The adopter seeks to reduce dissonance but will react to information that leads to questioning the merit of the innovation. At this point, the adopter may possibly discontinue use of the innovation. The change agent has a special responsibility at this time to provide messages to the adopter in support of the innovation (Rogers, 1983, pp. 184-185).

The validity of these stages is evidenced by research from an Iowa study by Beal and Rogers (1960) that indicated these were the stages that most farmers recognized that they went through during the process of adopting an agricultural innovation. Other studies (Copp, 1958; Mason, 1962; & Wilkening, 1956) substantiated Beal and Rogers. These studies revolved around farmers and did not reflect other kinds of innovations.

Communication Channels and the Diffusion Process

Rogers (1983) points to the importance of communication channels during the various stages of the innovation-decision process. The communication channel is the means by which messages transfer from one individual to another. These channels are categorized as (a) interpersonal or mass media in nature or (b) originating from either localite or cosmopolite sources. An example of a cosmopolite source is a doctor traveling to an out-of-town medical specialty meeting. Cosmopolite and mass media channels are more important at the Knowledge Stage, and localite and interpersonal channels are more important at the Persuasion Stage. Interpersonal channels are more effective in forming and changing attitudes toward the new idea and thus in influencing the decision to adopt or reject a new idea (Rogers, 1983, pp. 197-200).

In regard to adopter categories and communication channels, mass media and cosmopolite channels are more

important to earlier adopters than later adopters. That these channels are used by early adopters is reasonable in that early adopters must depend upon outside sources for their information and consequently become the interpersonal and localite channels for later adopters (Rogers, 1983, pp. 201-202).

Attributes of Innovations

Rogers (1983) has developed a comprehensive set of characteristics of innovations. These characteristics include relative advantage, compatibility, complexity, trialability, and observability. A detailed description of this general framework is as follows:

1. Relative advantage is expressed as the extent to which an innovation is thought to be better than the practice or idea which preceded it. This advantage may be seen from various viewpoints such as economic or social and has implications as to the rate of adoption. The "relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption" (Rogers, 1983, p. 218).

2. Compatibility is considered the degree to which an innovation is believed to be consistent with existing values, past experiences, and needs of potential adopters. Compatibility or incompatibility of an innovation may stem from sociocultural values and beliefs, previously introduced

ideas, or client needs for innovations. As with relative advantage, "the compatibility of an innovation, as perceived by members of a social system, is positively related to its rate of adoption" (Rogers, 1983, p. 226).

3. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use, and this may be expressed on a complexity-simplicity continuum. The "complexity of the innovation, as perceived by members of a social system, is negatively related to its rate of adoption" (Rogers, 1983, p. 231).

4. Trialability is based on the extent to which an innovation can be tried on a limited basis. This ability to experiment with a new idea or practice reduces uncertainty. "The trialability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption" (Rogers, 1983, p. 231).

5. Observability is determined by the degree to which the innovation is observable to others. This is based upon the concept that some innovations are easily observed and communicated to others, whereas some innovations are difficult to describe to others. "The observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption" (Rogers, 1983, p. 232).

In defining the attributes of an innovation, it is important to know that much diffusion research has focused on technological ideas. Rogers (1983) views technology as:

A design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome. A technology has two components: (a) a hardware aspect that consists of the tool that embodies the technology as material or physical objects, and (b) a software aspect that consists of the information base for the tool. (p. 12)

Rate of Adoption

The rate of adoption is the speed at which an innovation is adopted by members of a social system. It is usually measured by determining the number of individuals who accept a new idea or practice in a specified period of time. Rogers (1983) determined that 49% to 87% of the variance in rate of adoption is explained by the five attributes, but other variables are also important to the adoption process. These other variables include (a) type of innovative-decision, (b) communication channels, (c) nature of the social system, and (d) extent of change agent's promotion effects.

There are three types of innovation-decisions: optional, collective, and authority. Each of these influences the rate of adoption. "We generally expect that innovations requiring an individual-optional innovation-decision will be adopted more rapidly than when an innovation is adopted by an organization" (p. 233).

Communication channels (mass media or interpersonal) used to diffuse an innovation influence the rate of adoption. If interpersonal channels must be used to create awareness-knowledge, as frequently occurs among later adopters, the rate

of adoption will be slowed (p. 233). This becomes a complex issue. Petrini et al. (1968) found differences in communication-channel use on the basis of the perceived complexity of innovations among Swedish farmers. Mass media channels were satisfactory with less complicated innovations, and personal contact with extension change agents was more important for innovations that were perceived to be more complex.

The nature of the social system is another variable to consider in regard to the adoption process. Of particular importance is are the norms of the system and the degree to which a communication network structure displays a high degree of interconnectedness. This is demonstrated by the "diffusion effect" (Rogers, 1983, p. 234). This effect is the cumulatively increasing degree of influence upon an individual to adopt or reject an innovation. This may result from activation of peer networks about an innovation in a social system.

For example, when only 5% of the individuals in a system are aware of a new idea, the degree of influence upon an individual to adopt or reject the innovation is quite different from when 95% have adopted. In other words, the norms of the system toward the innovation change over time as the diffusion process proceeds, and the new idea is gradually incorporated into the lifestream of the system. (pp. 234-235)

The extent of the change agent's promotion efforts also impacts the rate of adoption of innovations. This is not a direct influence. "There is a greater pay-off from a given

amount of change agent activity at certain stages in an innovation's diffusion" (p. 234). When an opinion leader is adopting an innovation, there is greater response to the change agent's efforts.

Adopter Categories

To innovate is not to reform.
Edmond Burke (1796)

As some people are more predisposed to accept and use new ideas or practices than others, Rogers (1962) described adopters according to specific categories based on level of innovativeness. At the time Rogers developed his descriptions, a number of other diffusion researchers had also attached various adjectives to describe adopters. This was especially so for those determined to be innovative. These descriptors varied from Progressists, Hightriers, Experimentals, Lighthouses, Advance Scouts, and Ultraadopters; those thought to be the least innovative were called Drones, Parochials, and Diehards (Rogers, 1983, p. 242).

Recognizing the need for standardization of terms, Rogers (1983) developed the following adopter categories as ideal types and as a framework for synthesizing research findings.

1. Innovators are described as venturesome. These individuals desire to try new ideas and usually will go out of their social circle into more "cosmopolite" social relationships (p. 248). This individual may not be the most respected

within the social system but will play a major role in the diffusion process.

2. Early Adopters are considered respectable in that they are more integrated into the social system than innovators. These individuals rely on "localite" social relationships (p. 249) and have a greater degree of opinion leadership in that potential adopters will look to these persons for advice and information. They serve as "role models for many others of a social system" (p. 249).

3. Early Majority will adopt new ideas before the average member of the social system and are deliberate in their efforts. These individuals usually do not hold leadership positions, but interact frequently with their peers. "They follow with deliberate willingness in adopting innovations, but seldom lead" (p. 249).

4. Late Majority are seen as skeptical and adopt new ideas after the average member of the social system. Their acceptance may be based more on economic necessity as well as increasing pressures from peers.

5. Laggards are traditional in their mindset and are the last to adopt an innovation. They are not opinion leaders and they are the most localite in their social relationships. These individuals use the past as their point of reference and are extremely suspicious of innovators and change agents. This term has been criticized as being especially negative,

but as Rogers (1983) asserts, any name would soon take on a negative connotation by diffusion scholars.

These categories are important in that they suggest that change agents should use somewhat different approaches with each adopter category, thus following a procedure of audience segmentation, a diffusion strategy in which different communication channels or messages are used with each audience segment (p. 262).

Opinion Leadership

Opinion leadership is a term mentioned throughout this discussion of diffusion theory and especially in reference to adopter categories. Opinion leadership is "the degree to which an individual is able informally to influence other individuals' attitudes or overt behavior in a desired way with relative frequency" (Rogers, 1983, p. 271). These are the individuals who influence the opinions of others in regard to innovations and also influence the rate of adoption throughout a social system.

The generalizations related to the characteristics of Opinion Leaders fall into four areas: (a) communication, (b) accessibility, (c) socioeconomic status, and (d) innovativeness (Rogers, 1983). Opinion Leaders differ from their followers by their manner of external communication. Opinion Leaders are considered to have greater exposure to mass media, are more cosmopolite, and have greater change agent contact.

They also differ in their level of accessibility for communication. Opinion Leaders demonstrate greater social participation than their followers. The socioeconomic status of Opinion Leaders is usually higher than their followers as well as their level of innovativeness. This does not necessarily imply that all Opinion Leaders are thought to be innovators (pp. 282-284).

Opinion leadership stems from a two-step flow model which hypothesizes that "the communications messages flow from a source, via mass media channels, to Opinion Leaders, who in turn pass them on to followers" (Rogers, 1983, p. 310). This communication flow can be enhanced by understanding the concepts of homophily and heterophily (Lazerfeld & Merton, 1964). The label homophily was based upon the concept that communication is more effective if the receiver and sender are homophilious--that is, they are alike in terms of their value system, social status, and educational level. Opinion Leaders play an important role in the diffusion process through their interactions with and influence upon others. This role is of particular importance as most Opinion Leaders are categorized as Early Adopters and potential adopters will look to these persons for advice and information. The Early Adopter, who is often considered the Opinion Leader, tends to serve as a role model within that social system.

Diffusion theory can provide a framework by which to understand the adoption and spread of technological innovation

throughout an educational environment. It provides useful terminology by which to characterize the participants in a change process and to gain understanding of the diffusion process.

Learning, Motivation, and Behavior Change

Social Learning Theory

Rogers (1983) indicated that a "social-psychological theory with direct applicability to diffusion networks is Social Learning Theory" (p. 304). Social Learning Theory looks outside of the individual at information exchanges with others in order to explain how behavior changes. "The central idea of Social Learning Theory is that an individual learns from observation from another by means of observational modeling; that is, one observes what another person is doing, and then does something similar. But not exactly the same thing" (p. 304). Also, another perspective of Social Learning Theory is that the individual can learn from other people's activities and does not necessarily have to experience verbal interchange to be influenced by the model. Also, because Social Learning Theory recognizes external factors to the individual as important in behavior change, it views communication as causing change, along with the individual's psychological makeup. "Social modeling can occur in interpersonal networks or by a public display by someone with whom one is unacquainted" (p. 305).

The modeling concept of Social Learning Theory is tangential to the diffusion process in that an important component of diffusion is the modeling by potential adopters of their peers who have previously adopted a new idea or practice.

Rogers (1983) also identified the differences between Social Learning Theory and diffusion of innovations. These differences show that diffusion research as opposed to Social Learning Theory measures more exactly what the individual learns through a network link with an adopter of an innovation; it gives greater attention to time as a variable in behavior change; it recognizes that the individual learner may abstract or generalize the information learned from the role model; and, following the lead of social learning theorists, diffusion studies move toward more focus on the mutual exchange of information as a basis for behavior change.

Another important issue tied to this concept of modeling is the proximity of the role model to the observer. It has been observed by other diffusion researchers that individuals were influenced by those in direct link with themselves and by those linked through one intermediary (Lee, 1977). Beyond this two-step link, influence diminishes. This has implications for diffusion research conducted in an organizational setting which may be departmentalized and isolated either environmentally or geographically and which may limit communication.

Attitude, Motivation, and
Behavior Change

The barriers to learning often correlate to the attitudinal issues of how people accept change in their personal and professional lives. "Attitudes are powerful influences on human behavior and learning because they help people to make sense of their world and give cues as to what behavior will be most helpful in dealing with that world" (Wlodkowski, 1993, p. 46). "An attitude is an internal state that influences the choice of personal action" (Gagne, 1984, p. 383). Attitude is a determinate of desire, value, and expectation of the learning experience. "We realize much more that whether students are learning is a function of what they want to learn; not just the value they place on the learning experience but also their expectations about the chance of success if they devote effort to learning" (McKeachie, 1988, p. 10).

Introducing technology into the instructional environment may require faculty to learn new skills as well as change their teaching behaviors. What would motivate the teacher as an adult learner to engage in activities with such potential? "Recent research on motivation has focused especially on how certain thoughts, perceptions, and meanings of the situation to the person affect how or whether the person will invest time or talent" (Maehr & Braskamp, 1986, p. 35).

Cognitive theories of motivation argue that what is important are the thoughts, perceptions, and feelings that an individual has at the moment of behaving. Present thought and past experience related to the situation are critical to the outcome. These thoughts are of two kinds: (a) thoughts about self and (b) thoughts about the situation ((Maehr & Braskamp, 1986, p. 36). In regard to thoughts about self, importance is given to the judgment of significant others as an intrinsic motivational factor. Thoughts of self-confidence is a judgment that one makes for oneself. "A sense that one can do something if one tries has been characteristically associated with motivational patterns" (p. 37). The concept of self-determination requires that the individual believe that he or she has initiated the action. Believing that the activity is self-determined allows the individual to develop a sense of ownership, thereby increasing the likelihood of participation.

Thoughts about self are linked to thoughts about the situation. Before an individual engages in an action, there must be a perception that it is a viable option. "People will act in terms of what they perceive to be available to them in any given situation; that is, they will act in terms of what they perceive as possible" (Maehr & Braskamp, 1986, p. 40). Also, the option needs to be perceived as acceptable and ties in with what is right and proper--judgments that are based in large part on one's membership in particular sociocultural groups and on the roles one plays. Emphasis on cognition in

understanding motivation underscores the importance of internal thoughts regarding the self as well as the situation in encouraging a positive attitude toward a new learning experience.

Learning Style

One of the implications of integrating technology into the classroom environment is to recognize the importance of assisting faculty to learn how to use these technologies effectively. This task may well require a change in attitude as well as ability. Recognition of the teacher as a learner may be correlated to the success of professional development activities. During the learning process an individual may prefer to debate abstract concepts while another may desire to participate in practical application; one individual may want to research information while others will want to obtain insight from other persons (Kolb, 1981, p. 237). "A learning process for staff that respects such differences can model ways to respond to individual and group differences among students" (Lindquist, 1981, p. 745).

Learning style research is built on the concept that individual differences are important in learning (Bonham, 1988). Learning style is the characteristic way in which a learner operates within the learning situation. The various dimensions of cognitive style include an "analytical, impersonal approach to problem solving versus a more global

orientation; cognitive complexity and abstraction versus cognitive simplicity and concreteness; impulsivity versus reflection; and convergent thinking versus divergent thinking" (Knox, 1987, pp. 22-3). Analysis of cognitive styles provides the structure for comparing one adult with another as they engage in the learning process.

Kolb (1977) proposes a framework that includes various styles of learning and suggests that effective learners may be those who can use various approaches depending upon the purpose and circumstance. The development of the "experiential learning theory" (p. 235) blends research on cognitive development and cognitive style resulting in "a model of the learning process that is consistent with the structure of human cognition and the stages of human growth and development" (p. 235). Within this model, learning is seen as a four-stage cycle, and concrete experience is the basis for observation and reflection. These observations are used to generalize or "build an idea" (p. 235) from which new implications arise. Effective learners need four kinds of abilities: concrete experience, reflective observation, abstract conceptualization, and active experimentation. As these abilities are diametrically opposed to one another, the learner must choose which set to use in a specific situation. From this model Kolb identifies four types of learning styles. These are the Converger who is best at finding practical uses for ideas and theories, the Diverger who prefers viewing

concrete situations from many points of view, the Assimilator who is best at understanding a wide range of information and putting it into concise, logical form, and the Accommodator who has the ability to learn primarily from hands-on experience (p. 238).

Kolb stresses that these styles should not be considered stereotypes. However, the theoretical framework by which these styles were created may provide a basis for understanding behavior manifestations while engaged in a new learning experience. People vary in how they learn and react differently from one another in new learning situations. As learning activities are developed to teach new skills in the use of technology, it is critical to integrate diverse activities into the learning experience to complement these differing styles.

CHAPTER 3

DESIGN OF THE STUDY

Introduction

The role that technology is expected to play in regard to the delivery of instruction is considered to be significant. How this will impact the teaching and learning environment is an area of concern at all levels of the educational process, but it is of special concern for those charged with the responsibility of providing professional development opportunities to ensure that the technology is appropriate to the task and will be adopted and diffused throughout the system.

Design

"The selection of a particular design is determined by how the problem is shaped, by the questions it raises, and by the type of end product desired" (Merriam, 1988, p. 6). As the intent of this study was to describe and explain a phenomenon rather than to make a prediction based on cause and effect, a descriptive case study design was used.

A descriptive case study was utilized to investigate the current practices of faculty members of a public community

college in relation to the adoption of technology as an instructional tool and diffusion of this innovation throughout the educational institution. Both qualitative and quantitative data were gathered throughout the research process. Qualitative data consist of direct quotations from people about their experiences, attitudes, beliefs, and thoughts (Patton, 1986, p. 187). Quantitative data come from questionnaires, tests, standardized observation instruments, and program records (p. 187).

"Using more than one data collection approach combines strengths and corrects some of the deficiencies of any one source of data. Building checks and balances into a design through multiple data collection strategies is called triangulation" (Patton, 1987, p. 60). This study utilized methodological triangulation or the use of multiple methods to study a single problem or program such as interviews, observations, questionnaires, and documents (Patton). The data collected for this study included information from interviews and standardized instruments.

Setting

Bellevue Community College (BCC) is a two-year public community college located in an urban setting of Seattle, Washington, in close proximity to industry leaders such as Microsoft and Nintendo which are known worldwide for development of innovative computer technologies. Bellevue

Community College has a mission to provide an academic environment which encourages students to become responsible, analytical, creative, and productive citizens; provide accessible services and educational programs that reflect excellence; meet the changing educational needs of a diverse community; promote pluralism within a multicultural society; and be a leader and partner in the culture, technology, and business of the community.

Bellevue Community College is unique among community colleges in its efforts to be recognized as a regional resource for the development of electronic courseware and telecommunications-based curricula. Through development of the Center for Emerging Technologies under the auspices of the National Science Foundation's Advanced Technical Education Grant Project, an emphasis has been placed upon designing curricula to meet the anticipated employment needs of regional businesses in the areas of information, biomedical, environmental, and manufacturing technologies. The Center for Emerging Technologies may provide the key for training regional employees to stay technologically competitive. "High technology companies require a wide range of job skills, including technical, marketing and management expertise. Such programs as those offered at the Bellevue Community College Center for Emerging Technologies are essential to begin equipping students with necessary skills" Reynolds, 1994, p. 9).

The BCC Center for Emerging Technologies is designed to help to serve a nontraditional student body which has been in the work force for several years. According to the BCC's Director of College Relations, the average student at the school is not a freshman, but 31 years old and is typically a university graduate with a four-year degree looking to improve their marketable job skills (Reynolds, 1994, p. 9).

This striving for technical competence is evident throughout Bellevue Community College. A professional development program provides summer grants to faculty to engage in such pursuits as increasing technological skill or developing innovative instructional strategies. A HelpDesk was established to provide technical support for faculty as they interface with technology. A Technology Plan was drafted for preview focusing on the strategies for implementation from four perspectives: Division, Department, Faculty, and Faculty and Staff Training. The response of the Arts and Humanities Division to this Technology Plan outlined specific faculty strategies such as assessment of interests and capabilities in relation to types of training desired; input into the department's instructional technology plan and suggested priorities and implementation time-lines; identification of needs for hardware/software and technical support; and assessment of positive and negative benefits of using computer tools in teaching and the benefit to students. Implementation of this technology plan will ensure that a campus-wide

coordinated effort will be made to encourage the use of information technology to improve teaching and learning at Bellevue Community College.

Sampling

It is the faculty of this college which represents the unit or "bounded system" (Merriam, 1988, p. 9) of this study. The sample for this study was drawn from the roster of 100 faculty members representing various disciplines within the divisions of Arts and Humanities, Business, Educational Development and Health Sciences, Science, and Social Science as well as Educational Services and Instructional Services at Bellevue Community College.

For this study, value was placed on using purposeful sampling to select "information-rich cases" (Patton, 1987, p. 52), which would provide a great deal of information about the issues of central importance. "Naturalistic sampling is based on informational, not statistical, considerations. Its purpose is to maximize information, not facilitate generalization" (Lincoln & Guba, 1985, p. 202).

The process for identifying participants from the BCC faculty follows: (a) permission to conduct a study to examine the adoption of computer technology by faculty at Bellevue Community College was granted by the Executive Dean; (b) a liaison between the researcher and the college was identified to assist in this process; and, (c) communication between the

liaison and the researcher was established to identify the faculty members. Through this process 27 faculty members representative of each department on campus were selected as participants for this study. They were from the following departments: Art--2, Business--1, Chemistry--1, Computer Science--1, Computer Information Systems--2, Communications--1, Developmental Education--1, English--3, Economics--1, Engineering--1, Foreign Language--2, Library Science--1, Life Science--1, Math--1, Music--1, Nursing--1, Parent Education--1, Physical Education--1, Physics--1, Reading--1, Social Science--1, and Statistics--1. Of these participants, 17 (67%) were male and 9 (33%) were female; 16 (59%) held full-time faculty positions, and 11 (41%) held administrative as well as faculty positions.

Principles of Adult Learning Scale (PALS)

Both quantitative and qualitative data were collected. Quantitative data were gathered with the Principles of Adult Learning Scale (PALS) and the Learning Style Inventory (LSI).

The Principles of Adult Learning Scale (PALS) is an instrument designed to assess the teaching style of adult education practitioners. "The total score gives the practitioner's overall preference for teaching behavior in an adult education setting" (Conti, 1985, p. 8). This instrument is based upon the principles advanced in adult education literature (Conti, 1979, 1982) which support the

"collaborative mode" of instruction as the most beneficial to the adult learner. In the collaborative mode, "adult education is learner centered and a cooperative venture in which the learner is a full partner" (Bergevin, 1967, p. 168). In this view, the role of experience of the adult learner is crucial to the instructional process (Conti, 1983). Supporting this assumption, Malcolm Knowles (1980) asked the question: What does it mean to understand learning from the adult perspective? In response to this question, Knowles developed a conceptual framework to describe the way in which adults engage in the learning process. This framework suggested that the adult learner has a need to be self-directed; has a rich reservoir of experience that is a resource for learning; is ready to learn when there is a real life need to learn; and sees education as a process of developing increased competence to achieve full potential (pp. 43-44).

Construction. As this instrument is based upon the professional body of literature which supports the collaborative teaching-learning mode, each item in this instrument reflects these theoretical principles stated in behavioral terms. Twenty of the 44 items are stated positively to assure congruity with the collaborative mode. The items are randomly arranged throughout the instrument.

This instrument utilizes a modified Likert scale. Respondents are asked to indicate the action described in the way which would be most frequently practiced. In scoring the instrument, responses which are congruent with the collaborative mode are assigned a high value and, conversely, responses not congruent are assigned a low value. The Likert scale provides six options ranging in value from zero to five. The 44-item instrument has a possible high score of 220.

Validity and Reliability. Validity and reliability of the items in the PALS instrument were established through field testing. The research design controlled for construct, content, and criterion-related validity, reliability, social desirability, and congruence of interpretation of the instrument's items (Conti, 1982).

Conti (1982) established construct validity of the items through the testimony of two juries of adult educators. The first jury consisted of three Northern Illinois University education professors who analyzed the items, commented on the validity of the constructs of the items, and suggested improvement for various items. The second jury, who were asked to validate the construct of each item, consisted of 10 professors with a high degree of visibility in the field of adult education, with geographic dispersion throughout the country, and with philosophical heterogeneity.

Conti (1982) established content validity by field-tests using adult basic educators in full-time public school programs in Illinois. The field-testing process consisted of two phases. Phase 1 included three field-tests to identify items that discriminated between supporters and nonsupporters of the collaborative mode. Phase 2 included the field testing of the instrument with 57 educators in six programs--two of which were metropolitan, two were in medium-size cities, and two were in small rural communities. Upon analysis of the pooled scores, it was determined that an individual's total score could be used as the criterion measure of the support of the collaborative mode. Conti (1982) found that "the items which were valid and representative samples of this mode would contribute significantly to the total score and would correlate positively with this criterion measure of total score" (p. 6). Also, "content validity was determined by Pearson correlations which measured the relationship between each individual item and the total score for each participant" (p. 6).

Criterion-related validity was established by comparing the scores on PALS of those who scored two standard deviations either above or below the mean in Phase 2 of field testing to their scores on the Flanders Interaction Analysis Categories (FIAC) (Conti, 1982). The FIAC was used because it was a validated system for measuring initiating behaviors and responsive classroom actions and because the actions described

in the definition of initiating were highly congruent with the characteristics of the collaborative mode (Conti, 1982). "The scores derived from actual observations were used to evaluate PALS concurrent validity and to assess the degree to which accepting a mode and practicing it were congruent" (p. 6).

Reliability of the instrument was established through the use of the test-retest method (Conti, 1982). This procedure was conducted after Phase 2 of the field-testing and utilized a group of 23 adult basic education practitioners in Chicago. This instrument was re-administered to these individuals 7 days after the initial testing and their scores were correlated using the Pearson correlation. The Pearson correlation for the 23 practitioners in the sample group yielded a reliability coefficient of .92 (Conti, 1982).

A social desirability score was calculated for each item in PALS. Items with a rating of 2.0 or less were considered to be nonneutral and judged as socially desirable. Nine items were rated as socially desirable. Since eight of the items (6, 8, 12, 14, 25, 27, 30, and 31) had high content validity values and since the social desirability literature lacks definitive research findings, these items were retained in the instrument with the caution to potential users to consider the implications of these eight ratings before implementing the instrument (Conti, 1982 p. 142).

The Principles of Adult Learning Scale (PALS) has been used in at least 37 dissertation projects and in various

inservice and training sessions. As stated, "the analysis of 477 additional cases indicates that the descriptive statistics produced in this study are stable and can be used for interpreting individual scores on PALS" (Conti, 1982, p. 8). In consequent studies utilizing the PALS instrument, an analysis of variance showed no significant differences between the scores of those of the original groups and the scores of those in the subsequent data gathering groups. Collectively, the validation studies indicate that the norm for PALS should be a mean of 146 and a standard deviation of 20 (p. 8).

Finally, Conti's (1982) final analysis of the data from subsequent sampling further substantiated the content validity of the items in the PALS instrument. "Pearson correlations between an individual's total score and the degree to which each item contributed to that total score indicate that all items are statistically significant ($p = .001$) and that each item contributes to the overall discriminating power of the instrument" (p. 8).

Thus, PALS is a proven instrument for assessing teaching style in adult education (Brookfield, 1986). It can serve as an assessment of the teaching behaviors of the faculty participants in relation to the principles of adult education and the collaborative mode of instruction.

Learning Style Inventory (LSI)

Davis A. Kolb (1977) proposed a framework that included various styles of learning and suggested that effective learners were those who could call upon various approaches, depending on the purposes and circumstances of the learning. Kolb's (1981) research "focused on an approach to learning that sought to integrate cognitive and socioemotional factors into an 'experiential learning theory'" (p. 235). This model was viewed as consistent with the structure of human cognition and the stages of human growth and development. The outcome of this research was the identification of individual learning styles and corresponding learning environments. Kolb called this "experiential learning" because it tied in with the intellectual origins of social psychology of Kurt Lewin and with the sensitivity training of the '50s and '60s and because it emphasized the role that experience plays in the learning process. The core of the model is the "learning cycle" (p. 235) which demonstrates how experience translates into ideas which are then used as guides in the choice of a new experience.

Kolb (1981) believed that for learners to be effective, they would need four different kinds of abilities. These abilities are as follows: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). These four-stage learning abilities are "polar opposites" (p. 236), thereby forcing the learner to

choose which set of learning abilities to use in a specific circumstance. Kolb (1981) recognized two dimensions to the learning process. The first dimension has concrete experiencing of events at one end and abstract conceptualization at the other. The second dimension is active experimentation and reflective observation. "Thus, in the process of learning, one moves in varying degrees from actor to observer, from specific involvement to general analytic detachment" (p. 236).

Construction. Kolb's Learning Style Inventory (LSI) is constructed to measure an individual's learning-style preference. The original Kolb Learning Style Inventory consisted of nine items. In 1985, the inventory was expanded to include 12 items. Each item has four choices which are to be ranked in order of preference. The four choices deal with the four-stage learning abilities: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The typical item asks the respondent to decide the order in which they prefer feeling, watching, thinking, and doing. "Because the order of items is consistent, adding rating values for corresponding responses yields four primary scores: CE for concrete experience, RO for reflective observation, AC for abstract conceptualization, and AE for active experimentation" (Ivey, 1992, pp. 66-67).

As the four-stage learning abilities are "polar opposites," the scores for abstract conceptualization and

concrete experience are at opposite ends of the perception learning scale. Therefore, a composite score is calculated for this perceiving dimension by subtracting Abstract Conceptualization from Concrete Experience. A composite score for the processing dimension is calculated in a similar manner by subtracting the Active Experimentation score from the Reflective Observation. These composite scores are used to place individuals along the two lines of the Learning Style Type Grid (Kolb, 1985) to characterize the learner's style as an Accommodator, a Diverger, a Converger, or an Assimilator.

Validity. The four-stage learning model is indicative of learning abilities which are opposed to one another. This does not allow for a perfect mathematical relationship between LSI scores for AC and CE and between AE and RO, but there are general relationships. "We would predict a moderate (but not perfect) negative relation between abstract conceptualization (AC) and concrete experience (CE) and a similar negative relation between active experimentation (AE) and reflective observation (RO). Other correlations should be near zero" (Kolb, 1984, p. 74).

In support of the concept that the dimensions are independent, Kolb (1985) referenced prior studies indicating that the concrete/abstract dimension correlates with measures of cognitive development.

Learning Styles Inventory is based on several tested theories of thinking and creativity. The

ideas behind assimilation and accommodation originate in Jean Piaget's definition of intelligence as the balance between the process of adapting concepts to fit the external world (accommodation) and the process of fitting observations of the world into existing concepts (assimilation). Convergence and divergence are the two essential creative processes identified by J. P. Guilford's structure-of-the-intellect. (p. 7)

Studies by Certo and Lamb (1979) spoke to the LSI as an instrument which generated scores that could be explained by chance as well as by the underlying theoretical learning construct upon which it was designed. The Certo and Lamb results showed that random-score correlations between AC and CE ($r = -.26$) and between AE and RO ($r = -.35$) are both significantly ($p < .001$) lower than those of actual scores (Kolb, 1984, p. 75). Despite these low correlations, Kolb suggests that these data support the validity of the LSI and factors out the bias of the instrument. From Kolb's viewpoint, construct validity was evidenced through the high correlations between words comprising the item responses (p. 29).

Construct Validity. In relation to construct validity, Ferrell (1983) evaluated four different learning style instruments from the perspective of factor analysis. As a result, Kolb's LSI was "the only instrument for which a match between factors and learning styles existed" (p. 36).

Reliability

Reliability was established by utilizing Spearman-Brown correlation split-half coefficients for the primary scales range from .54 for Concrete Experience (CE) to .73 for Abstract Conceptualization (AC). Derived scores had split-half coefficients of .79 for AC-CE and .83 for AE-RO. Alpha coefficients reported by Freedman and Stumpf (1978, 1980) were lower but followed the same pattern; CE was the lowest at .34, and AC was the highest at .70. Reliability for the 1985 version of the LSI showed improvement. Both the primary and composite scores "show good internal reliability as measured by Cronbach's Standardized Scale Alpha" (Gregg, 1989, p. 422) with values ranging from .73 to .88 (LSI, 1985).

Criticisms of LSI. Bonham (1988) evaluated learning style instruments from the perspective that most learning style instruments are "self-report inventories; their accuracy is dependent on subjects knowing themselves and wanting to reveal that knowledge" (p. 12). This is just one of the problems that can beset a learning styles instrument such as Kolb's LSI.

Criticisms of the original form of the Kolb LSI revolve around its brevity and reliability (Moore & Sellers, 1982), the possibility of individual words being interpreted differently (Wunderlich & Gjerde, 1978), and the lack of correlation with statements taken from Kolb's descriptions

(Fox, 1984). Since all options are presented in the same order, the LSI has the possibility of response set bias (Kirby, 1979). Finally, choices are sometimes difficult to make because they are not within the same dimension and they are not opposites.

Additionally, Bonham (1988) points to the ranking format of the LSI as one which prevents dimensions from being independent. When one option is ranked first, no other choices in that item can be equally valued. This lack of independence "prevents the Kolb LSI from measuring the ability to style-flex (use whatever style is most beneficial in a given context)" (p. 15).

Wunderlich and Gjerde (1978) further see the ranking format when combined with norms as a problem in that ranking is an ipsative approach, which measures the subject against self; norms compare the subject to other subjects.

Use of norms with this instrument affects the quadrant in which subjects are placed. If a subject's scores were exactly even on the four measures (showing equal preference for abstract as compared to concrete and reflective as compared to active), he or she would not be shown as having equal preference (a sort of no-style placement). Instead the person would be classified as reflective and concrete (forming a strong diverger style). The effect on individual interpretation is obvious. (Bonham, 1988, p. 15)

Kolb's 1985 version of the instrument dealt with problems concerning the number of items and the wording, but it did not address the problem of format and use of norms. Kolb (1976) has been aware of the limitations of the original version

in regard to individual placement and has advised that "administration always include an interpretation in which the subject is encouraged to evaluate the placement and change it if it does not seem to fit (Bonham, 1988, p. 15). Bonham (1988) also suggests that the problem of norms can be dealt with by showing placement on a chart that uses 0 as the midpoint.

The Learning Styles Inventory (LSI) was used for this study because learning style theory has an appeal in the idea that individual differences are important in learning (Bonham, 1988, p. 14). Although this instrument has validity difficulties, the describing of these differences in learning is important in developing a profile of the participant. The LSI provides another perspective of the participant and is just one piece of data in the process of establishing credibility through triangulation. "While some writers in the field of cognitive and learning styles are skeptical about the psychometric properties of the Kolb Learning Style Inventory, most generally accept the validity of the its framework for viewing the methods that individuals use to accomplish learning (Geiger, 1992).

Data Collection

The Principles of Adult Learning Scale was given to the participants at the time of the interview. The Learning Styles Inventory was given to the participants after the

interviews were completed and were returned by mail. The results of these instruments were combined with the qualitative data structure designed to provide additional concepts related to the interviewee's comments. Data collection took place at the Bellevue Community College Campus. The 27 interviews were conducted over a 6-day period of time. Approximately 60 minutes were allocated for each interview. The data collected through the interviews were transcribed for sorting and categorizing.

The interview process was conducted as though it were a conversation with a purpose, and that purpose was to obtain:

Here and now constructions of persons, events, activities, organizations, feelings, motivations, claims, concerns and other entities; reconstructions of such entities as experiences in the past; projections of such entities as they are expected to be experienced in the future, and triangulations or verification, emendation, and extension of information obtained from other sources. (Lincoln & Guba, 1985 p. 268)

Qualitative interviewing collects data through in-depth, open-ended interviews which may be approached as an informal conversational interview, the general interview guide, or the standardized open-ended interview (Patton, 1987, p. 108). This study utilized the general interview guide approach which allowed a list of questions or issues to be explored during the interview session. The order of the questions was not determined in advance, but provided a checklist to assure that the issues important to the study were discussed. This

procedure allowed for individual perspectives and experiences to emerge (p. 111).

The questions for this interview explored the participants' personal and professional use of technology, level of use of technology as an instructional tool, perceptions of the impact of technology on their role in the classroom, factors which would encourage or discourage use of technology, and student learning outcomes. A detailed listing of these questions is provided in Appendix B.

At the onset of the interview, rapport was established through introductions and an explanation of the purpose of the interview. Opening questions were general in nature thereby giving the participant time to "warm up" (Lincoln & Guba, 1985, p. 270). Throughout the interview, it was important to maintain productivity by probing with questions with more specificity than prior questions.

The content of the interviews was captured in two ways. Field notes were taken by the interviewer. In addition, to enhance memory and ensure thoroughness, the interview was taped with the permission of the interviewee. Demographic data of the participant were collected through a secondary source of the Bellevue Community College Faculty Directory. This directory provided information regarding discipline, position, and department affiliation.

Analysis of Interviews

Within the qualitative or naturalistic inquiry paradigm, data are the "constructions offered by or in the sources; data analysis leads to a reconstruction of those constructions" (Lincoln & Guba, 1985, p. 322). Data of naturalistic inquiry which are the observational or interview notes accumulated in the field demand a form of processing similar to that which has traditionally characterized ethnography inquiry (Lincoln & Guba, 1985).

The qualitative data gathered in the interviews were sorted and categorized using a word processing program. This type of categorizing served to bring together into provisional categories those words or quotes which related to the same content. It is important to look at the process of categorization. Glaser and Strauss (1967) stressed that the analyst "has developed two kinds of categories: those that he or she has constructed him or herself and those that have emerged as categories used by the respondents--their local language and cultural covering terms" (p. 106). Through the interview process, the following types of categories emerged: researcher identified categories representative of consistent interview questions; categories representative of strands of thought; and categories representative of diffusion theory.

Analysis of Instruments

The results of both instruments used in this study were used to further enhance understanding by adding valuable information regarding characteristics of the participants. The overall PALS score can range from 0 to 220. The mean for the instrument is 146 with a standard deviation of 20. The overall score is broken into seven factors. These factors are the basic elements that make up an instructor's general teaching mode (Conti, 1985). The result of this instrument was expressed in a total score as well as an individual score for each of the seven factors compared to an average score and a score indicating the difference.

The LSI scores relate to the four stages in the Cycle of Learning from Experience. A total for each category was calculated. The categories are Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. The concentric circles on the Cycle of Learning from Experience represent percentile scores for the normative group. In comparison to the normative group, the shape of the individual profile indicates which of the four basic modes the individual tends to emphasize most as well as the least. By combining the scores, the learning-style type was identified as Accommodator, Diverger, Converger, or Assimilator.

CHAPTER 4

FINDINGS

The intent of this study was to describe the current practices of faculty members of a community college in relation to the adoption of technology as an instructional tool and diffusion of this innovation throughout the educational institution. Quantitative and qualitative data were gathered through the Principles of Adult Learning Scale (PALS), the Learning Style Inventory (LSI), and interviews of 27 faculty members of Bellevue Community College.

Principles of Adult Learning Scale

PALS is a 44-item instrument patterned as a summative rating scale using a modified Likert scale. PALS respondents indicate the frequency with which they practice the action that a teacher of adults might exhibit in a classroom. The scores may range from 0 to 220. The mean for PALS is 146 with a standard deviation of 20. This instrument can be completed within 15 to 20 minutes. Each of the 27 participants of this study was given the opportunity to complete the Principles of Adult Learning Scale (PALS). Of the 27 participants, 20 (77%) completed and returned the instrument for scoring.

As this instrument is based on the principles that are advanced in adult education literature, it supports the collaborative teaching-learning mode in which the learner and the teacher share in the formulation of curriculum. This instrument gives an indication of a practitioner's overall preference for teaching behavior in an adult education setting (Conti, 1979). High scores on the PALS are indicative of a learner-centered approach in which authority for curriculum formation is jointly shared by the learner and the practitioner and a low score indicates a teacher-centered approach in which the teacher directs the learning experience. Scores near the mean indicate a combination of teaching behaviors which draw elements from both the learner-centered approach and the teacher-centered approach (Conti, 1985).

Factors in PALS

The total PALS score can be broken down into seven factors which make up the teacher's general teaching mode and are representative of a collaborative teaching methodology (Conti, 1985, p. 9). The main factor in PALS is Learner-Centered Activities. This factor is made up of 12 negative items which relate to evaluation by formal tests and a comparison of students to outside standards. Teachers in support of a teacher-centered mode of instruction favor formal testing over informal evaluation techniques. They rely heavily on standardized tests, encourage students to accept

middle-class values, maintain control of the classroom by assigning quiet deskwork and by using disciplinary action, and determine the educational objectives for each student.

Factor 2 relates to Personalizing Instruction. This factor contains six positive items and three negative items. High scores in this factor indicate a desire to personalize instruction to meet individual needs. This would be accomplished through utilization of various methods, materials, and assignments and would not necessarily rely on lecture as a way of presenting information.

Factor 3 focuses on Relating to Experience and consists of six positive items. Individuals in support of this factor view learning activities from the perspective of prior experiences of the learner as a means of making learning relevant.

Factor 4 has four positive items related to Assessing Student Needs. A high score in this area is indicative of a desire to treat a student as an adult by finding out what that student wants and needs to know.

Factor 5 contains four positive items related to Climate Building. This factor describes the efforts of the teacher to set a friendly and informal environment in which dialogue and interaction are encouraged.

Factor 6 relates to Participation in the Learning Process and consists of four positive items. This factor addresses the involvement of the student in determining the nature and

evaluation of the content area and the level of participation in the decision-making process regarding the areas to be covered during the class.

Factor 7 contains five negative items which do not foster Flexibility for Personal Development. Individuals who support the collaborative mode view themselves as facilitators rather than providers of knowledge.

These seven factors are indicative of classroom behaviors and reveal the philosophical position from which the teacher functions. The collaborative mode stems from the humanist belief system which views humankind as inherently good, having potential for growth, and exhibiting behavior that is the result of personal perceptions of the individual as a unique self. This system also sees human beings as proactive and able to take responsibility for their actions (Elias & Merriam, 1980, pp. 115-121). From this progressivist perspective, education has the responsibility to promote individual growth and maintain democracy, freedom, and participation as a means to promote the good of society (Darkenwald & Merriam, 1982, p. 50). The antithesis of the collaborative mode is the teacher-centered view which is compatible with the behaviorist position. This position considers humans as "controlled by their environment, the conditions of which can be studied, specified and manipulated. An individual's behavior is determined by the events

experienced in an objective environment" (Elias & Merriam, 1980, p. 83).

When the behaviors of a teacher in a classroom setting reflect a humanist or progressivist philosophy, the collaborative mode reigns, although these behaviors may vary somewhat according to the situation or institutional restraints. When teaching behaviors vary greatly, it is indicative that the teacher does not have a firm commitment to a particular teaching style and, therefore, does not have a firm philosophical orientation. In this study, the scores on the Principles of Adult Learning Styles (PALS) identified the dominant teaching modes of the 20 faculty members who completed the instrument. An analysis of the results of the PALS instrument for the total score and each of the 7 factors follows.

The PALS instrument was completed by 20 of the faculty who were interviewed for this study. The total score on the PALS instrument for the 20 respondents revealed a strong teacher-centered orientation in which the teacher directs the learning experience. The scores ranged from 91 to 176 with a group mean of 123.48 which is 22.52 below the norm of 146 for the instrument (see Table 1). Thus, the group was 1.1 standard deviations below the mean. This implies a strong teacher-centered orientation for the 20 faculty members assessed.

Table 1. PALS Total Score.

Value	Freq	Value	Freq	Value	Freq
91.00	1	115.00	1	133.00	1
98.00	1	117.00	1	142.00	1
100.00	1	121.00	1	155.00	1
108.00	2	129.00	1	172.50	1
109.00	3	131.00	1	176.00	1
114.00	1	132.00	1		

On Factor 1, which deals with Learner-Centered activities, the group was learner-centered. The mean for this factor was 43.3, which is 5.3 above the norm of 38. This is .61 standard deviations above the mean. In contrast to their overall teacher-centered position, as a group they did not favor formal testing over informal evaluation techniques nor did they desire to maintain control of the classroom through disciplinary action and determining the educational objectives for each student. Conversely their learner-centered orientation supports an approach which would rely on diverse teaching methods as a way of meeting the varying learning styles of students and allowing the student to participate in determining the educational objectives. Such a classroom focus would then be upon the learner and learner-centered activities (Conti, 1985).

Table 2. Factor 1: Learner-Centered Activities.

Value	Freq	Value	Freq	Value	Freq
35.0	1	41.0	1	46.5	1
37.0	3	42.0	1	51.0	1
38.0	2	43.0	1	52.0	1
39.0	1	44.0	2	55.0	2
40.0	2	46.0	1		

On Factor 2, which address Personalized Instruction, the group was teacher-centered. The mean for this factor was 23.650, which is 7.35 below the norm of 31. This is 1.1 standard deviations below the mean. The factor for Personalized Instruction contains six positive items and three negative items. The data for this factor reveal a strong teacher-centered orientation to instruction that favors objectives being determined by the teacher rather than the student; encourages competition; and utilizes lecture as the preferred instructional mode. A high score in this area would have shown that a teacher would do a variety of activities to personalize instruction to meet the individual needs of each student. However, as a group, the teachers interviewed were not oriented to these activities.

Table 3. Factor 2: Personalizing Instruction.

Value	Freq	Value	Freq	Value	Freq
17.0	1	21.0	4	30.0	2
18.0	1	22.0	1	34.0	1
18.5	1	23.0	4	39.0	1
19.5	1	24.0	1		
10.0	1	25.0	1		

On Factor 3, which addresses Relating to Experience, the group was teacher-centered. The mean for this factor was 15.000, which is 6 below the norm of 21. This is 1.2 standard deviations below the mean. Relating to Experience consists of six positive items. The results show that there was a strong teacher-centered approach to this factor and one which would not support designing the instruction to incorporate the student's prior experiences. Instead, this group favored an approach which is content specific and directed by the teacher.

Table 4. Factor 3: Relating to Experience.

Value	Freq	Value	Freq	Value	Freq
3.0	1	14.0	2	23.0	1
7.0	2	16.0	1	24.0	1
8.0	2	17.0	1	24.5	1
11.0	1	18.0	1	26.0	1
12.0	2	21.0	1		
13.0	1	21.5	1		

The results for Factor 4 show a mean of 11.35, which is 2.65 below the norm of 14. This is .40 standard deviations below the mean. Factor 4 is made up of four positive items related to Assessing Student Needs. A high score would indicate that the teacher would treat a student as an adult and try to find out what each student wants and needs to know. The scores for respondents on this factor show a teacher-centered orientation, but the difference was not as great as in the previous three factors.

Table 5. Factor 4: Assessing Student Needs.

Value	Freq	Value	Freq	Value	Freq
3.0	2	9.0	4	15.0	1
5.0	1	12.0	1	16.0	2
6.0	1	13.0	3	17.0	1
7.0	1	14.0	1	19.0	2

The scores for Factor 5 show a mean of 9.250, which is 6.15 below the norm of 16, This is 2.25 standard deviations below the mean. Factor 5 contains four positive items related to climate building. Establishing a friendly and informal climate is essential to the learner-centered environment. The scores on this factor reveal a teacher-centered approach to instruction that favors a structured educational environment which does not put an emphasis on the student's perception of that environment.

Table 6. Factor 5: Climate Building.

Value	Freq	Value	Freq	Value	Freq
1.0	1	6.0	1	13.0	2
2.0	2	7.0	2	14.0	2
3.0	1	8.0	1	15.0	1
4.0	1	9.0	1	19.0	1
5.0	1	11.0	2	21.0	1

Scores for Factor 6 show a mean of 10.050, which is 2.95 below the norm of 13. This is .84 standard deviations below the mean. Factor 6 contains four positive items related to Participation in the Learning Process. This factor specifically addresses the amount of involvement of the student in determining the nature and evaluation of the content. The results indicate respondents hold a teacher-centered approach which views the learner as dependent and gives the teacher the responsibility for determining what is learned, when it is learned, how it is to be learned, and if it has been learned (Knowles, 1980). A high score in this area would show that the teacher would encourage the students to be independent and would allow them to participate in making the decisions about the content to be covered and the criteria for evaluation.

Table 7. Factor 6: Participation in the Learning Process.

Value	Freq	Value	Freq	Value	Freq
1.0	1	8.0	2	12.0	3
4.0	1	9.0	2	13.0	1
6.0	1	10.0	1	14.0	2
7.0	1	11.0	4	18.0	1

Scores for Factor 7 show a mean of 11.150, which is 1.85 below the norm of 13. This is .47 standard deviations below the mean. Factor 7 contains five negative items which do not foster Flexibility for Personal Development. This group did not support a tendency toward fostering Flexibility for Personal Development. They viewed themselves as providers of knowledge rather than facilitators of knowledge. This result is consistent with the other factors which were indicative of a teacher-centered rather than learner-centered instructional mode.

Table 8. Factor 7: Flexibility for Personal Development.

Value	Freq	Value	Freq	Value	Freq
2.0	1	9.0	3	14.0	4
6.0	1	10.0	1	15.0	1
7.0	1	11.0	2	18.0	2
8.0	2	13.0	2		

Learning Styles Inventory (LSI)

Kolb's 1985 revised version of the Learning Style Inventory (LSI) was given to each participant after the interviews were conducted. Of the 27 participants, 21 (78%) completed the assessment. Each participant was asked to complete 12 sentences, each of which has four endings. Each ending was to be ranked according to how well the participant thought each ending would fit with what that individual thought about learning something. The four columns related to the four stages in the Cycle of Learning from Experience which are Concrete Experience (CE), Reflective Observation (RE), Abstract Conceptualization (AC), and Active Experimentation (AE). The LSI gives a general picture of the learner and stresses that since learning is a cycle, the four stages occur repeatedly. Each person's learning style is a combination of the four basic learning modes. By combining scores, the learning style which best describes the learner is identified. These learning-style types are Accommodator, Diverger, Converger, and Assimilator.

The LSI was utilized for this study to provide another piece of information about the faculty members at Bellevue Community College who were interviewed in regard to their use of technology. It is recognized that "while some writers in the field of cognitive and learning styles are skeptical about the psychometric properties of the Kolb Learning Style

Inventory, most generally accept the validity of its framework for viewing the methods that individuals use to accomplish learning (Geiger, 1992).

The scores provided the following information regarding learning-style types of the 21 participants who completed the instrument. These results showed that 9 of the 21 participants were characterized as Convergers. A Converger combines the learning steps of Abstract Conceptualization and Active Experimentation. People with this learning style are best at finding practical uses for ideas and theories. These individuals have the ability to solve problems and make decisions based on finding solutions to questions or problems and would rather deal with technical tasks and problems than with social and interpersonal issues (Kolb, 1985, p. 7).

Of the 21 participants, 7 were shown as Assimilators, which combines the learning steps of Abstract Conceptualization and Reflective Observation. People with this learning style are best at understanding a wide range of information and putting it into concise, logical form. Individuals with this learning style are less focused on people and more interested in abstract ideas and concepts. Generally, people with this learning style find it more important that a theory have logical soundness than practical value (Kolb, 1985, p. 7).

There were three individuals characterized as Divergers, which combines the learning steps of Concrete Experience and

Reflective Observation. People with this learning style are best at viewing concrete situations from many different points of view. Their approach to situations is to observe rather than take action. Individuals with this style enjoy situations that call for generating a wide range of ideas as in brainstorming sessions and would have broad cultural interests and like to gather information. This imaginative ability and sensitivity to feeling is needed for effectiveness in arts, entertainment, and service careers (Kolb, 1985, p. 7).

Lastly, two individuals were identified as Accommodators, which combines Concrete Experience and Active Experimentation. People with this learning style have the ability to learn primarily from "hands-on" experience. Individuals with this style enjoy carrying out plans and being involved in new and challenging experiences. They tended to act on "gut" feelings rather than on logical analysis and in solving problems would rely more heavily on people for information than on one's own technical analysis. This learning style is important for effectiveness in action-oriented careers such as marketing or sales (Kolb, 1985, p. 7). As an observation regarding the results of the LSI, the majority of the scores fell in the abstract conceptualization quadrants of the Learning Style Type Grid. The literature supports this observation in that persons of higher educational levels tend toward abstract conceptualization rather than the concrete experimentation (Kolb, 1985).

Interviews of Participants

The interviews of the 27 participants were conducted on site at Bellevue Community College. The interview format included open-ended, in-depth questions. This study utilized the general interview guide approach which allowed a list of questions or issues to be explored during the interview session. The order of the questions was not predetermined but rather provided a checklist to assure that the issues important to the study were discussed.

The interview process provided relevant information regarding the participant's use of and attitudes toward technology. It also addressed the research question relating to the integration of technology into the instructional environment and influence of this integration in regard to the role of the teacher in the classroom. The interview distinguished positive or negative factors which influenced the acceptance and diffusion of technology as an instructional tool and provided confirmation of actions related to the teaching and learning style of the participant.

Following the interviews, the information gathered through the interview process was categorized. The task of converting field notes and observations about issues and concerns into categories is difficult and is not an infallible procedure (Guba, 1978).

A first step for the inquirer is to look for "recurring regularities" in his sources. Do the

same kinds of observations or comments recur at different times, from different informants or documents, in somewhat different contexts? These regularities form a basis for an initial sorting of the information into categories that will ultimately be labeled as concerns and issues. (p. 53).

This process fosters the development of a holistic profile of the participant as an adopter of technology.

Use of Technology

The opening general question which asked the participants to talk about their use of technology prompted a variety of responses from a personal, professional, and institutional perspective. The question generated comments addressing attitudinal issues as well as philosophical assumptions regarding teaching methodology and student outcome. These comments also provided some insight into the participant's learning and teaching style.

From the comments given in this context, a picture of Bellevue Community College as a rapidly changing institution was generated. The College has become technologically advanced over a short period of time. The college provides computers for each faculty member, but the use of technology as an instructional tool did not seem to be equally spread across the institution. There were implications that there is a need for institutional coordination of this integration of technology as well as a concentrated effort to provide faculty development opportunities. Comments from a science instructor portray Bellevue Community College as it was.

About three years ago, there was nothing going on campus. One of my colleagues was teaching full-time at Seattle Central and really got into computers and showed me what you could do. All I wanted to do was to make a transparency via a computer. There was nothing on campus I could use.

The use of technology as an instructional tool was perceived as occurring in specific departments such as science, social science, and computer science rather than throughout the institution as a whole. However, there was an awareness that technology was a reality for the total institution and there was a discernable change in regard to access to and use of technology on campus. A statistics instructor indicated that a coordinated effort was needed to integrate technology institutionwide. Two instructors, economics and science, acknowledged that the use of technology is primarily concentrated in the science department, but that it is also moving into other departments such as social science and music. A language faculty member could see the future as one which would demand change.

Lots of people are using technology at Bellevue Community College, but not in a coordinated effort. The niches where it is being used the most are Science, Computer Science, and Music.

The Science Department was the first to adopt technology and then the Social Sciences.

I came here in 1986 and I had a computer. I would say that in the science division that if you are not into technology you are really behind.

There is change going on at Bellevue Community College. Two years ago we were asked to stand up and indicate years of service. Those who were 25 years and more were few in number; those at nine or

ten were quite a few. There is a change in the guard. Those that don't change may be left behind.

For many of the individuals interviewed, use of technology produced comments associated with the perceived appropriate use of technology. A teacher-centered science instructor viewed technology as a means to present information rather than a way to increase student interaction and encourage problem solving. A teacher-centered music instructor had a different perspective. Although learner-centered in teaching style, one arts and humanities instructor saw technology as an enhancement of traditional methodology.

I see it as a tool to enhance teaching, but I wouldn't see it as a large portion of the class. You get bogged down with this. The theoretical stuff is a lot cleaner, straight forward.

To ignore technology as a tool is not using technology effectively.

Technology should be used as supplemental rather than to replace the teacher in the classroom.

Others, such as two learner-centered computer science faculty members, could see technology as something other than a tool and envisioned that it could stimulate creative thinking and problem solving.

Technology for simulation would be very useful.

I see the next level up is to provide the student in the classroom some interactivity.

Comments were gathered on how technology was actually being used on campus. A music instructor as well as a computer science instructor valued technology as more than a

tool and could see its potential in enhancing the learning process. A science faculty member looked upon the computer as a tool to enhance the presentation of information and did not want to be encumbered by complicated programming requirements.

I use it in the classroom as both a learning and a teaching tool.

I use it now as an extension of the overhead projector although it could be visual images, sound and even full-motion video, but that is the lowest level.

I don't want to program, I want to use the computer as a tool.

Again, the technology is being used as an extension of traditional methods to present information, but there is recognition that technology has the potential to be used in a more effective manner. Faculty who have had the opportunity to network with other professionals who are using technology as more than a presentation tool have begun to see the value of technology in motivating students as well as impacting student learning. Traditional methodology is questioned as the most effective way in which to motivate students and improve learning. As the result of interaction with other professionals using technology, one computer science instructor was stimulated to reflect upon how the needs of students can be met using technology as the delivery mechanism. A teacher-centered physics instructor saw the appropriate use of technology as one which would change the learning process.

I just returned from the League of Innovation Conference in Houston. It became obvious that people are going to question, and rightly so, how is this better than what I am doing now. Lecture is still a big part of the picture here at BCC, but I think we have to look at other ways of motivating students. Technology can play a big role in that.

If the purpose is for the student to get the idea, then this is an appropriate use of technology.

A science faculty member identified as being a Converger learning type and teacher-centered questioned change for change's sake and needed confirmation of the value of technology in the student learning process. Skepticism was alive and well.

I would need to see that it would really make a difference. Changing for change's sake is not worth it. There has to be a real value that goes beyond technology for technology's sake. I have yet to see research to show that these innovations of technology in the classroom make a difference in student learning.

Concern regarding the value of technological change to student learning outcomes was raised by several faculty. These faculty felt a discernable need to be convinced that using technology would enhance learning. This issue of student learning outcomes is inextricably linked to the faculty's expectations of the learning process and the role of the learner. These concerns were addressed by faculty members across disciplines. A teacher-centered art instructor emphasized expediency while a learner-centered statistics instructor hoped to use technology as the medium which would kindle creative thinking and problem solving.

I use technology in a wide range of ways. I am sensitive to appropriate use and am not charmed by magic. I must have clear pedagogical benefits.

As much as possible I still use the traditional methods because they are quicker.

I use computers in a stats course, but would like to make it more interactive rather than lecture approach, as I see process more important than content.

There was evidence of an element of apprehension not only of change but of the innovation itself. Technology was viewed by a teacher-centered instructor as a threat to the status quo thereby generating a feeling of discomfort and uncertainty.

I really have a deep fear of technology in terms of how it will increase our workload. I don't mind it as a supplement. I don't think I want it in the classroom. We all are a little reluctant to change, but then students are reluctant to change sometimes too.

A lot of my colleagues view technology with fear because of its potential to put us out of work.

The responses to the interview question regarding use of technology provided secondary information about the participant's teaching and/or learning style orientation. These were not overt responses but were assumptions deduced from statements such as "I would need to see that it would really make a difference. I would experiment to see which is better" suggesting that this computer information systems instructor is a Converger learning type. This type would rely on systematic planning, developing of theories and ideas to solve problems, taking a practical approach, and being concerned with what really works.

Another example of this secondary information is demonstrated through this statement made by a learner-centered instructor: "I use computers in a stats course, but would like to make it more interactive rather than lecture approach. I see process more important than content." This implies that this faculty member values climate building as a part of their teaching style to encourage interaction and that this view of the purpose of education coincides with the view that the method of learning is nearly as important as what is learned-- a learner-centered belief. This assumption is supported by the data which identify this faculty member as having a teaching style which is student-centered.

An overriding concern expressed by several faculty members pertained to the availability of funding to provide the equipment necessary to remain competitive in a technologically driven society. One administrator conceptualized this concern.

We are dammed if we don't because students coming in from the high schools need the training; the work force training we are involved in demands it and business demands it, but we really don't have the resources to carry through those commitments."

Role of the Teacher

The participants were asked to discuss their impressions of how technology might impact their role in the classroom. Several faculty members looked at the integration of technology as a way of freeing them to assume new roles and to be

more creative in the process of teaching. These individuals were proactive in their efforts to adapt to a new situation and to make the most of new opportunities.

If I can be replaced in the classroom, it will take place and should take place. Perhaps what that will do will be to free me up to be more creative in other ways and take on new roles in the classroom that I couldn't take on before. I welcome having some of the drudgery taken away . . . anything you can do to make me more efficient, then do it.

This is a testimony to the strength of ego and vision of this learner-centered educator from the Department of Arts and Humanities who has the potential to be a role model for all. This teacher-centered language instructor saw the value in transitioning from a teacher-centered orientation to one that was learner-centered in order to make the most of what technology could offer as an instructional tool.

The other big point I see about the computer is that there is a certain collegiality between me and my students. I don't know much and we learn together. I am not the sole font of knowledge.

This faculty member saw technology as the means by which a climate building environment could be established to encourage participation by the student. Climate building is a strong learner-centered action. This same faculty member had not always believed that this was the way to interact with students.

These guys know about computers; I know about my language. It is a power trip. I am it. I can stand in front of people and lock their attention. I don't see it that way at all. Honestly, in my teaching career I was always looking at the clock,

but now I always run over. We must get away from teacher-centered and evolve toward learner-centered.

An arts and humanities learner-centered administrator had relevant advice for others to bear in mind. This individual recognized that there is danger in using technology as an extension of traditional methodology and creating an environment of passivity.

Maybe we ought not to be lecturing, ought not to be using the technology to make an outmoded pedagogical medium like lecture to be attractive. This concerns me. The students are sitting there and instead of passively listening to an instructor and taking notes, they are passively watching a presentation and taking notes.

If we are not careful, technology is going to take us forward into the 19th century rather than forward to the 21st.

A computer science faculty member also saw that if technology were only used as a presentation tool, nothing would change in regard to how information was delivered. The technology would have to be used as a tool for both the teacher and the learner in order to produce the interactivity which would foster problem solving and creative thinking. Technology used in this fashion would encourage learner-centered activities in which the student takes responsibility for the learning.

As a presentation technology, I don't see it changing my role. However, what would change things would be if we would have more hands-on and interactive things for the students. I try to get the students to teach themselves; really all I do is direct and point the way.

If used interactively, the technology would change the role of the teacher from a,

Deliverer of knowledge to one of facilitator of knowledge where students will directly interact with the information that they obtain through the use of computer multimedia technology and the instructor will frame the interaction by framing questions to start the inquiry, then backing off and letting the students explore their interests.

This comment given by an arts and humanities instructor conceptualizes the very best that technology has to offer when utilized as a medium to encourage learner initiated behaviors.

Although faculty did not use the terminology associated with adult learning theory to describe their philosophical views regarding the role of the teacher in the classroom, there was recognition that students could benefit from having a say in how their educational experience was to be conducted and that faculty would need to be ready to relinquish the power that being the provider of information gives. To be a facilitator requires faculty to move from a teacher-centered role into a learner-centered role as summarized by this art administrator.

I think that fear comes from some people's inability to relinquish the personal power that is information. As technology becomes more accessible, it will democratize education from the student's point of view. Faculty have to see themselves as the facilitator not a storer.

The struggle between being the controller of the learning process or the facilitator was likened to maintaining or relinquishing power. With technology, faculty can help the

student become a resource manager. This allows the student to become actively involved in determining the direction of the learning experience. This is an important ingredient in a learner-centered approach to teaching as described by a learner-centered nursing faculty member.

They don't need me for the lecture. They can get that from a book. What they need me for is to help them take that knowledge base and integrate it into the clinical setting. What I want is for them to know how to find information.

Factors Which Encourage Use of Technology

A variety of factors which could encourage the adoption and diffusion of technology throughout the educational institution were identified through the interview process. Although all factors were significant, three areas recurred most often. These were peer role modeling, faculty involvement, and support.

Opportunities for faculty to observe and interact with peers who successfully utilize technology were mentioned by several of the participants as being a major motivational factor in encouraging use of technology. This supports the position taken by Everett Rogers (1983) that the "mutual exchange of information between two or more individuals is the basis for the convergence in cognitive and behavioral change" (p. 306) and that an individual learns from another by the means of observational modeling. For this to occur, the individual must be aware of the behavior of another individual

within the personal communication network who has adopted the innovation to be modeled (Rogers, 1983). At BCC, being aware of the behavior of those who have successfully used technology in the classroom has made the difference.

I need to see successes. I like to see other instructors trying something. I saw a multimedia presentation on Emily Dickinson prepared by one of our faculty members teaching a summer workshop. It was visually effective. I would be more encouraged by seeing a peer develop it. Gee, if an English teacher can do this, a computer science person had better be able to do it.

Others also recognized the need to observe their peers interacting with the technology. One computer science faculty member felt the problem could be resolved by "showing faculty good examples as a way of saying, 'Hey look at this! It is really effective and not that hard to do.'" An arts and humanities faculty simply said, "I need a role model."

Faculty involvement in identifying appropriate technologies for integration into the instructional environment as well as participating in the decision-making process is tangential to the successful integration and diffusion of technology throughout the institution. A positive outcome may well depend upon the strategies implemented by the institution to bring new ideas and methodologies into the instructional environment. A need for faculty input in the decision-making process was evident in comments by an arts and humanities administrator as well as faculty.

I think that it is important that faculty have the kind of technology they ask for rather than hearing

there is this new thing out there, you ought to be using it.

When it comes from without, it is not as encouraging as it would be if we were to have a real need for this. There should be a real give and take. Real faculty involvement is a must.

Bellevue Community College is trying very hard. Our president has been doing a lot, but sometimes I want to have more input into what is going on. I am afraid that decisions are made without us being involved. I am afraid we are going to lose jobs and things like that.

Support as a motivational factor in adopting technology embraced numerous areas such as equipment, training, technical support, administrative support, convenience, and access. That Bellevue Community College provides support for faculty is not in question, but the way in which it has been traditionally provided needs to be re-evaluated to meet the needs that new technologies engender. A mathematics faculty member stressed that:

We have to change the way we think about equipping instructors. Right now we have to use professional development dollars to upgrade. If I am interested in a piece of software and am willing to put in the time to learn it, they should hand it to me. I realize it is expensive, but we have to make it easy. It is a question of accessibility and support.

Administrative commitment to training was another component identified by a science instructor as necessary to successfully integrating technology. "Administrative support has just now become a commitment. Bellevue Community College is now beginning an attitude change." Along with administrative commitment, one social science administrator expressed

that there must also be incentives and rewards to stimulate a desire to become actively involved in instructional innovation.

If you are looking at encouraging faculty to use technology, you have to provide training and release time. You can't just say here it is, now go back to the classroom and use it. You have to give some type of release time, some type of reward, some type of training so they can produce something and they can see some type of benefit for themselves.

Additional factors which encourage use of technology would require the institution to be cognizant of the need to maintain equipment, provide competent technical support personnel, and coordinate equipment availability to training activities. It was the feeling of a learner-centered English instructor that if the technology is viewed as unreliable and too time consuming to manage, the likelihood that it will be used is doubtful. Also it was the opinion of a nursing faculty member that the integration of technology be coordinated with training opportunities.

The equipment must be maintained. Nothing is going to be more frustrating if a faculty member walks into a classroom and the equipment doesn't work.

The institution has been good to support by bringing in technology to use, but it would be nice if the equipment and training were available at the same time.

An unexpected area discovered during the course of this study related to the importance of support personnel as a factor in encouraging the use of technology. To verify this, office support staff were interviewed in regard to using new

technologies and software programs in the workplace and its impact on both the support staff and faculty. From the perspective of support staff, faculty do expect assistance from office staff when interacting with technology. "Yes, we are always asked to help. Faculty turn more and more to support staff because of lack of time and the demands to interact with the community." Helping support staff to stay current with new technologies encourages faculty to try new technologies.

Factors Which Discourage Use of Technology

Lack of time discourages individuals from using technology. It takes a considerable amount of time to learn how to use new technologies and even more time to develop curricula utilizing technology. As time is a nonrenewable resource, many faculty members felt that there just was not enough to go around. Comments such as "it is a time-consuming process" and "time is needed to learn and use technology" were suggestive of this concern.

Technology is viewed as an intimidating force to be tamed. If it is viewed as nothing more than a tool, then it loses its power to control the learning process. Attitudinal issues such as intimidation, resistance to change, and loss of comfort zone do much to discourage the use of technology. This is shown by the response of a teacher-centered computer information systems instructor.

The problem is continuing to glorify technology; continuing to see it as something other than just another tool. If people see it as just another tool, that is good because they can approach it as you would a piece of paper. If they approach it as this larger than life thing, then they would be intimidated by it.

Difficulty moving away from one's comfort zone impacts acceptance of technology. Another computer information systems faculty proposed that teachers might be "hesitant because of being uncomfortable with technology. This may just be resistance to change combined with the attitude that what I am doing works well and I get good student evaluations, so why change." From the viewpoint of one computer science faculty member, resistance to using technology may just be a matter of fear and the result of "a phenomenon called cyberphobia or fear of technology." On a different level, one language faculty member overcame that problem. "I do see some good things about technology. We have to make some changes. I used to be afraid to use my bank card, but now it is no big deal."

Interrelated factors within this study which could encourage or discourage use of technology are the characteristics of innovations. Innovations which are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations (Rogers, 1983, p. 15). The interviews produced comments which implied that these characteristics were essential to the

process of adopting technology as an instructional tool at Bellevue Community College.

A technology that is user-friendly will be more readily adopted. "If it is not easy to use, it is really hard to engage in the process." A social sciences administrator sees that "you don't want to make the system too complicated, or the faculty won't use it."

Observability is an essential component of the diffusion process and has been identified by faculty members as a primary motivator for acceptance. If the innovation can be observed when used by a peer, it is more likely that the innovation will be considered as an acceptable option. A computer science instructor has a "need to see successes. I need to see other instructors trying something." A nursing administrator could see that as her staff were "able to observe demonstrations of what the equipment could do, excitement would build. They just needed exposure and needed to feel confident that they were going to get the equipment."

Trialability is important to the process. For adoption to occur, there must be opportunities to experiment with the technology. The language instructor saw a need to have "more opportunities to see how it works. I am like a student, I need to be exposed to good stuff." Faculty need to have access to the technology to try it out. For a nursing administrator, there was evidence that "once they get hooked

on it, you can't stop them." "The only way they are going to get comfortable is by using it."

There was a need by a computer information systems faculty member to be shown why new delivery methods were better than traditional methods. In other words, there was a need to understand the relative advantage of using the technology. "Why I don't use it in the classroom is because I haven't seen where it is giving me some big advantage over just writing on the board and no one has shown me why it is better."

Student Learning Outcome

Student learning became a discussion area in the interview process in response to the concerns that were raised about this issue. An arts and humanities administrator saw technology as a means to enhance student learning by allowing the development of higher level thinking skills. "There are exciting possibilities for teaching student-directedness and opportunities for different approaches to problem solving." One science administrator saw technology as the vehicle to "side-step the boredom and go for the main drive that keeps students learning and excited about learning." A computer information systems instructor was more skeptical regarding the use of technology in relation to student learning and asked a relevant question which needs to be answered.

I still don't believe that just because we are presenting information via the computer the

learning is going to get better as compared to the traditional notes. It seems like it is more involved than having the instructor change the medium in which they present their material. It seems like it is a shift for the student as well. How do they learn from that different way of presenting information?

There was realization that not all faculty members would embrace technology and use it to its full potential. A teacher-centered science instructor poses the issue that when technology is not used just to improve existing practice, it has the capacity to transform the teaching and learning process.

Among good instructors, you develop a new set of skills. Fewer teachers will be able to do this. To be effective, no longer will the role be to develop linear presentations. There will be a need for concept building skills. There will be a need for teachers who can orchestrate these experiences.

The success of technology as an instructional tool is contingent upon the teacher who has the foresight and desire to investigate its possibilities as well as the willingness to implement diverse methodologies to enhance the learning process. This insight is provided by an arts and humanities faculty member.

It would be totally dependent on the teacher. As an example, a teacher using traditional methods can be exemplary whereas a teacher using technology can be a failure. The teacher's ability and gift have a whole lot to do with it. It could go either way. It could serve to showcase a teacher. Technology is an added dimension but the issues are still the same. Whatever is hot, good teachers have always done. It would be interesting to know what the connection would be between gifted teachers and their embracing of technology.

I assume many would, but not all.

However technology is to be used within the instructional environment at Bellevue Community College, there is a need to demonstrate that it promotes learning. From this perspective, educational effectiveness is determined by what students learn. A computer information systems instructor would need evidence of positive student outcomes. "I would be encouraged if I saw some hard facts about what kind of technology increases student learning so that I would understand the relationship."

As this study utilized a purposive sampling of faculty at Bellevue Community College, the individuals selected for interviewing were predominantly persons who used technology as an instructional tool but with varying degrees of application of specific technologies. These individuals were located in the Departments of Arts and Humanities, Business, Educational Development and Health Sciences, Science, and Social Science. The diffusion of technology could be identified as occurring within these areas and referenced as being integrated by persons considered opinion leaders within their disciplines. This is evidenced through the responses gathered through the interviews. The interview process provided the in-depth and rich description so important to the naturalistic inquiry in which multiple realities exist. "The reality with which the naturalistic inquirer must deal exists only in the minds of individual people and depends heavily on their separate perceptions" (Guba, 1978, p. 15). It is the individual

perceptions of the participants that have given this study its substance. These perceptions of reality need to be acknowledged in relation to a particular time, place, and circumstance.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SummaryPurpose and Design

As technology advances as an essential component of the instructional environment of higher education, it becomes critical to develop an awareness of how technology is being used in the classroom and to better understand how integration of this new instructional tool will impact the teaching and learning process. It is equally important to identify the factors which encourage acceptance and optimal use of technology as an instructional tool.

The purpose of this research study was to characterize the current practices of faculty members of a community college in relation to the adoption of technology as an instructional tool and its diffusion throughout the educational institution. This process of adoption and diffusion was examined in relation to the faculty's demographic characteristics, teaching style, learning style, perceptions of technology as an instructional tool, impact of technology upon the role of the teacher in the classroom, and the factors which either encouraged or discouraged the use of

technology. A discussion area related to student learning outcomes and technology was added to the interview process as a result of several participants raising this issue as a concern.

To accomplish the purpose of this study, quantitative and qualitative data were gathered from 27 faculty members of Bellevue Community College. The demographic information gathered for this population was limited to gender, position, and discipline. Teaching style as identified through the Principles of Adult Learning Scale (PALS) and learning style as identified through Kolb's Learning Style Inventory (LSI) provided additional information on each participant. The Principles of Adult Learning Style (PALS) was administered to 27 faculty members with a 74% return rate (20 participants responding). The Learning Style Inventory (LSI) was administered to 27 faculty with a 78% return rate (21 participants responding). Interviews were conducted with all 27 participants.

The interview was conducted with 27 participants and the information that was gathered was categorized according to the questions that were asked as well as by the issues or concerns which were raised during the interview. From these categories, themes which recurred throughout the 27 interviews were identified as areas of focus. The resultant information provided characteristics of faculty members who adopted

technology as well as the determinants which encouraged diffusion of technology throughout Bellevue Community College.

Findings

Findings of this study were indicative of several patterns of behavior and attitude of the participants regarding their use of technology at Bellevue Community College. The PALS instrument gave evidence that the 20 faculty members of Bellevue Community College who completed the instrument were predominantly teacher-centered in their approach to delivery of instruction. The teacher-centered approach supports the traditional mode of instruction which has ties with behaviorism as an educational philosophy. This philosophical position asserts that "humans are controlled by their environment, the conditions of which can be studied, specified and manipulated. An individual's behavior is determined by the events experienced in an objective environment" (Elias & Merriam, 1980, p. 83). This philosophical stance is in opposition to the learner-centered approach which is progressive and humanistic in orientation and emphasizes the collaborative mode of instruction as a means to enhance personal growth and development and to provide the learner with practical knowledge and problem-solving skills.

Kolb's Learning Style Inventory was used to identify the learning styles of the participants. The results of the LSI

inventory indicated that the Converger learning style was characteristics of 43% of the participants who completed the instrument (21) and that these individuals were best at finding practical uses for ideas and theories. A faculty member identified as a Converger typifies this learning style. "I would experiment to see which is better." This type is concerned with what really works. The next largest category was the Assimilator learning style. As these individuals prefer a learning modality which is more abstract in nature rather than practical, they want a wide range of information which is conveyed in concise, logical form. The Diverger prefers viewing concrete situations from many points of view.

The interviews of faculty produced a qualitative description of Bellevue Community College as a changing institution in regard to use of and integration of technology into the instructional environment. Diffusion of technology was described as occurring within specific departments rather than across the institution as a whole. Technology was viewed primarily as an enhancement of instruction. Concerns were raised regarding the benefit to students and improvement of the learning process. For several faculty members, there was also an expressed adherence to traditional pedagogy as well as fear of or reluctance to change these methodologies.

The faculty of Bellevue Community College participating in this study held diverse opinions regarding the impact of technology on the role of the teacher in the classroom. Some

saw it as a challenge to be met. These individuals viewed technology in the classroom as an opportunity to experiment, create, and try new ideas. Others did not view technology as changing their role in the classroom. Still others viewed technology as a threat to the traditional mode of teaching. Some faculty members expressed a concern for making the transition from being teacher-centered to learner-centered in their instructional approach.

Four of the 20 faculty completing the PALS instrument scored above the normed mean of 146. From these results, it can be assumed that these individuals would choose a learner-centered approach as their preferred instructional methodology. Comments made during the interviews such as "faculty have to see themselves as the facilitator not the storer" and "technology will democratize education from the student's point of view" supported the learner-centered orientation of these individuals. These comments are evidence of an inclination to establish a climate-building environment to encourage student participation. A climate-building environment is one in which dialogue and interaction with other students are encouraged, barriers are eliminated by utilizing the numerous competencies that adults already possess as building blocks for educational objectives, risk taking is encouraged, and errors are accepted as a natural part of the learning process (Conti, 1985). Using technology as more than a presentation tool was viewed as a means to

accomplish such participation. In support of this view, one faculty member envisioned technology as "a front line teaching methodology with much more video and audio and a lot more of students interacting with the program and getting immediate feedback." Technology can take society into a new learning age, and in regard to education, "the technological breakthrough of the century will likely arrive in the form of simulated learning utilizing a new technology like the interactive compact disc" (Parnell, 1990, p. 240).

Factors which would encourage the use of technology at Bellevue Community College were concentrated in three areas: role modeling, faculty involvement, and support. Role modeling or peer observation was a primary motivational factor in the adoption and diffusion of technology. Opinion leaders, those individuals who were able to influence others' attitudes or overt behavior (Rogers, 1983), were of importance to this process of behavior change. Faculty involvement in the decision-making process was pivotal in the process of integrating technology at Bellevue Community College. From a faculty perspective, being a decision-maker in the process of developing and implementing a technology plan assured relevancy of the technology to the task and reduced fear of loss of authority or position.

Support as an issue for concern was related to convenience and access to equipment, timely training programs, availability of technical expertise, and appropriate

incentives. Evidence of administrative support was also identified as an encouragement to use technology. As the interviews progressed, it became evident that it was equally important to provide support for staff as well as faculty. As an additional encouragement to integrate technology into the instructional environment, there is a need for support staff to be trained in the use of the technology alongside faculty.

One primary factor which was identified as discouraging the use of technology as an instruction tool was time. Time was an issue in regard to the lack of time required to develop new programs using technology as well as the amount of time needed to learn new technologies. Attitudinal barriers were identified as factors which would discourage use of technology. Many faculty felt intimidated by technology and felt a loss of comfort.

Related to factors which would encourage or discourage the use of technology were issues of complexity, compatibility, observability, trialability, and relative advantage; these are the five characteristics of innovations (Rogers, 1983). These characteristics as perceived by individuals help to explain their rate of adoption (p. 15). The technology would need to be easy to use: "You don't want to make the system too complicated or the faculty won't use it." It must be consistent with existing values: "Changing for change's sake is not worth it. There has to be a real value that goes beyond technology." Faculty need to see it: "If I could

observe, that would help." Faculty need to try it: "The only way they are going to get comfortable is by using it." Faculty must see that it is better than what they have: "Why should I spend my time on it, no one has shown me why it is better." For a technology to be used, these issues must be resolved.

Student learning outcome was identified as a faculty concern. Some faculty questioned the value of technology as an instructional tool in improving student learning over traditional methods. Others believed in its use as an enhancement of the learning environment.

Conclusions

1. Technology can be a catalyst for faculty to reflect upon their practices in the classroom and rethink their educational philosophy.

2. Adoption of technology can stimulate faculty to move toward a learner-centered teaching methodology.

The PALS scores revealed that the faculty who completed the instrument were predominately teacher-centered in their approach to the delivery of instruction. Although the overall scores reflected a teacher-centered approach, there was a strong tendency to value behaviors in the classroom which were conducive to Learner-Centered Activities. Learner-Centered Activities as presented in the PALS instrument are those which

encourage students to take responsibility for their own learning (Conti, 1985).

If teacher-centered methodology is the dominant approach of faculty participating in this study, what are the implications for whether integration of technology into the classroom impacts the role of the teacher? There was diversity of opinion in regard to this question, but there was evidence of a thread of willingness to look at alternatives. In reference to the PALS instrument, it was said by one faculty, "Some (many really) of the questions are causing me to review my methods." The answer may lie in awareness. Developing an awareness of teaching style and the philosophical foundation upon which it is shaped could allow for development of "a personally constructed model to help teachers make effective instructional use of information technology without sacrificing important aspects of their teaching style" (Florini, 1989, p. 51). Being able to evaluate the compatibility of one's teaching style with technology as a delivery mechanism would foster adoption and diffusion of technology across the instructional environment.

It might also provide the stimulus for making a paradigm shift from a teacher-centered style to a learner-centered style. From one faculty member's perspective, there is a desire to make this transition. "I want to get away from teacher-centered and evolve toward learner-centered."

Assessing one's teaching style in relation to the philosophical foundation upon which that style is based can facilitate effective decision-making in regard to the role the teacher assumes in the classroom and the compatibility of that role with the use of technology. Making effective decisions as to how or if technology is to be incorporated into the instructional environment requires that the teacher decide upon what the outcomes of learning should be, and then design the instructional methods most likely to achieve the intended outcomes. To accomplish this task, it is necessary to ask the following questions: What are the philosophical assumptions upon which the learning objectives are constructed? How can the learning experience be designed in such a way that learning objectives are achieved? What medium is most appropriate for accomplishing objectives? What is the role of the teacher? What are the expected outcomes for the learner? Applying theory to practice can solidify teaching style and the role of the teacher in the classroom.

3. Faculty are more willing to adopt an innovation if they can see their peers using it successfully.

4. Faculty who become role models for students in the use of technology will in turn encourage student use and interaction.

5. Everett Rogers' model of diffusion theory is applicable to the educational environment.

Other factors that were not necessarily driven by financial considerations were also identified as encouraging use of technology. Faculty are encouraged to adopt technology if they can see their peers using it successfully. This supports the concept that observability, the degree to which the innovation is observable to others, as well as the proximity of the role model to the observer (Rogers, 1983) are critical to the rate of adoption. The faculty wanted to see the technology being used by a peer within a specific content area rather than demonstrated by an outside entity not representative of a particular discipline.

6. Institutions must provide the technical support and resources necessary to maintain a technologically oriented instructional environment to encourage faculty to adopt technology as an instructional tool.

7. Diffusion of technology throughout the instructional environment may be lessened if technical training necessary for support personnel is not provided alongside faculty.

Bellevue Community College is a changing institution striving to integrate technology more fully. These efforts have often been thwarted by lack of funding, but the institution has expended considerable energy and expertise in identifying and securing alternative funding to help them meet their technological needs. Even with these efforts by the institution, use of technology as an instructional tool is sporadic.

Support is a necessary component to encourage use of technology at Bellevue Community College. Support was identified as accessibility of equipment, opportunities for training, release time for curriculum development, and technical and administrative support. Adequate funding along with administrative commitment could provide the institution with the means to meet these needs.

Additionally, institutional coordination in regard to providing timely, quality support to faculty as well as support staff does much to encourage the diffusion of technology throughout the educational system. Faculty are encouraged if "the cost of support for the technology is built in up front" and if "there is commitment from administration that money will be available to maintain the equipment."

8. Faculty must be included at all levels of the decision-making process to assure that they will become stakeholders in the process of integrating technology into the educational system.

Faculty are also encouraged to use technology if they can participate in the decision-making process of identifying, procuring, and integrating technology into the classroom. This also supports Rogers (1983) inference that innovations requiring an individual-optional innovation-decision will be adopted more rapidly than when an innovation is adopted by an organization (p. 233). Also, faculty who are involved in making decisions regarding the use of technology as an

instructional tool are encouraged to adopt and diffuse that technology because they are stakeholders in the process.

Addressing these issues would increase the adoption and diffusion of an innovation throughout an educational institution. Bellevue Community College has already taken steps toward this end through a professional development summer grant program, the Center for Emerging Technologies, the HelpDesk for faculty, and an institution-wide Technology Plan.

9. The institution needs to incorporate geographically isolated units into the strategic technology plan.

10. The institution must make accommodations in terms of release time and/or compensation to give faculty the time and incentive to learn new technologies and incorporate them into the instructional environment.

11. Acquiring learning style information can assist in preparing professional development activities which will accommodate diverse modes of learning.

Several factors discouraged the use of technology in the classroom. Time was mentioned by faculty as a major factor in discouraging the use of technology. Also, geographic isolation of some departments from the main campus area created a situation in which technology was limited or inaccessible. Issues of a more subjective nature discouraged use of technology as well. These were attitudinal issues related to feelings of intimidation, resistance to change, and

loss of comfort. To overcome these barriers, faculty will need to be shown that the technology is not "larger than life," that it can work, and how they can best work with it.

Also, understanding the dominant mode of learning of the faculty member would help to break down the feelings of intimidation and resistance to change and increase their feelings of comfort with the technology. The LSI scores revealed that the participants who completed the instrument were representative of diverse learning styles. Although a definitive pattern of types was not identified, many of the respondents' scores fell into the abstract conceptualization quadrant of the Learning Styles Type Grid. This supports the literature which states that persons of a high educational level tend toward the abstract rather than the concrete. As professional development activities are designed to introduce new technologies and new ideas into the instructional environment, consideration should be given to the ways in which people learn and the activities should incorporate methods which relate to diverse learning styles.

To accept an innovation, a person must (a) first be made aware of it and how it works, (b) form an attitude toward it, (c) acquire more knowledge to make a decision, and (d) confirm the decision either by institutionalizing the innovation or discontinuing its use (Rogers, 1983 p. 165). This innovation-diffusion process addresses these attitudinal issues which can impede adoption of new technologies.

12. Faculty who are aware of the appropriate uses of technology and how students can benefit from that use are more likely to adopt technology as an instructional tool.

13. Faculty who have training in adult learning theory will have the knowledge to construct a theoretical base from which a marriage of technology and teaching methodology can occur.

14. Not all faculty will adopt technology. Qualitative research is an emergent design that "allows the study to emerge rather than to construct it preordinately (a priori) because it is inconceivable that enough could be known ahead of time about the many multiple realities to devise the design adequately" (Lincoln & Guba, 1985, p. 41). As this study dealt with multiple realities, student learning outcomes in relation to use of technology emerged as a new discussion area and they were identified as factors which could encourage or discourage use of technology. Faculty are encouraged if they have evidence of positive benefits for students although what is considered a positive student learning outcome for one teacher may not be for another. This is determined by the teacher's view of the nature of the learner and the purpose of education, both of which are philosophical considerations. Developing a clear educational philosophy will assist the teacher in designing an instructional environment that works for the learner and is compatible with the teacher's expectations of student outcomes.

Teaching methodology has traditionally been based upon the assumptions of pedagogy, a term often mentioned throughout the interview process by a computer science instructor and a learner-centered instructor in the Arts and Humanities department.

You would have more effective presentations, but the pedagogy would not be any different than having overheads.

Maybe we ought not be lecturing, ought not to be using the technology to make an outmoded pedagogical medium like lecture to be more attractive when you have other pedagogical methods such as group work.

We need faculty involved in technological decisions to make sure that current pedagogy is used.

The term pedagogy is derived from the Greek words paid (meaning child) and agogus (meaning leading). Pedagogy literally means the art and science of teaching children. Pedagogical assumptions regarding learning and the nature of the learner are based upon observations of teaching young children. Research in adult learning theory has resulted in a set of assumptions based upon the adult learner.

The model for these assumptions utilized the term "andragogy" which is based on the Greek work aner (with the stem andr-). This means man and has been interpreted to imply adult. The assumptions of andragogy focus on the nature of the adult learner, the role of experience, readiness to learn, and orientation to learning (Knowles, 1980). Student learning outcomes became an emerging issue of concern as this study

progressed. This implies that the assumptions of andragogy may provide the theoretical base upon which faculty could construct a teaching model compatible with technology.

Recommendations

The outcome of this study contributes new knowledge as well as new insights garnered from the literature of the processes which encourage the adoption and diffusion of technology throughout Bellevue Community College. The new knowledge centers upon the view that technology can be the catalyst for faculty to reflect upon their practices in the classroom and rethink their educational philosophy, that training in adult learning theory will provide the knowledge to construct a theoretical base from which a marriage of technology and teaching methodology can occur, and that adoption of technology can stimulate faculty to move toward a learner-centered teaching methodology.

The following recommendations are divided into two areas: (a) new knowledge which has implications for educational practices and (b) knowledge which is confirmed from the existing literature. These recommendations are given in regard to the use of technology as an instructional tool by faculty at Bellevue Community College.

New Knowledge

1. Professional development opportunities should be designed that would allow faculty to reflect upon their teaching style and the philosophical foundation upon which it is based. As the use of technology may be the stimulus for changing educational practices, it is important that faculty have a well-defined theoretical base upon which to determine their views of the purpose of education, the nature and expectations of the learner, and the role the teacher assumes in the classroom.

2. Training for support staff needs to be provided alongside faculty to assure that there is mutual understanding and technical level of expertise in regard to the application of technology.

3. Placement of equipment and training opportunities for both faculty and support staff need to occur simultaneously.

4. Technology needs to be incorporated into the instructional environment on a rotational schedule to assure that it will be supported fiscally and will be an on-going commitment.

5. Instruction in the applications and appropriate uses of technologies which enhance teaching and learning should be provided to faculty. As faculty place high value on processes that improve student learning, the technology must be perceived as a tool which will benefit the student and enhance the teaching and the learning process.

6. A review of current research or successful practices relating to technology and student learning outcomes needs to be made available to faculty members.

7. All segments of the campus need to be included in the development and implementation of a technology plan for an educational institution. It is important to specifically incorporate representative faculty from each department as well as support staff to assure that there is a feeling of ownership and responsibility toward the stated outcomes of a coordinated plan.

8. Comprehensive training in the use of specific technologies and applications designed to enhance the teaching and the learning process needs to be provided. Such training will do much to overcome the attitudinal barriers which discourage use of technology.

Knowledge Confirming Existing Literature

1. Faculty members recognized as opinion leaders and early knowers of an innovation (Rogers, 1983, p. 168) should be selected for training in the use of the technology prior to its introduction to other faculty members. These trained faculty will in turn become the role models for others and the interpersonal communication channels that serve to influence the decision of members of their social system to adopt the innovation.

2. Incentives should be provided to faculty to encourage professional development in the area of adult learning theory as a means to construct an andragogical model of assumptions upon which to build teaching methodology with direct application to technology.

3. Designing professional development activities which incorporate delivery methodologies related to diverse modes of learning may assist in decreasing the level of discomfort on the part of the learner when interacting with new technologies.

4. Institutions need to recognize that not all faculty members will change their view of technology and its perceived lack of compatibility with their own values and current practices. Therefore, they will not adopt technology as part of the teaching process.

Thus, this descriptive case study provides quantitative and qualitative information characterizing Bellevue Community College faculty who were interviewed in regard to their use of technology. It constructs a portrait of the process of diffusing technology within the educational environment of Bellevue Community College. This portrait strongly supports the diffusion model of Everett Rogers and has implications for development of a strategic plan by which Bellevue Community College may further integrate technology throughout its instructional environment.

REFERENCES

- Apps, J. W. (1988). Higher education in a learning society. San Francisco: Jossey-Bass.
- Beal, G. M., & Rogers, E. M. (1960). The adoption of two farm practices in a central Iowa community. Special Report 26. Ames, Iowa: Agricultural and Home Economics Experiment Station.
- Beder, H. (1991). Purposes and philosophies of adult education. In S. B. Merriam & P. M. Cunningham (Eds.), Handbook of adult and continuing education (pp. 37-50). San Francisco: Jossey-Bass.
- Bergevin, P. (1967). A philosophy for adult education. New York: The Seabury Press.
- Berger, C. (1993). Teaching with technology: Trends in integration. Technology for Higher Education, 3(5), 3-7.
- Boggs, G. R. (1993-94). Reinventing community colleges. Community College Journal, 64, 4-5.
- Bonham, A. L. (1988). Learning style instruments: Let the buyer beware. Lifelong Learning, 11(6), 12-16.
- Brookfield, S. D. (1986). Understanding and facilitating adult learning. San Francisco: Jossey-Bass.
- Carlson, R. O. (1965). Adoption of Educational Innovations. Eugene, OR: University of Oregon, Center for the Advanced Study of Educational Administration.
- Certo, S., & Lamb, S. (1979). Identification and management of instrument bias within the learning styles instrument through a Monte Carlo technique. Southern Management Proceedings.
- Copp, J. H., et al. (1958). The function of information sources in the farm practice adoption process. Rural Sociology, 23, 146-157.
- Conti, G. (1979). Principles of adult learning scale: An instrument for measuring teacher behavior related to the collaborative teaching-learning mode. (Doctoral dissertation, Northern Illinois University, 1978). Dissertation Abstracts International, 39, 711A.
- Conti, G. (1982). The principles of adult learning scale. Adult Literacy and Basic Education, 6, 135-150.

- Conti, G. (1983, April). Principles of adult learning scale: Follow-up and factor analysis. Twenty-Fourth Annual Adult Education Research Conference, Montreal, Canada.
- Conti, G. (1985). Assessing teaching style in adult education: How and why. Lifelong Learning, 8(8), 7-11.
- Conti, G. (1989). Assessing teaching style in continuing education. In E. Hayes (Ed.), New directions for continuing education: No. 43. Effective teaching styles (pp. 3-16). San Francisco: Jossey-Bass.
- Cuban, L. (1986). Teachers and machines: The classroom use of technology since 1920. Columbia University, New York: Teachers College Press.
- Darkenwald, G. G., & Merriam, S. B. (1982). Adult education: Foundations of practice. New York: Harper & Row.
- Dede, C. (1987). Empowering environments, hypermedia, and microworlds. The Computing Teacher, 15(3), 163-181.
- Dede, C. (1989). The evolution of information technology: Implications for curriculum. Educational Leadership, 7(1), 23-26.
- Doucette, D. (1994). Transforming teaching and learning through technology. In T. O'Bannion and Associates (Eds.), Teaching and learning in the community college (pp. 201-228). Washington D.C.: Community College Press.
- Elias, J., & Merriam, S. (1980). Philosophical foundations of adult education. Melbourne, FL: Robert E. Krieger Publishing.
- Ferrell, B. G. (1983). A factor analytic comparison of four learning-styles instruments. Journal of Educational Psychology, 75(1), 33-39.
- Fischer, B., & Fischer, L. (1979). Styles in teaching and learning. Educational Leadership, 36, 245-251.
- Florini, B. M. (1989). Teaching styles and technology. In E. Hayes (Ed.), New directions for continuing education: No. 43. Effective teaching styles (pp. 51-52). San Francisco: Jossey-Bass.
- Fox, R. D. (1984). Learning styles and instructional preferences in continuing education for health professionals: A validity study of the LSI. Adult Education Quarterly, 13, 72-85.

- Gagne, R. M. (1984). Learning outcomes and their effects: Useful categories of human performance. American Psychologist, 39(4), 377-385.
- Gay, L. R. (1987). Educational Research (3rd ed.). Columbus: Merrill.
- Geiger, M. A. (1992). A factor analysis of Kolb's revised Learning Styles Inventory. Educational Psychological Measurements, 52, 753-759.
- Gibson, C. C. (1992). Distance education: On focus and future. Adult Education Quarterly, 42(3), 165-169.
- Glaser, B. G., & Strauss, A. L. (1967). The discovery of grounded theory. Chicago: Aldine.
- Gooler, D. D. (1987). Using integrated information technologies for out-of-date classroom learning. In J. A. Niemi & D. D. Gooler (Eds.), New directions for continuing education: No. 34. Technologies for learning outside the classroom. San Francisco: Jossey-Bass.
- Gregg, N. (1989). Learning-style inventory. In J. C. Conley & J. J. Kramer (Eds.), The tenth mental measurements yearbook (pp. 441-442). Lincoln, NB: University of Nebraska Press.
- Guba, E. G. (1978). Toward a methodology of naturalistic inquiry in educational evaluation. Center for the Study of Evaluation. Los Angeles: University of California.
- Ivey, B. E. (1992). A case study of student learning in a microcomputer-based chemistry laboratory. Unpublished doctoral dissertation, Montana State University, Bozeman.
- Kidd, J. R. (1973). How adults learn. Chicago: Follett.
- Kirby, P. (1979). Cognitive style, learning style and transfer skill acquisition. Columbus, OH: The Ohio State University National Center for Research in Vocational Education.
- Kolb, D. A. (1976). Learning style inventory: Technical manual. Boston: McBer.
- Kolb, D. A. (1977). Learning style inventory: A self-description of preferred learning modes. Boston: McBer.

- Kolb, D. A. (1981). Learning styles and disciplinary differences. In A. Chickering & Associates (Eds). Modern American college. San Francisco: Jossey-Bass.
- Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall.
- Kolb, D. A. (1985). Learning style inventory: Self-scoring inventory and interpretation booklet (2nd rev.). Boston: McBer.
- Knowles, M. (1980). The modern practice of adult education: From pedagogy to andragogy. Chicago: Follett.
- Knox, A. B. (1987). Helping Adults Learn. San Francisco: Jossey-Bass.
- Lazerfeld, P. F., & Merton, R. K. (1964). Friendship as social process: A substantive and methodological analysis. In M. Berger and others (Eds.), Freedom and control in modern society. New York: Octagon.
- Lee, S. B. (1977). System effects on family planning behavior in Korean villages. Unpublished doctoral dissertation, University of Michigan, Ann Arbor.
- Lindquist, J. (1978). Strategies for change. Berkeley, CA: Pacific Soundings Press.
- Lindquist, J. (1981). Professional development. In A. Chickering & Associates (Eds.), Modern American college (pp. 730-747). San Francisco: Jossey-Bass.
- McKeachie, W. J. (1988). Psychology and adult cognition. Center for Adult Learning Research, Montana State University. Bozeman, Montana.
- McNeil, D. R. (1990). Wiring the ivory tower: A round table on technology in higher education. In D. Stewart & J. S. Daniel (Eds.), Proceedings of the International Council for Distance Education (pp. 297-300). Oslo, Norway: International Council for Distance Education.
- Maehr, M. L., & Braskamp, L. A. (1986). The motivational factor. Lexington, MA: C. D. Heath.
- Mason, R. G. (1962). Information source use in the adoption process. Unpublished doctoral dissertation, Stanford University, Palo Alto, CA.

- Merriam, S. B. (1988). Case study in research. San Francisco: Jossey-Bass.
- Moore, A. B., & Sellers, R. E. (1982). Pilot test results of two instruments for assessing the teaching and learning styles of adult education teachers. Adult Literacy and Basic Education, 6, 226-237.
- Moore, M. G. (1993). Is teaching like flying? A total systems view of distance education. American Journal of Distance Education, 7(1), 1-10.
- Mort, P. R. (1953). Educational adaptability. The School Executive, 71, 1-23.
- O'Bannion, T. (1994). Teaching and learning in the community college. Washington D.C.: Community College Press.
- Patton, M. Q. (1986). Utilization-focused evaluation. Beverly Hills, CA: Sage.
- Patton, M. Q. (1987). How to use qualitative methods in evaluation. Beverly Hills, CA: Sage.
- Parnell, D. (1990). Dateline 2000: The new higher education agenda. Washington, D.C.: Community College Press.
- Petrini, F., et al. (1968). The information problem of an agricultural college. Uppsal, Sweden, Nordisk Jordbrukforskning 50.
- Phelps, D. G. (1994). What lies ahead for community colleges as we hurtle toward the 21st century? Community College Journal, 65(1), 22-25.
- Privateer, P. M., & MacCrate, C. (1992, October). Odyssey project: A search for new learning solutions. T.H.E. Journal, 20(3), 76-80.
- Reynolds, J. B. (1994, September). BCC emerging technology center to prepare local workers for a world market. Bellevue Business, XI(1).
- Roe, Mary Ann. (1994). Lewis J. Perelman [Interview]. AACC Journal, 64(5), 8-10.
- Rogers, E. M. (1983). Diffusion of innovations (3rd ed.). New York: The Free Press.

- Roueche, J. E. (1993, November). Meeting the challenge: What does society need from higher education? Essay prepared for The Wingspread Group on Higher Education, University of Texas, Austin.
- Strange, J. H. (1981). Adapting to the computer revolution. Current Issues in Higher Education, 5, 14-18.
- Theobald, R. (1994). Changing success criteria for the 21st century: What can community colleges do? Community College Journal, 65(1), 16-21.
- Watkins, B. T. (1991, November 13). A program called 'Odyssey' aims at transforming an impersonal course. The Chronicle of Higher Education.
- Wilkening, E. A. (1956). Role of communication agents in technological change in agriculture. Social Forces, 34, 361-367.
- Wlodkowski, R. J. (1993). Enhancing adult motivation to learn. San Francisco: Jossey-Bass.
- Wunderlich, K., & Gjerde, C.I. (1978). Another look at learning style inventory and medical career choices. Journal of Medical Education, 33, 45-54.
- Wynne, G. E. (1993). Repositioning: A winning strategy for community colleges. Community College Journal, 64(3), 18-23.

APPENDICES

APPENDIX A
PERMISSION TO CONDUCT SURVEY

29 September 1994

TO: Gary McGlocklin
Executive Dean

FROM: Alan Yabui *Alan Yabui*

RE: Request to Conduct Research at BCC

1. Request permission to conduct a professional research project to examine the adoption of computer technology by faculty and staff at BCC between 1990-1994. The proposed study is part of a Ed. D. dissertation for Arlene Parisot, a doctoral candidate at Montana State University. Arlene is a faculty member at the Montana State University, College of Technology, at Great Falls, Montana.

2. I presently serve on Arlene's dissertation committee and will supervise the research here at BCC. Arlene will be examining how concepts about using computers and multimedia in the classroom and the adoption of computer techniques spread among the full-time faculty. She will also examine what support factors at BCC contributed to the spread of the technology. Arlene plans to conduct interviews on campus during the first week of December. I will do some preliminary work for her, such as contacting administrative and faculty members. About 25 interviews are planned. No written surveys will be used in the study.

3. The cut-off date for the study will be 31 December 1994. Arlene may conduct some follow-up interviews in February, 1995. Hopefully, the study will find factors that will help us at BCC make informed decisions based on research as we progress toward our goals in adopting technology in the curriculum.

4. Recommend approval. Thank you.

*Approved Minutes
Gary McGlocklin*

*Call ... survey!!
je*

RECEIVED

SEP 30 1994

.....

APPENDIX B
INSTRUMENTS

Principles of Adult Learning Scale

Directions: The following survey contains several things that a teacher of adults might do in a classroom. You may personally find some of them desirable and find others undesirable. For each item please respond to the way you most frequently practice the action described in the item. Your choices are Always, Almost Always, Often, Seldom, Almost Never, and Never. On your answer sheet, circle 0 if you always do the event; circle number 1 if you almost always do the event; circle number 2 if you often do the event; circle number 3 if you seldom do the event; circle number 4 if you almost never do the event; and circle number 5 if you never do the event. If the item *does not apply* to you, circle number 5 for never.

Always	Almost Always	Often	Seldom	Almost Never	Never
0	1	2	3	4	5

1. I allow students to participate in developing the criteria for evaluating their performance in class.
2. I use disciplinary action when it is needed.
3. I allow older students more time to complete assignments when they need it.
4. I encourage students to adopt middle class values.
5. I help students diagnose the gaps between their goals and their present level of performance.
6. I provide knowledge rather than serve as a resource person.
7. I stick to the instructional objectives that I write at the beginning of a program.
8. I participate in the informal counseling of students.
9. I use lecturing as the best method for presenting my subject material to adult students.
10. I arrange the classroom so that it is easy for students to interact.
11. I determine the educational objectives for each of my students.
12. I plan units which differ as widely as possible from my students' socio-economic backgrounds.
13. I get a student to motivate himself/herself by confronting him/her in the presence of classmates during group discussions.
14. I plan learning episodes to take into account my students' prior experiences.
15. I allow students to participate in making decisions about the topics that will be covered in class.
16. I use one basic teaching method because I have found that most adults have a similar style of learning.
17. I use different techniques depending on the students being taught.
18. I encourage dialogue among my students.
19. I use written tests to assess the degree of academic growth rather than to indicate new directions for learning.
20. I utilize the many competencies that most adults already possess to achieve educational objectives.
21. I use what history has proven that adults need to learn as my chief criteria for planning learning episodes.
22. I accept errors as a natural part of the learning process.
23. I have individual conferences to help students identify their educational needs.
24. I let each student work at his/her own rate regardless of the amount of time it takes him/her to learn a new concept.
25. I help my students develop short-range as well as long-range objectives.
26. I maintain a well disciplined classroom to reduce interferences to learning.
27. I avoid discussion of controversial subjects that involve value judgements.
28. I allow my students to take periodic breaks during class.

29. I use methods that foster quiet, productive desk-work.
30. I use tests as my chief method of evaluating students.
31. I plan activities that will encourage each student's growth from dependence on others to greater independence.
32. I gear my instructional objectives to match the individual abilities and needs of the students.
33. I avoid issues that relate to the student's concept of himself/herself.
34. I encourage my students to ask questions about the nature of their society.
35. I allow a student's motives for participating in continuing education to be a major determinant in the planning of learning objectives.
36. I have my students identify their own problems that need to be solved.
37. I give all students in my class the same assignment on a given topic.
38. I use materials that were originally designed for students in elementary and secondary schools.
39. I organize adult learning episodes according to the problems that my students encounter in everyday life.
40. I measure a student's long term educational growth by comparing his/her total achievement in class to his/her expected performance as measured by national norms from standardized tests.
41. I encourage competition among my students.
42. I use different materials with different students.
43. I help students relate new learning to their prior experiences.
44. I teach units about problems of everyday living.

PALS SCORES FOR EACH FACTOR

<p>Factor 1</p> <p>2. _____</p> <p>4. _____</p> <p>11. _____</p> <p>12. _____</p> <p>13. _____</p> <p>16. _____</p> <p>19. _____</p> <p>21. _____</p> <p>29. _____</p> <p>30. _____</p> <p>38. _____</p> <p>40. _____</p> <p>Total _____</p>	<p>Factor 2</p> <p>3. _____</p> <p>9. _____</p> <p>17. _____</p> <p>24. _____</p> <p>32. _____</p> <p>35. _____</p> <p>37. _____</p> <p>41. _____</p> <p>42. _____</p> <p>Total _____</p>	<p>Factor 3</p> <p>14. _____</p> <p>31. _____</p> <p>34. _____</p> <p>39. _____</p> <p>43. _____</p> <p>44. _____</p> <p>Total _____</p>	<p>Factor 4</p> <p>5. _____</p> <p>8. _____</p> <p>23. _____</p> <p>25. _____</p> <p>Total _____</p>
<p>Factor 5</p> <p>18. _____</p> <p>20. _____</p> <p>22. _____</p> <p>28. _____</p> <p>Total _____</p>	<p>Factor 6</p> <p>1. _____</p> <p>10. _____</p> <p>15. _____</p> <p>36. _____</p> <p>Total _____</p>	<p>Factor 7</p> <p>6. _____</p> <p>7. _____</p> <p>26. _____</p> <p>27. _____</p> <p>33. _____</p> <p>Total _____</p>	

Factor	Factor Name	Average Score	Your Score	Difference
1	Learner Centered Activities	38	_____	_____
2	Personalizing Instruction	31	_____	_____
3	Relating to Experience	21	_____	_____
4	Assessing Student Needs	14	_____	_____
5	Climate Building	16	_____	_____
6	Participation in Learning Process	13	_____	_____
7	Flexibility for Personal Development	13	_____	_____
				8/83

Negative Items

Items number 2,4,6,7,9,11,12,13,16,19,21,26,27,29,30,33, 37,38, 40, and 41 are negative items. For negative items, the following values are assigned: Always = 0, Almost Always = 1, Often = 2, Seldom = 3, Almost Never = 4, and Never = 5.

Missing Items

Omitted items are assigned a neutral value of 2.5.

Factor 1

Factor 1 contains items number 2,4,11,12,13,16, 19,21,29,30,38, and 40.

Factor 2

Factor 2 contains items 3,9,17,24,32,35,37,41, and 42.

Factor 3

Factor 3 contains items 14,31,34,39,43, and 44.

Factor 4

Factor 4 contains items 5,8,23,and 25.

Factor 5

Factor 5 contains items 18,20,22,and 28.

Factor 6

Factor 6 contains items 1,10,15,and 36.

Factor 7

Factor 7 contains items 6,7,26,27, and 33.

Computing Scores

An individual's total score on the instrument is calculated by summing the value of the responses to all items. Factor scores are calculated by summing the value of the responses for each item in the factor.

Factor Score Values

Factor	Mean	Standard Deviation
1	38	8.3
2	31	6.8
3	21	4.9
4	14	3.6
5	16	3.0
6	13	3.5
7	13	3.9

LEARNING-STYLE INVENTORY

- | | | | | |
|-------------------------|---|--|---|---|
| 1. When I learn: | <input type="checkbox"/> I like to deal with my feelings | <input type="checkbox"/> I like to watch and listen | <input type="checkbox"/> I like to think about ideas | <input type="checkbox"/> I like to be doing things |
| 2. I learn best when: | <input type="checkbox"/> I trust my hunches and feelings | <input type="checkbox"/> I listen and watch carefully | <input type="checkbox"/> I rely on logical thinking | <input type="checkbox"/> I work hard to get things done |
| 3. When I am learning: | <input type="checkbox"/> I have strong feelings and reactions | <input type="checkbox"/> I am quiet and reserved | <input type="checkbox"/> I tend to reason things out | <input type="checkbox"/> I am responsible about things |
| 4. I learn by: | <input type="checkbox"/> feeling | <input type="checkbox"/> watching | <input type="checkbox"/> thinking | <input type="checkbox"/> doing |
| 5. When I learn: | <input type="checkbox"/> I am open to new experiences | <input type="checkbox"/> I look at all sides of issues | <input type="checkbox"/> I like to analyze things, break them down into their parts | <input type="checkbox"/> I like to try things out |
| 6. When I am learning: | <input type="checkbox"/> I am an intuitive person | <input type="checkbox"/> I am an observing person | <input type="checkbox"/> I am a logical person | <input type="checkbox"/> I am an active person |
| 7. I learn best from: | <input type="checkbox"/> personal relationships | <input type="checkbox"/> observation | <input type="checkbox"/> rational theories | <input type="checkbox"/> a chance to try out and practice |
| 8. When I learn: | <input type="checkbox"/> I feel personally involved in things | <input type="checkbox"/> I take my time before acting | <input type="checkbox"/> I like ideas and theories | <input type="checkbox"/> I like to see results from my work |
| 9. I learn best when: | <input type="checkbox"/> I rely on my feelings | <input type="checkbox"/> I rely on my observations | <input type="checkbox"/> I rely on my ideas | <input type="checkbox"/> I can try things out for myself |
| 10. When I am learning: | <input type="checkbox"/> I am an accepting person | <input type="checkbox"/> I am a reserved person | <input type="checkbox"/> I am a rational person | <input type="checkbox"/> I am a responsible person |
| 11. When I learn: | <input type="checkbox"/> I get involved | <input type="checkbox"/> I like to observe | <input type="checkbox"/> I evaluate things | <input type="checkbox"/> I like to be active |
| 12. I learn best when: | <input type="checkbox"/> I am receptive and open-minded | <input type="checkbox"/> I am careful | <input type="checkbox"/> I analyze ideas | <input type="checkbox"/> I am practical |

TOTAL the scores from each column

Column 1

Column 2

Column 3

Column 4

INTERVIEW FORMAT
BELLEVUE COMMUNITY COLLEGE

Name _____

Age ___ Gender: M ___ F ___

Organizational Unit: _____ Teaching Area _____

1. Do you use technology in your teaching?
2. How do you see technology being used at Bellevue Community College?
3. Do you think that the use of technology will impact your role in the classroom?
4. What factors do you think are obstacles to the successful use of technology in the classroom?
5. What factors would encourage or have encouraged you to use technology as an instructional tool?

