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FACULTY USE OF INSTRUCTIONAL TECHNOLOGY IN HIGHER EDUCATION:
PROFILES OF CONTRIBUTING AND DETERRING FACTORS

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ABSTRACT

FACULTY USE OF INSTRUCTIONAL TECHNOLOGY
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While technology and computers dramatically affect our lives, their growth in education for instructional use has been less dramatic. At the higher education level, technology use is frequent in administration and research, but less in instruction. Why do some faculty members use instructional technology while others do not? Will an examination of the use of instructional technology in higher education help to explain why some faculty members use instructional technology more frequently than others do?

In this study I offered a model suggesting instructional technology use by higher education faculty members depends on: the faculty member's perception of change in the learner, the faculty member, the technology, the environment, and the faculty member's perceived value of using an instructional technology. Data was collected for this study by interviewing twenty-one faculty members at a mid-sized Midwestern university. Faculty members interviewed represented seven high-level users, seven medium-level users, and seven low-level users of instructional technology. While the interview data and analysis was qualitative in nature, I used quantitative methods such as frequency counting in the analysis to sort the data and identify patterns or differences.

This study found that a variety of factors are involved in a faculty member's decision to use or not use instructional technologies. Changes in content factors were not

as important as attitude and perceived value in influencing the use of instructional technologies. To encourage the use of instructional technologies in higher education, technologies must be convenient and beneficial to the faculty member. They must provide a benefit to the faculty member that they have identified as important to them. The instructional technology must help the faculty member do a better job of what they define as important.

Time was an issue important to all levels of users of instructional technology. Most faculty members at all levels of use commented on needing more time to do things they thought important, whether it be to learn software, communicate with students, or prepare for teaching. Benefit to using instructional technologies appeared as an important contrasting point between the levels of use. Frequent users of instructional technology were doing so because they saw a personal benefit to use, while low-levels users were less willing to use a technology unless it was shown to be better than what they were currently doing. Support was frequently discussed including training support, technical support, and material support. High-level users were frequently more positive overall, about the support in their situations and other issues, than the low-level users.

The model I used did not adequately explain instructional technology use or represent what seemed to be important to higher education faculty. A new model should de-emphasize the content factors (learner, faculty, technology, and environment) and focus more on the attitude of the user and the benefit they perceive in using instructional technology.

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CHAPTER I

INTRODUCTION

Digital computers have been on college campuses now for three decades or more. With their arrival came the expectation that new instructional technologies would revolutionize teaching and learning in American higher education (Gilbert, 1994; Geoghegan, 1994b). The picture envisioned was one where the individual needs and abilities of the students would regulate the pace of the learning. The faculty members would be mentors rather than lecturers, students would learn by exploration and discovery, and access to education would be unlimited (Geoghegan, 1994b). Contrary to predictions and isolated examples of individual success with instructional technology in the classroom, technology is not being regularly integrated into instruction (Geoghegan, 1994b; Green, 1994; OTA, 1995). Why do some faculty members use instructional technology while others do not? The use of instructional technologies in higher education needs further examination.

A trend toward technology in education is evident in the elementary and secondary schools. From 1985 to 1995, schools spent about $500 million on new computers. In 1992, high schools typically had fifty-four computers and elementary and middle schools had about twenty-five (OTA, 1995). Projections at the time said the number of computers used for K-12 instruction in public and private schools would total 4.95 million for spring 1994 and by spring of 1995 that number would be 5.8 million instructional computers (OTA, 1995). This shows public education systems place great importance on newer technologies in education.

This trend is evident in higher education also, as shown by the increased investments. Fueled by the great promise of computers and new technologies, higher education made a large investment in electronics technology. In 1994 it was estimated that the total outlay for computer-related goods and services in higher education was almost $70 billion over the preceding 15 years (Geoghegan, 1994b). Of that amount, $20 billion was estimated to have gone to the support of teaching and learning: for hardware, software and wiring to support PC-based teaching laboratories and student "clusters," for classroom and residence hall networking, for individual and institutional purchases of computers used in teaching and learning (Geoghegan, 1994b). Besides this, many universities are investing in equipment to do distance learning courses with interactive video and on-line courses so that they can tap into a new market of students outside their normal share. The predictions at the time were that American colleges and universities would spend $6 billion on information technologies alone, with $1.75 billion going to support the instructional mission (Geoghegan, 1994b).

Classroom Technology Use

> The first teacher ever, that priest in preliterate Mesopotamia who sat down outside the temple with the kids and began to draw figures with a twig in the sand, would be perfectly at home in most classrooms in the world today. Of course, there is

> the blackboard, but otherwise there has been little change in tools and none in respect to methods. The one new teaching tool in the intervening 8,000 years has been the printed book. And that few teachers really know how to use-or else they would not continue to lecture on what is already in the book.

This is the picture that Peter Drucker painted in 1969 (Drucker, 1969, p. 347). If we are to believe what others say, this is an accurate reflection of most college classrooms today, more than 25 years later. Despite the available new technologies and their potential influence on teaching and learning in higher education, technology's actual effect in the classrooms of higher education is difficult to characterize as especially widespread or significant at this time. Even the colleges of education (COEs) that prepare teachers are slow to focus attention to this area in the curriculums. In most COEs, technology is not a major part of the teacher's preparation experience. Most of the instruction is about technology as opposed to teaching with technology across the curriculum. College professors who prepare teachers for the teaching profession do not use the technologies themselves in their teaching. They provide little example and serve as poor models for prospective teachers (OTA, 1995).

Some exceptional faculty members use new instructional technologies regularly, but many do not. Most articles about technology use in higher education appear to be based on anecdotal evidence about outstanding professors using the latest innovations in dramatic and highly effective ways. These articles appear regularly in such publications as The Chronicle of Higher Education (Jacobson, 1993; Watkins, 1944), Syllabus (Technology Across Campus, 1994), and T.H.E. Journal (1994), featuring examples of instructional technology use.

While these efforts are praiseworthy and exemplify exciting potential, this may be the exception rather than the norm. The research literature suggests little use of instructional technologies in higher education. Data from the 1993 USC Survey of Desktop Computing in Higher Education suggested that while demand for technology resources was strong, campuses did not expand their investments to create the materials (Green, 1994). In a survey of faculty members at a mid-sized Midwestern university, few of the university faculty members actively used instructional technologies in their teaching. Fewer than 40% of the faculty surveyed had good to expert knowledge of or experience with newer instructional technologies and less than 20% suggested they used them weekly (Spotts & Bowman, 1995a). In a report published by IBM Academic consulting, Geoghegan suggests only a small portion (less than 5%) of courses taught at the time of the report use information technology (Geoghegan, 1994). Albright and Graf suggested that while faculty members are becoming more comfortable with using microcomputers, instructional use of computers remains minimal (Albright & Graf, 1992).

During the past 90-plus years we have seen little change in the basic acts of classroom teaching, in spite of attempts to introduce technology into our education system (Snider, 1992). The leading technology in higher education is still that of a teacher delivering a lecture to a large group of students, a technology introduced to education as an efficient process of educating large numbers. However, technology is an integral part of daily life where we are constantly confronted with computers, fax machines, price scanners, and cable television. This includes an explosion of on-line courses being offered by a variety of institutions targeting a new market of potential students. Though common in daily life, higher education classrooms do not appear to reflect these phenomena. University classrooms should lead the field for others to follow, yet they lag behind.

With the tremendous growth of computers in our society, instructional technologies are receiving a good deal of attention. They can enhance, improve, and alter the current way we teach in higher education. Computers, videos, audio tapes, information technologies, and multimedia can provide drill and practice, simulate actual working or emergency conditions in the classroom, enhance presentations, bring the reality of the actual time and location into the classroom, and provide individualized self-paced instruction among other things. Instructional technologies can enhance presentations without changing the content or structure of the current courses, or may promote change within the course structure and content based on new conceptualizations of the underlying disciplines (OTA, 1988). Using technology can transform instruction from a standard scenario of instructor delivery of information to passive students into one of motivated students working with the instructor to develop knowledge on their own (Solomon, 1992).

Instructional technologies can also be used by faculty to do their jobs better, faster, and more effectively. With the demand for greater accountability rising and the trend toward increasing class sizes, testing and record keeping are likely to increase also. Computers with the right software offer the instructor a way to ease some aspects of classroom management. Programs such as spreadsheets, databases, and desktop publishing may make record keeping and material preparation easier (OTA, 1988, 1995). Specialty software, such as grading programs or management databases, can help instructors track student progress and adjust lessons better to meet student needs (OTA, 1995). Besides easing the above management functions, integrating computers into the classroom may make the instructor's job less demanding. Students engrossed in computers may create fewer discipline and absenteeism problems (OTA, 1988). When instructors realize the benefits for their teaching, administrative tasks, and professional growth, they may see the wisdom in using the newer instructional technologies. Those instructors that do not see benefits are less likely to enthusiastically adopt new technologies for teaching (OTA, 1995).

To most instructors, improved student learning is an important criterion for instructional technology use (OTA, 1995; Spotts & Bowman, 1993b). Many who use instructional technology see that it can help them motivate student learning and address different student learning styles. It can also expose students to a broader field of experts, a wider variety of information, and a brand new array of teaching techniques.

Other possible applications involve new advances in interactive programs in multimedia. These can allow simulation of actual conditions in the classroom without involving the risk or the expense of many learning situations, like for emergency procedures or large, expensive equipment operation. The ability of instructors to use such programs makes it possible to provide near actual practice conditions for students without the concerns about student injury or equipment damage.

With the growth of information technologies, instructors can select and use unique combinations or teaching materials from a wider variety of options. This capability allows faculty to design a more tailored course without relying on only text or limited sources of information. Greater availability of information also provides the most up-to-date resources and gives the students a greater source of supplementary information. Instructors may encourage students to use communications technologies to contact scientists, industry leaders, or various experts in particular fields for additional information or help. Leading professors in a discipline from universities nationwide may give "guest lectures" to classes via a communications network, to complement and support regular instruction (OTA, 1995).

Instructors clearly would benefit from instructional technology. While classrooms of today generally resemble those of the last 50 years, instructional technologies used properly may enhance learning and ease the organizational/ management aspects of instruction, benefiting both the students and the teachers. It seems most would not hesitate to use technology because the application and use appears a beneficial situation for all involved.

The Problem

Despite the greater availability of technology at reasonable prices, a growing familiarity with technology by faculty, and what seems large investments in technology for student and faculty use by the colleges and universities (Geoghegan, 1994b), instructional technology is not being used in the classrooms of higher education at the level early expectations would have us believe. This situation is not isolated to a limited number of universities. While the trade publications report on exceptional faculty doing exciting things in teaching with new instructional technologies, the research literature reveals little use of new instructional technology in the classrooms of higher education (Albright & Graf, 1992; Doloughry, 1994; Geoghegan, 1994; Green, 1994; Spotts & Bowman, 1993b). With technology use common in our daily lives and the benefits of instructional technology use apparent, it seems that university classrooms should be the showplaces of instructional technology use. Why have few faculty members not attempted to integrate technology very deeply into the instructional process?

To attract future students, universities need to lead not only in research, but in the classroom and teaching also. Because newer technologies have the potential to be a powerful tool for helping educators in many aspects of their job, including enhancing instruction and easing administrative tasks, universities may want to encourage the use of instructional technologies. To develop strategies and policies that encourage the faculty to use newer instructional technologies, administrators need to understand what motivates the faculty decision to use or not use innovative new instructional technologies.

Barriers cited for infrequent or non use of newer instructional technologies include the following: fear of technology, too little time to learn the new technologies, cost, limited technical and administrative support, no available equipment, the rapid pace of change, and the complexity of technology based instructional systems (Albright & Graf, 1990; OTA, 1995; Spotts & Bowman, 1993b). Besides these barriers, using newer instructional technologies represent the unfamiliar compared with traditional educational methods (chalkboards, lectures, and textbooks) and requires change. As such, faculty members, based on their resistance to changing what they are doing, frequently reject innovations like this. This resistance to change further slows the introduction of computers and technology into the classrooms of higher education (Ely, 1989; Snider, 1992).

A Model for Decision

This study explores the influence of five variables on the decision to use instructional technology. The variables are the learner, the faculty member, the technology, the environment, and perceived value. The model, Uc=f (LcFcTcEcV), is proposed in this study to explain a faculty member's decision on using instructional technologies.

The students can influence the effectiveness and value of the technology in a particular situation. A faculty member's experience, attitude, and style (how they do things) might also influence the use of technology. Ease of using the technology influences how it is perceived by the faculty members and will influence the likelihood of use in instruction. Environmental factors, such as equipment availability, facilities, and support influences the effort that must be expended to use a technology, and so influences its use. Finally, if no benefit is derived from using the technology, faculty members will be less inclined to change how they currently do things. These issues may influence how readily a faculty member might adapt to new technology. This study examines what faculty members have to say about these factors.

Evans (1982) points to four major components influencing the process by which individuals become aware of, evaluate, and finally accept or reject innovations. These include the innovation itself; the process by which it is introduced, promoted, and adopted; the characteristics of the individuals or groups in the social system; and the nature of the social system itself. Rogers' research emphasizes four elements in the diffusion process: channels of communication, characteristics of the innovation, phases in the process, and influence of the social system (Rogers, 1995). These components or elements suggested by innovation diffusion research imply important areas in deciding to use newer technologies in teaching. They encompass the technology, the environment, and the individuals involved in the social system. The innovations are the newer technologies that faculty members consider. The characteristics of the groups and individuals in the system are the learners and the faculty members using the technologies. The social system itself would be the university community and immediate working conditions.

The areas of the learner, faculty, technology, and environment are also indicated in survey research. During 1993 and again in 1995, I conducted a survey of the faculty at a Midwestern university, collecting information about the use of instructional technology in higher education. The most frequently cited factors encouraging or inhibiting technology uses were related to the areas of learner, faculty member, technology, and environment (Spotts & Bowman, 1993a, 1995a). This suggested that these areas might be influential in a faculty member's decision to use instructional technologies.

In open-ended questions of the survey was the "show me that it is better than what I am currently doing" attitude was frequently expressed by faculty members. Responses to some questions implied that instructors needed proof of benefits or advantages to using a new technology. Cuban, in his book Teachers and Machines, suggests a similar notion. He implies that teachers use methods that make efficient and convenient use of their time

(Cuban, 1986). Teachers will use technologies if it meets their test of efficiency. It seemed logical then, that value or benefit might also be influential in deciding to use an instructional technology.

Scope and Limitations of the Present Study

Qualitative research is most often associated with the disciplines of anthropology and sociology. It is used interchangeably with naturalistic, ethnographic, subjective, or postpositivistic research (Borg & Gall, 1989). I use qualitative research much as described by Gay (1996). It refers to a collection of narrative data on many variables to gain insights about why some people feel or think the way they do, what they believe, and what meanings they attach to context. The intent was to select a limited sample and gain more in-depth understanding.

Qualitative research permits a deeper understanding of why behavior or action may occur, but it does not permit making inferences of broad applicability from limited cases. That requires the collection of information from a larger, more representative sample. In this study, the data was collected from faculty members at a single Midwestern university during a specific time. This means that the circumstances and general atmosphere of the university influenced information collected then and the perceptions of these factors by those interviewed. Factors unique to this university and time make this study atypical and caution is warranted when making any generalizations, no matter how limited.

Since the purpose of this study was to find out why decisions are made, a qualitative approach was used. Qualitative data does permit a description of the faculty member's perceptions on factors and how they influence decisions about instructional technologies.

Contributions of the Study

The purpose of this study is to provide information to administrators, educators, and instructional designers who wish to promote newer instructional technologies to faculty who are hesitant to try them. This study examines factors that may influence instructional technology use and describes the perspectives of different level users on these factors.

The contributions of this study are in three areas. First, it offers detailed information that complements a 1995 Faculty Development Survey on instructional technology use by faculty at a mid-sized Midwestern university. The survey provided a variety of information on faculty knowledge/experience, frequency of use, barriers to use, incentives for use, and demographics of the respondents. The survey could not offer information about why some faculty use instructional technologies and others do not. This study examines factors influencing faculty members' decisions that may help answer that question. This information may help institutions strategically direct resources to needed areas. Without knowledge about why faculty members decide as they do, institutions act on the assumption that all faculty members should use technology because it benefits them. Equipment and software could be introduced where not needed (situations where faculty members probably cannot use it) or wanted and training could be provided that is not useful because it does not address the problems. If institutions do not begin to understand why some faculty members do not use instructional technologies, resources may be directed in the wrong area or at the wrong problem.

Second, information generated from this study may help individual faculty members decide the use of new technologies in their teaching. Knowing the motivation and barriers perceived by other faculty members can enable individuals to evaluate rationally what benefits are available and take advantage of incentives offered by universities to encourage use.

Thirdly, this study provides a baseline of knowledge that should help institutions and faculty development offices to design suitable programs that help reluctant faculty members overcome initial barriers to instructional technology use. Instructional designers can use the information to develop a better understanding of the participants in potential training programs and direct specific units to focus on problems. Better designed training programs, perceived by faculty members as beneficial, will further encourage them to apply the lessons learned, again encouraging expanded use of instructional technology.

CHAPTER II

BACKGROUND

Technology Definition

To examine the use of technology in higher education, the term *technology* must be defined in relation to education and instruction. Dictionaries define the term as the application of science concepts and knowledge to problem solving, which may include many things, from processes to software and hardware. Educational technology, as defined by the Association for Educational Communications and Technology (AECT) in Educational Technology: Definition and Glossary of Terms (1977), is "a complex, integrated process involving people, procedures, ideas, devices, and organization for analyzing problems and devising and implementing, evaluating, and managing solutions to those problems involved in all aspects of human learning."

Instructional technology is related to and considered a subset of educational technology by some (Thompson et. al., 1992). Thompson (1992) draws upon the AECT definitions to define instructional technology as educational technology with the proviso that instructional technology refers to situations where "learning is purposive and controlled" (1992 p. 2). Thompson (1992) adds that because instructional technology is a narrower, more specific term, media professionals typically prefer it.

The use of "media professionals" above implies that only instruments of media are included in the definition of instructional technology. This study requires a clearer definition. "Instructional technology" will refer to the use of products to achieve an instructional objective and be used interchangeably with educational technology. Like Armsey and Dahl (1973) I perceive instructional technology as "made up of 'the things of learning,' the devices and materials used during learning and teaching."

In this study, I often speak of instructional technologies as synonymous with innovation. The technologies considered are typically current computer-related or electronic. Though not entirely new, they are perceived as innovative by faculty members. This is compared with traditional technologies of instruction such as chalkboards, overhead projection units, and textbooks. It will include medium of technology such as video, CD-ROM, computers, multimedia, or the implements and media of communication (Gentry, 1987). As used in education, these are usually categorized into print technologies, telecommunications, film and video technologies, and computer technologies (Anandam & Kelly, 1981). Authoring software, presentation software, word processing software, spreadsheet software, and similar types of software will be included also.

Typical Recommendations Regarding Instructional Technology Use

Decisions to use instructional technology, whether for instructional delivery or organizing and planning lessons, should be an integral part of the design of instruction or the planning phases of teaching. One of the most challenging decisions facing the instructional designer or teacher is what medium to use. Technologies and materials must be examined, considering factors like specific objectives of the lessons and the needs of the learners (Heinich 1993). From a systematic instructional design perspective, the decision is dependent on knowledge of what is being taught, how it is taught, knowledge of the learners, the learning situation, and many related factors. Unfortunately, the decision is often taken lightly, done either before or early in the design process, without consideration of all the factors involved (Dick, Carey 1985). For example, rationale for a media selection decision may be "we have a video, let's show it" or "we are getting some computers, let's use them in this class" instead of careful planning and consideration of the factors involved.

Instructional design literature provides some recommendations and guidelines for use of instructional media and incorporating it into classroom instruction. The literature also emphasizes planning and addressing factors in the learning process that are directly affected by using instructional technologies. Though it does not necessarily address theoretical explanations of instructional technology use, the literature offers many taxonomic classifications, conceptual frameworks, and theoretical systems that offer some insight to faculty members deciding to use instructional technology. Some examples follow.

Edgar Dale's "Cone of Experience," published in 1946, is an example of a model for media selection. It presents a schema for classification of media with accompanying taxonomic information. In this model, the cone classified media on a concrete-to-abstract succession, ranging from direct purposeful experiences to symbolic experiences (Seels, 1997). The learner moves from participant in the actual experience, to an observer, to observing symbols representing the event. Dale suggests the learner could use concrete experiences to make abstract instructional activities more useful. He proposed the "Cone of Experience" as a practical guide for identifying the characteristics of instructional media/methods and a guide to apply these to the instructional process (Heinich et al, 1993). He encouraged relating reality to abstract thinking at different points during the learning process (Seels, 1997), and his model as a guide to selecting the proper media to accomplish this.

Reigeluth's Elaboration Theory proposes a theory for sequencing instructional design on the macro level (Reigeluth & Stein, 1983). It suggests an overview of instruction including an epitome of what is to be taught. The simple-to-complex sequencing suggested in this theory helps make sure that the learner is aware of the context and importance of the variety of ideas being taught (Reigeluth & Stein, 1983). The instructor offers the overview, and then each subsequent lesson gives a more detailed presentation that elaborates the earlier one. Each lesson builds on the information previously presented, giving a more detailed view or elaboration. This theory emphasizes the importance of planning the sequence of lessons and systematically presenting the material. One important step includes content analysis or task description. By carefully considering the content to be presented in the lessons, the teacher is encouraged to consider the best techniques for presenting the lessons. This consideration should include decisions on the use of instructional technologies that would aid organizing and presenting content at the different levels of elaboration. The specific lessons and their objectives must be designed to meet the needs of the learners, and should be a consideration in decision on instructional technology use. This theory encourages planning that enables this.

Merrill's Component Display Theory offers a set of prescriptive relationships to use to guide the user in the design and development of learning activities (Merrill, 1983).

This theory defines categories of objectives based on performance level and content type. It also defines primary and secondary presentation forms that will effectively promote the acquisition of the objective (Merrill, 1983). The Component Display Theory focuses on the micro level instructional strategies and can be used with any delivery system. These micro-level strategies may include consideration of available technologies by which to aid this process. Again, in consideration of presentation, no matter the delivery, instructional technologies may aid the acquisition of the outcomes and is something to include in the planning. The Component Display Theory offers a basis to decide instructional strategies (Seels, 1997).

Keller's motivational-design model addresses the motivational aspects of the student that the instructional designer or teacher must consider in planning instruction. The four factors in this model are interest (attention), relevance, confidence, and satisfaction. These are conditions the instructor should address to make instruction that is interesting, meaningful, and appropriately challenging (Keller, 1983). The model integrates motivational strategies with the instructional design process. It helps the teacher focus on improving student motivation through improved instructional design. In one component of the model, building relevance, a technique suggested is to vary instructional strategies during prolonged periods of instruction (Keller, 1983). Some strategies suggested, grouped activities and cooperative activities, can be aided and enhanced with newer instructional technologies (computers, GroupWare software, network servers).

Instructional design theorists Gagne, Briggs, and Wager (1992) suggest the learning situation, the media, the task characteristics, and learner characteristics are categories of factors to consider in media selection. The environment, including budget, resources, and attitudes toward media are additional determining factors since they may limit certain media choices. According to Gagne (1992), media selection should be a rational matter based on theory and research concerning learning effectiveness.

This literature assumes that, if faculty members and teachers have these options, they will use instructional technology. It assumes that if it is available and appropriate, faculty members or teachers will use it. Yet do they? Are people going to use the recommendations or guidelines to integrate instructional technology into their teaching? What if faculty members or teachers think their time can be better spent? Are the faculty members or teachers convinced the technology is effective and efficient? The literature does *not* ask why some people do or do not use instructional technology. Though guidelines and recommendations may be available, if the guidelines do not take into consideration the immediate situation or make sense, then these guidelines are not going to be used.

Recognition of Additional Factors

Decisions on use of technology in the classroom or selection of media, rather than being well thought out, are often quick decisions (Dick & Carey, 1985). Are these decisions often based on a reason such as using a video because it is available, not because it does a better job of presenting the material than a lecture? The models or theories cited above do not directly deal with the motivation or the positive and negative factors that influence the decision to use instructional technologies. These models focus the instructor on components of instruction that may be aided by instructional technology or included in decisions on technologies to use. The models suggest appropriate use of media or how to decide what media to use when, but do not examine why some people use instructional technologies and others do not.

Despite the many additional duties, delivery of instruction is still the primary duty of a higher education instructor. Since many newer instructional technologies encompass the delivery of instructional material, instructional technology use becomes almost synonymous with media selection. While most faculty members mean well, I question whether many consider instructional design models and the recommended factors selecting instructional technology to use in their teaching. The use of instructional technology appears dictated more by environmental factors, the situation, emotional factors, and personal biases that determine the value or personal benefit of the particular technology.

Consider individual faculty members, their teaching style and beliefs. Modeling teaching after how one was taught appears common for university faculty members. This constancy in teaching is due in part to classroom/school structure and the culture of teaching, including social individual beliefs of the teachers (Cuban, 1986). An instructor (or a faculty member) is expected to manage a group of 25 or more students for about an hour. In this time they are to teach a prescribed amount of content, capture the student interest, match level of instruction to the differences among the students, and show some evidence that the student has learned (Cuban, 1986). For example, an introductory class in any discipline may have 25 students enrolled with knowledge and skills varying from elementary to advanced. In the brief class time, the instructor is expected to gain the attention, interest, and motivate all the students to learn a prescribed amount with instruction matching all levels. The result of this arrangement of classes is that teachers have allocated their time and efforts to deal with the demands of the situation. They have modeled their practices to provide simple solutions and ways to cope with the moderate to large number of students, confined to a space for a given unit of time (Cuban, 1986). At the university level, as in public schools, it appears that chalkboards, text books, overhead projectors, and a lecture format offering limited discussion is an orderly frame work for group instruction that makes efficient use of the instructor's time. Instructors model their teaching style to suit the situation, using technologies that have been used in past situations.

What if the learner changes? Most university students fall into the 18-21 year old full-time student category. However, the U.S. Bureau of Census reports that the percentage of students 25 years and older attending college is increasing (U.S. Bureau of Census, 1993). A significant percentage of these students are part-timers with other responsibilities. Sources report that 45% of college enrollments consist of part-time students (Jacobson, 1994). If the profiles of the students change, flexible technology alternatives such as E-mail, networks, and dedicated servers might help meet the student's and instructor's needs.

The comfort levels of newer technologies -- or ease of use -- may influence a faculty member's perception or attitude toward the instructional technology. A faculty member may be reluctant to use technologies that they are not comfortable with, especially in a classroom situation. Video, including direct broadcast, cable, satellite, and taped programming, is the most common technology used for instruction in schools (OTA, 1995). This is due in part, to other factors, from increased educational cable options to the widespread availability and familiarity with videocassette recorders. Since videocassette recorders are common in many households, teachers are more familiar with this technology and do not hesitate to use it in the classroom.

The time and effort necessary to learn to use a new technology may be an important factor in use also. If a good deal of time is required to learn to use a technology, a trade off must be made. Is the time better spent on other things? Is the advantage of using the new instructional technology enough to justify the time spent to learn it? It seems that if effort is required, faculty members are less inclined to use newer instructional technologies. Sometimes, this resistance by faculty members to expending additional effort is even greater than monetary incentives (Evans, 1982, pg. 101).

Convenience is frequently affected by availability of equipment and support. If the software to create material is readily available but the facilities to present the material are limited, use of this technology may potentially be limited. Is the additional effort arranging equipment for use worth it? If a faculty member does not have adequate equipment to try or use new instructional technologies, will they try to get support from outside sources if it requires additional effort and they are satisfied with their current methods?

Faculty members and teachers alike appear to use what is convenient and beneficial to them and question the value of alternatives. They want to know if using an instructional technology is better than what they are currently doing. Do the new instructional technologies provide benefit or value to the user? If not, are they likely to consider it? Faculty members at a university need to perceive a new instructional technology as essentially superior (their basis may be factors such as timesaving or ease of use for example) to an existing technique or instructional method for it to be used frequently or regularly (Evans, 1982).

What is really going on when a faculty member decides about using instructional technology? Is the decision well thought out and a part of the planning and design of instruction using the guidelines as literature recommends or are decisions influenced by other factors? I thought that this deserved further consideration and should be examined.

Faculty Use of Instructional Technologies

My interest in faculty use of instructional technologies started during the Fall semester of 1992 when I worked as a faculty associate with the University Office of Faculty Development at a mid-sized Midwestern university. During that semester, Winter 1993, I helped conduct a survey of the faculty. The focus was to assess faculty familiarity with and use of instructional technologies. The survey also asked about a variety of factors that might be perceived as incentives to use these technologies.

The results suggested few faculty members had good knowledge of and experience with newer instructional technologies. It also suggested that few faculty members were using them and suggested many factors perceived as incentives or barriers to instructional technology use. This survey provided descriptive data and facts about the population with respect to some variables encouraging and inhibiting the use of technologies. The information though, does not explain why some respond as they do or what is going on when deciding to use or not use technologies. This study stimulated my interest in finding out more about why some faculty use technologies in their teaching and others do not.

The survey was repeated in 1995 as a follow-up to find out more information and for comparing to the first survey. With the new survey I included a request for permission to conduct a follow-up interview. I wanted to use an interview to seek more detailed information about faculty instructional technology use and why faculty members do or do not use instructional technology. A discussion of the survey studies is available in Appendix I.

Some factors apparently encourage or discourage faculty from using new instructional technologies in teaching, but do not affect others. In the 1993 and the 1995 surveys, respondents were asked to rate the importance of factors influencing use, incentives encouraging use, and in the 1995 survey, barriers preventing use. These questions, as part of the survey designed by the researchers, were submitted for review to a panel of advisors. The panel consisted of the director of university computing services, an instructional consultant for computing services, and the director of university media services. In both the 1993 and 1995 surveys, respondents to the survey rated as most important factors primarily related to the areas of the learner, the faculty member, the technology, and the environment. Since the respondents cited these factors as most important, these areas might be influential in the faculty member's decision to use or not to use instructional technology.

The surveys also included some open-ended questions that allowed faculty members to expand on certain areas. The response to these questions showed some frustration among members of the faculty concerning using newer technologies. Frequently, the idea was expressed that newer instructional technologies must be better than what the faculty members are currently doing. They appeared to want to see proof that it would be of value or benefit to them. The responses suggested that perceived value might be more important than physical barriers.

In reviewing the data and open-ended responses from the survey analysis, I compared the information and some statements with thoughts I have or statements I find myself making. I pondered why more faculty members did not use newer instructional technologies while not even evaluating my own situation. I looked at my immediate colleagues and myself at the time and realized no one was doing anything remotely connected with the newer technologies available. What was my reason for not using more instructional technology?

I word processed notes, assembled packets for my different classes that contained outlines, handouts, and overheads for the students, but did little else. I used chalkboards, overheads, some slides, and occasionally a video. I used the slides and videos more often than not because they were available, rather than because my instruction was designed specifically to use this media as the most effective option. What things kept me from doing more?

Though guidelines are available in the literature for media selection, these do not always consider factors important to the instructors. In the 1993 and 1995 surveys of a mid-sized university faculty, the learner, faculty member, technology, environment, and perceived value were important factors to the respondents. Other literature mentions the importance of perceived value or benefit to the teacher considering instructional technology. I do not think these kinds of influences have not been given sufficient attention. The literature reviewed recommends guidelines to follow and suggests what teachers should be doing, but does not appear to consider the above factors that are a part of the daily reality of teaching.

CHAPTER III

A MODEL

Introduction

In examining readings in literature, the results from the instructional technology surveys, and my own teaching situation, I realized the decisions were not necessarily made as the literature suggests they should be. The guidelines and recommendations of instructional design literature, while they might be helpful, did not necessarily deal with all the issues involved in making a decision to use instructional technology. The literature does not provide an adequate explanation for why, given equal opportunity to use technology, some faculty members adopted newer instructional technologies while others did not. Survey information obtained from the 1993 and 1995 Faculty Development Surveys, while helpful in understanding who is using instructional technology and what some inhibiting factors are, does not suggest why some faculty use instructional technologies while others do not.

Deciding to use instructional technology should consider many factors including the learners, the content, materials, where instruction is to be delivered, support, and availability. The decision should be part of the instructional plan from the beginning. Unfortunately, many faculty members do not consider instructional technologies while planning instruction, but often decide shortly before teaching or as they go. Immediate concerns and perceptions as to the value or advantage of using the technology most likely influence these decisions.

As for my teaching situation, I did not use technologies that were inconvenient to use or did not offer an immediate recognizable advantage. If the effort required using a technology did not yield an equivalent benefit (as judged by me), time might be better spent on other tasks. The surveys I conducted with Faculty Development Services at the university showed other faculty members expressed similar and other rationale for using or not using instructional technology. Faculty members make their decisions based on issues other than those suggested by instructional design literature.

Several social psychological theories lend support to my model components and are relevant. Diffusion research identifies elements important to adoption of innovations. Social-cognitive theory emphasizes the importance of the interaction of cognitive, behavioral, and environmental factors on behavior. Expectancy-value theory suggests that perception of value and likelihood of success influences actions. I will elaborate on these theories below.

Diffusion of Innovation

According to Rogers (1995, pp. 10), diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system. It is a special type of communication where the information is about a new idea. The four main elements identified in diffusion research are the innovation, communication channels, time, and the social system.

The innovation. An innovation is typically described as an idea, practice, or object perceived as new by those considering adoption (Rogers, 1995). As for newness, the innovation does not necessarily have to involve new knowledge or equipment, but may be thought of as an individual's perception of the innovation or their decision to adopt.

Many of these instructional technologies require not only a computer, but also software. As an example, I suggest presentation technology that is currently very popular. A computer with necessary memory, speed, and additional peripherals, is needed to use the presentation software to its fullest extent. Presentation software alone does enable a faculty member to use this instructional technology. The computer necessary to use the software and develop the presentation also requires a LCD panel or computer projection unit to take full advantage of this technology.

Characteristics of innovations as perceived by individuals help explain adoption. These characteristics include the following:

> <u>The relative advantage of the innovation</u>. This is the degree to which the innovation is perceived as better than what it replaces. This can be measured in economic terms, social terms, convenience or just satisfaction (Rogers, 1995). The actual advantage of the innovation is not as important as the perceived advantage. If a faculty member does not perceive a new technology as improving student leaning or saving the faculty member work for example, it is less likely to be adopted. This benefit or advantage then influences the faculty member's perceived value of the technology, improving the likelihood that it will be considered.

The compatibility of the innovation. This is whether it is consistent with values, needs, and experiences of those evaluating it (Rogers, 1995). As for instructional technology use, this should include the faculty member's existing materials and work. If the technology is not adaptable to the faculty member's existing material it is less likely to be welcomed.

Complexity. This refers to how hard it is to understand the technology or to use it (Rogers, 1995). If an innovation is readily understood and easy to use, it is more likely to be adopted by the social system. If a computer technology is difficult to use, a faculty member is more likely to use their time on other tasks instead of trying to figure out the technology and learn how to use new software.

Trialibilty. This refers to the degree to which an innovation may be tried experimentally. An innovation that can be experimented with on the installment plan is generally adopted more quickly than those not (Rogers, 1995). If a faculty member can try a new instructional technology on a limited basis, They may find it has some benefit and be inclined to decide to use it. Without some partial experimentation first, most faculty members will not try new technology. In this sense it is a benefit of those encouraging use to make it easy for faculty members to try new technology out by providing accessibility.

Observability. This means how visible innovations are to others. If an individual sees the benefits, they are more likely to adopt (Rogers, 1995). This is similar to the importance of modeling to learning suggested in the social cognitive leaning theory. If a faculty member works with colleagues that use newer technologies in their teaching regularly, they can more readily evaluate the advantage of use without going through the trial and error of trying it themselves initially. By observing other's successful use, they may be inclined to decide to use it in their instruction. This may be considered an environment factor, as the colleagues worked with are part of the environment.

Communication channels. Diffusion theory defines communication as the process by which participants share information concerning a new idea with each other in reaching an understanding (Rogers, 1995). This can encompass a variety of means of transferring information, including mass media and interpersonal. Most people rely on subjective evaluation rather than research studies when examining innovations. As such, the information is more likely conveyed to the individual from other individuals who have adopted the innovation rather than by reviewing scientific studies (Rogers, 1995). In faculty decisions on instructional technologies, I think many evaluate other's use of it when deciding, but also want scientific studies that document any advantages over traditional methods. Faculty members often want to see some proven advantage over their current practice or methods when considering new instructional technologies. This, based on survey response, appears to be the nature of the university social system.

Time. In diffusion research, time is involved in 1) the diffusion process, from first knowledge to adoption or rejection, 2) the rate of individual's adoption of the innovation compared with others in the system, and 3) the system rate of adoption of the innovation over a given period. While time is a factor in the components, the rate of adoption of technology is not within the scope of this study.

Social system. A social system in diffusion theory is a set of interrelated units engaged in joint problem- solving to accomplish a common goal (Rogers, 1995). This can be a set of individuals, groups, or organizations. The system defines the boundaries within which the diffusion occurs. The structure of the system, interpersonal links within the system, and the norms can be influential on the adoption decision.

In higher education, the university serves as the social system. Faculty, administrators, staff, students, and all the expectations of our culture in university systems, may potentially influence a faculty member's instructional technologies decision.

The factors from diffusion research discussed above do not directly parallel the component areas in the proposed model and they were suggestive in my consideration of factors that influence decisions to use instructional technology.

Social Cognitive Learning Theory

Social cognitive learning theory suggests behavior, internal personal factors, and external environment are all interlocking determinants of each other. The decision to use technology in instruction is influenced by personal internal factors and external environmental factors. It also emphasizes the importance of observation and behavioral modeling in learning about or considering a new behavior. It provides support for the components in deciding to use instructional technologies because it recognizes many factors that determine whether people will act on what they have learned (Marcus, 1985).

Social-cognitive learning theory explains human behavior as reciprocal interaction between cognitive, behavioral, and environmental determinants (Bandura, 1977). These components encompass internal cognitive perceptions and external situation factors, similar to the decision factors suggested. The suggested model in this study equates technology use as influenced by internal and external factors in several component areas. Internal factors such as faculty perceptions, beliefs and attitudes, alongside external factors such as the teaching environment and physical determinants, contribute to the decision to use instructional technologies.

Bandura's theory suggests behavior, internal personal factors, and environmental factors are all interlocking determinants of each other (Bandura, 1977). The weight of any one component will vary with different circumstances and different individuals. The study model representing technology use is similar in that the behavior (use) is related to internal personal factors and environmental external factors in the four component areas. Like the above theory, the weight of any component may vary with the circumstances or the individual faculty member. It includes faculty beliefs, attitudes, and perceptions in the four areas and external influences such as environmental factors.

The decision to use a new instructional technology typically represents a change in the way a faculty member does things so is frequently met with resistance. Lewin (1948) views any situation in which potential for change exists as a dynamic balance of forces working in opposite directions. One set of forces moves toward the anticipated change (driving forces) and an opposite set of forces restrains the situation from moving in the direction of change (restraining forces). The two sets of forces working opposite each other create an equilibrium or balance that may be altered by either sets or forces. Change, therefore, is to alter the balance between the driving and restraining forces that keep a situation in balance or as is (Bennett, 1962). The decision to use a new instructional technology is similar. Using a new technology is a change or alteration in the balance of forces of the model component areas. Forces favoring a change in a situation, like new software, available equipment, and support, may outweigh restraining forces such as technology anxiety or time investment. In weighing these forces, the faculty member accesses the value of the new technology.

Expectancy-Value Theory

Expectancy-value theory suggests that potential value of an outcome related to action may direct behavior. In evaluating the factors, the faculty member analyzes the effort expended against the benefit offered by the technology. If the potential value is perceived as a benefit, the faculty may be more willing to use the instructional technology.

Expectancy-value theory is a motivational theory that suggests the value of an outcome related to actions and the perceived likelihood that outcome will occur, instigate, or direct behaviors. The decision to use a new instructional technology in teaching is a change in the way a faculty member does something. Changing internal and external influential factors motivates this action. As factors change, so do faculty members' expectations of related outcomes. For example, as faculty members perceive a change in the type of student they have in classes compared with the past classes, their expected outcomes may also change. This may motivate consideration of an instructional technology to increase the potential for the desired outcome.

Expectancy-value theory has some roots in work related motivational theory. Vroom's theory (1964) suggests people make choices between alternatives and these choices are related to perception and the formation of beliefs and attitudes. Atkinson included the individual's disposition to strive for success or avoid failure as a variable in motivation. In this theory, motivation includes variables that would make someone undertake a task and variables that would make someone avoid a task (Atkinson, 1957; Spitzer, 1977). Weiner extended this to address an individual's perceptions of their abilities to undertake a task and how this relates to motivation to do a task. He relates the nature of causal inference (what one ascribes success or failure to) and the relationship of this to behavior (Gredler, 1992; Weiner, 1986). A faculty member's perception of change in the model component areas relates to their expectation of success or failure in using technology in teaching. The decision to employ instructional technologies in the teaching process, possibly motivated in part by faculty attributions, could be related to faculty perceptions of changes in the four model component areas.

Conceptual Model

The model for this investigation of instructional technology is derived from experience, survey results, diffusion theory, social learning theory, and expectancy-value theory. The model for this study proposes that five primary areas influence the process by which a higher education faculty member becomes aware of, evaluates, and decides to use or not to use a newer instructional technology. These are:

Learner - a recipient of the instructional material and the focus of the instructional process.

Faculty member - a part of the social system and the individual using the technology.

Technology - the actual instructional technology considered or applied.

Environment - the physical surroundings and the context into which the use must be incorporated.

Value - whether the technology use is perceived as a benefit or of some value to the faculty member.

I do not suggest these to be the only influential factors, but for this study I focus on these five items.

The model shows the potential for change of components to represent better ways faculty members would analyze the situation to decide on instructional technology use. If faculty members perceive change in their working environment (administrative pressure) or the technology (easier software), they may discern a value to using the instructional technology not previously realized. In the model:

$$Uc=f(L_cF_cT_cE_cV)$$

where

U_c=change in use L_c=the change in learners

F_c=change in faculty T_c=change in technology E_c=change in the environment

V=perceived value

Learner

The learner area concerns what the faculty member thinks about the students they teach. It concerns differences faculty members see in the students compared with students in the past, why they think these things are changing, and if this has had any influence on their instruction.

Faculty

Faculty area concerns the faculty member's attitudes, personal/teaching style, and how they prepare or organize classes. It primarily examines how they do things and if changes in these areas have affected their use of instructional technologies.

Technology

This area includes the faculty member's perceptions on the technologies themselves and their perspective of whether they are getting better or more complex.

Anxieties, attitudes toward technology, and conditions at the university regarding technology are also included.

Environment

Environment area consists of the individual faculty member's working conditions and perceptions about the university support of technology in instruction. It includes not only physical environment, but also the climate or attitude of the working situation.

Value

Value is the faculty member's perception of how useful the instructional technology is, both personal and functional. It might include a judgement of improved student learning or personal time saved. In this study it is difference between the perceived benefit (positive value) and perceived costs (negative factors).

Examples of things considered in each component area are listed below.

Learner:

learner knowledge - how the faculty perceives the student's knowledge and expertise with technology such as computers; for example if the learner is computer literate as defined by the faculty member.

learner motivation - how the faculty perceives the student's drive or actions toward the learning goals.

learner experience - the experience in using a variety of technologies that may be used in the classroom.

type of student - whether students are considered traditional students (18-21 year old, full-time student being fully or partially supported by parents) or non-traditional (older student, working full time with outside job and family responsibilities).

student outside responsibilities - variety of non-school responsibilities that compete for time with the student's school demands.

Faculty:

personal beliefs and attitudes about teaching and learning - whether the member holds to behavioral or cognitive theories, what the faculty member thinks are the responsibilities for participants in the process.

teaching style - closely related to the above (beliefs/attitudes), for example lecture only, mix lecture and discussion, and cooperative.

class preparation - how the faculty member prepares for class, including developing materials and information gathering.

class management/organization - what a faculty member does to keep evaluation scores, student information, and similar functions; for example, the use of spreadsheets or other software.

course information gathering - how a faculty member researches the material for class; for example, whether or not they use on-line resources.

Technology:

technology anxiety - faculty feeling insecure in or not competent with technologies; uneasy about using to the point of fear in extreme cases.

technology knowledge - how much the faculty member knows about the technologies.

technology experience - actual experience using technologies in teaching.

attitude toward technology - faculty member's internal disposition toward technology.

beliefs about technology in teaching - dependent on attitude toward technology, but a faculty member's thoughts about the place of technology in teaching; for example, it is effective in increasing learning or more efficient.

technology interactivity - how much does the technology allow the user to interact or participate.

technology ease of use - is the technology quick and simple to use; sometimes referred to as user friendly.

technology flexibility - how responsive to change in use is the technology; can it be used in a variety of ways and settings.

technology adaptability - how easy can it adjust to current teaching situations; depends on flexibility.

Environment:

faculty motivation - the faculty member's internal drive that leads toward incorporating technologies in teaching or developing new materials for technology use.

faculty desire to stay current - how important to the faculty member is it to stay current with methods in the field, such as by using current instructional technologies.

administrative pressure - administrative dictates that faculty will use technologies in their teaching for the potential recruiting benefit, for example, or so that they can teach larger classes.

technical support - how available is help to solve hardware and software problems, especially when occurring right before or during classroom use.

training - is training available to faculty to learn to use new hardware and software.

material resources - readily available material in field of study.

other faculty doing similar work - colleagues at the same university or similar situations utilizing technologies to share ideas and problems with.

funding for projects - money available to develop materials or purchase subject specific materials.

recognition or similar support - merit pay, promotion/tenure recognition, university or similar recognition for using instructional technologies and developing materials in the area.

new learning theories - adaptability of new learning theories to the use of technologies in instruction.

Value:

increased or improved student learning - a faculty member perceives a difference because of the technology use, which implies an advantage

time saved - technology shortens time spent on a task and a faculty member has time to pursue other tasks

recognition - colleagues and administration recognize work done with instructional technology and this is rewarded in some fashion

eases tasks - technology allows a management or organizational task to be done easily

personal improvement - teaching or other job related skills improve and are acknowledged by evaluations or other vehicles

The model proposed suggests the decision to use instructional technology depends on the faculty member's perception of change in the component areas that may attach value to using the instructional technology. The perception by the faculty member of these five components helps in their decision to use the newer instructional technology.

As they analyze the areas, they decide if any benefit is expected by using the technology. If benefit or perceived value exceeds inhibiting circumstances associated with the component areas, the technology is used. Each level of user, high, medium, and low, decides to use based on their individual perceptions of the four components in their situation. This study examines high, medium, and low level users to see if perceptions of the factors and perceived benefits do influence use.

Questions Guiding the Present Research

The primary purpose of this research is to provide information about factors that influence the faculty use of instructional technology. By studying these factors, administrators and educators may better promote or encourage the use of instructional technologies among higher education faculty members. This leads to two main research questions.

A. Why do some faculty members readily use instructional technologies and others do not?

B. Do high users of instructional technology differ from low users based on the four components of the model and the value they perceive from using that instructional technology?

CHAPTER IV

LITERATURE REVIEW

Review of the Literature

This literature is organized into areas related to the model components discussed in Chapter III. These components are the learner, the faculty member, the technology, the environment, and perceived value. I have also included some instructional design literature that contains guidelines for use of technology in teaching and some related technology literature.

Overview of Literature

Thompson et. al (1992) report that research on technology in education has been published for nearly 90 years. Published reports are dominated by evaluation research, comparison studies, intra-medium studies, and studies of the interaction between the learner's aptitude and experimental treatments. Much of the literature involves effectiveness of a particular technology, computer-related research, or research on student use and attitudes rather address the degree of faculty use or why it is or is not used. This literature does not show the extent to which these technologies are being used by faculty in higher education. For example, while a variety of research is available in the literature on the effectiveness of individual technologies like televised instruction or computer-based learning (CBL) and the effects of technologies such as computers on students, few studies examine technology use in higher education. Few studies examine faculty use instructional technologies, how they use them, or why they do or do not use the technologies. Studies that do address technology use in the classroom usually focus on specific technologies such as computers and address general education (K-12) as opposed to higher education.

I also found some differences in terminology. Educational computing is in reality only a segment or subset of educational technology (Thompson, et. al., 1992), which includes a wider variety of devices. But there is a tendency to equate educational computer use to educational technology, and some of the technology related articles reviewed focus or concentrate on computing only.

Most of the research studies found that concern the uses of technology in education were at the K-12 level of education, weighted toward elementary or middle school. Other articles available in the literature are discussion articles where the author expands on his or her own thoughts on the topic of technologies in education, based on their own experiences and/or readings. Many anecdotal references also appear in trade journals. Most of these frequently cite case studies of exceptional faculty members or teachers using an instructional technology. Once again, little research addresses the use of instructional technologies by faculty in higher education.

Use of Technology

Why do some use it and others do not? Why do they choose some methods over others? Why use the different technologies? Why do some faculty members avoid technology? The literature does little to answer these questions

When preparing for instruction, instructors must decide what to do and how to do it. They must decide intend the outcomes of the instruction are to be and what actions are necessary to achieve them. This procedure, as an activity done by teachers and instructors, is instructional design, concerned with optimizing the process of instructing (Reigeluth, 1983).

Instructional theory offers a conceptual framework on which to base design of instruction. Reigeluth (1983) suggests that a theory of instruction should consist of three major components: methods, conditions, and outcomes. According to Reigeluth (1983), the methods are the different ways to achieve the desired outcomes under different conditions. The conditions are factors influencing the effects of the methods, and as such are very important when prescribing methods. The outcomes are of course the effects that are the measure of the value of the methods under the conditions.

Instructional theories attempt to identify as many variables that influence outcomes as possible, primarily focusing on what the teacher does. Instructional conditions that affect the instructional methods necessary to derive the desired outcomes include subject matter characteristics, learner characteristics, and external environmental conditions. These conditions may be variables that influence the organizational, delivery, and management strategy necessary to produce the desired instructional outcomes. When considering how to achieve the learner outcomes, the instructor should consider all these variables.

An essential decision made in instructional design is what medium to use as a vehicle for instructional communications and stimulation (Gagne, Briggs, & Wager, 1992). The instructor has a great variety of media from which to choose, both print and non print, and must decide which materials will most satisfactorily achieve the desired outcomes. In making these decisions, the instructors should consider the requirements of the learning situation, the characteristics of the medium technology, and the expected outcome.

Learner Related Literature

In Gagne's work with instructional design, he describes a set of events designed to enable learners to achieve the target objective or desired outcomes. The instructor usually deliberately arranges these events. The form of the events (usually communications to the learner) is specified for each objective. These are fit to each set of circumstances to affect the learning process (Gagne, et. al. 1992). Important in deciding the event forms are the audience (learner) characteristics.

Gagne stresses the importance of the relationship between the learner characteristics and the effectiveness of the learning. The instructional designer must account for how the outcomes of learning may be brought about in different learners. A variety of learners, especially at the higher education level, must be addressed by the instruction. Their characteristics will differ considerably. They may have different levels of experience and learning, different learned capabilities, and different abilities and traits. Instructional technologies may be selected to address the factors and adapt to the differences.

If the focus of the decision is on delivery or media selection alone, some instructional designers use models or methods like Dale's "cone of experience" which considers learner variables (Heinich, 1993). Dale's model most noticeably emphasizes the reading level of the learner, but many other characteristics must be considered.

As an example, consider the work place and how this is affecting higher education. The impact of technology and information has affected the work place and, as a result, the worker within the workplace. Many professions frequently require workers to upgrade skills in science and engineering to keep pace with the exploding availability of information that may have an impact on the way things are done. Displaced workers also find the need to upgrade skills or develop new skills to secure new positions in the work force. Lifelong learning has become a necessity for many workers if they expect to compete successfully in a complex, information-based society (Stern, 1986-87).

This emphasis on education in the work place has contributed to some potential change in current education. A shift in the characteristics of student populations is occurring, and higher education needs to adapt or to address this change. To quote Gentry (1991) in Instructional Technology

> . . . the college population is becoming older and more part-time in their attendance. Because of family and job responsibilities, these individuals are much more critical of demands on their time. Given the educational establishment's control over certification, these students have had to adjust to universities and colleges designed for younger, full-time students. But increasing numbers are opting for educational systems (when available) that are more flexible in terms of when where, and how they learn.

> As non-traditional students become aware of more flexible alternative educational programs, they will pressure existing institutions and newly formed ones to bend in that direction. (p. 29)

These students make up a population that is often called non-traditional students, traditional students being the younger 18 - 21 group with parental support who attend institutes of higher education immediately after completion of secondary school. The U.S. Bureau of Census statistics shows that the proportion of college enrollment of students 25 years and older, has increased from 28% in 1971 to 41% in 1991 (U.S. Bureau of Census, 1993). Some sources state that about 45% of all college enrollments consist of part-timers (Jacobson, 1994). New and different instructional technologies may offer flexible alternatives that would be helpful in meeting the needs of the changing student profile.

Other types of learners or non-traditional learners include those who require special conditions such as the growing numbers of women, minorities, disabled, low-income groups (Gentry, 1991) and distance learners. In each case, these learners may have special needs that may be served by technologies. Geographic distances may be overcome by telecommunications technologies, allowing campuses and remote cites to enjoy the same classes and lectures. Students with visual disabilities may be served by technologies that help reading. Hearing impaired students may read text on a screen instead of hearing a lecture. Physically disabled students can join classes from the comfort of their quarters through two-way video and other distance education technology systems. Women, minorities, and foreign students might find greater opportunity to participate or feel more comfortable joining class discussions held over computer conferencing networks or E-mail. With more time to formulate questions and statements, students with limited language skills or naturally shy students may be more willing to join in the discussions. Women and minorities may feel greater equity and opportunity in online discussions. An online class discussion may benefit the group as a whole because it gives more opportunity for every member to join the discussion. Sometimes one or two outspoken members dominate face to face classroom discussions and the class time is over before the shy students have a chance to speak.

Clark and Peterson, in reviewing research on the teacher's thought process (1986), suggested several factors that may affect what a teacher attributes as causes for a student's performance. These include factors such as the teacher's perception of a student's past performance and student characteristics (social class, race, and gender). If an instructor attributes low performance on computer oriented projects to student technical sophistication, gender, or past experience, they may decide to use a different technology or approach the problem with different instructional technologies.

In addition to general education literature mentioning learner and instructional technology, trade publications and other journals often have case descriptions of learners benefiting from the use of instructional technology in all levels of education. For instance students at the Open School: Center of Individualization in Los Angeles use computers set into their desks to do math and create dynamic simulations of ocean life, according to an article in Scientific American (Kay, 1991). It predicted that with the arrival of notebook size computers, children could probably carry them with them wherever they go. However, the author warned about technology use as a responsibility for both the learner and the teacher. Education must not allow computer representations replace the ideas themselves. Teachers need to nourish or promote the learning and expressing aspects with the technology, or risk students with instant access to the world's information becoming numb instead of enlightened (Kay, 1991).

Other examples of how higher education is using technology to benefit students can readily be found by looking at the trade journals. A recent article in the T.H.E. Journal reviewed several programs resulting from IBM Teacher Preparation grants. At the Curry School of Education, University of Virginia, an IBM grant in the early 1980s helped link preservice teachers and their supervisors to university faculty members. The goal was to reduce the isolation of student teachers and bring the resource of the university faculty to the teachers. Success of this project made it the prototype for the Virginia Public Education Network (PEN). The group is now working on developing a graphical-user environment to prepare preservice teachers for the transformation into the digital environment of multimedia, and simulations. It is the goal of the Curry School of Education to prepare "teachers to reach the vision of teachers as technology experts and advocates" (Ashburn & Cilley, 1991). This is a good example of how student needs encouraged the development of a technology solution.

Despite the time needed for evolutionary changes, the demand for increased instructional technology use in higher education is becoming more urgent. As Albright and Graf (1992) note, "Societal pressures alone will mandate that we make significant changes in our approaches to teaching as we near the turn of the century." (p.13). Both the demands of the marketplace and the demands of the students themselves will require institutions to use more instructional technologies. Most of today's college students have grown up with technology and often are "more technologically literate than many of their professors" (p.13). Traditional technologies will no longer be acceptable for instruction. "The 'chalk-and-talk' era is just about over for many disciplines. Colleges and universities will have to incorporate technology into their curricula or they simply will not be competitive with institutions that have made the transitions" (Albright & Graf, 1992, p.13).

Some technologies have advantages that might encourage or promote their use in instructional situations, which are dictated by the learner population. The use of visual images and sound to enhance lectures may pique student interest and motivate student learning (OTA, 1995). The uses of these technologies do not always require major changes in course structure or content and that helps the probability of faculty adoption. Essentially, the faculty members do not have to change the way they are doing things currently. The use of such technologies may inspire pedagogical changes by the faculty, which also inspires students and influences students and learners, helping them gain a better understanding (Gilbert, 1994).

In other instances, faculty members help overcome barriers that exist in the traditional instructional structure that might hinder student participation, using new teaching approaches structured around a particular technology. For example, using electronic mail, computer conferencing, or similar telecommunications technologies changes the nature of the interaction between faculty members and students as well as between students. An online discussion forum allows students to think about their answers and formulate questions and responses that they are more confident about. Not having the restrictions of a scheduled class time also allows participation at ones convenience. Likewise, communication between the professors and students is eased by not having the restriction of scheduled office hours. Students and faculty may communicate on a more regular basis without worrying about detracting from more substantive academic issues (Gilbert, 1994).

Newer technology permits students and faculty alike to spend some instruction time at individual computer work stations either at home or in locations about campus. From the workstations the students may find information, instruction, and interact with faculty and other students without ever having to leave their home or work location. Faculty members on the other hand, can deliver instruction, information, and communicate with students without ever entering the classrooms. The technology to do this is available and this structure of instructional delivery is currently feasible, being used in some cases in distance education.

In distance education courses, the circumstances of the students typically include the separation from teachers and do not permit the student to participate in face-to-face classroom instruction. Regardless if the separation is the result of geographic constraints or time/schedule conflicts, telecommunication technologies, interactive television, and televised instruction permit education to continue. It has been an effective for teachers to continue to learn and professionally develop (OTA, 1995). Technology can provide teachers seeking continuing education access to new ideas, other professionals or master teachers outside their immediate area, and support needed as they apply the new techniques (OTA, 1995).

Business or industry is generally considered advanced or ahead of the academic world in the application of technology, such as the telecommunication technology required in distance learning. A similar trend for individual home workstations was evident in industry not too long ago. In the business area or in industry, telecommunication has had a major impact on how people conduct their business. Computer networks have allowed an alternative method to exchange data/information and access to information sources more readily. Fax machines have become a necessity in offices and have replaced standard mail in many uses. These and similar telecommunication innovations have promoted the notion of home work -- or what futurist Alvin Toffler has phrased "electronic cottage." (Lubar, 1993) Many white-collar positions involve using and manipulating data and as such, workers spend more time interacting with their computers than with other workers. With periodic concerns about energy consumption by transportation, and environmental concerns over pollutant concentration resulting from traffic, it made sense that the modern worker in the information age might be better staying at home than commuting into work. Since many jobs primarily involved utilizing computers, workers could dial up computers from their homes to download data and upload finished work and reports, then make the necessary contact with coworkers utilizing the fax and telephone and not have to commute to work. This offered the worker increased flexibility in addition to the advantages to be reaped environmentally (Lubar, 1993).

However, according to Forester (1989), in spite of the promises of working at home, the trend in business declined for reasons including the inability of many people to be self managers and the desire of most to have social contact with others. While the concept of staying at your home to work is enticing initially, eventually it is overcome by the desire to interact and see what is transpiring at the office in one's absence. Isolation does not always suit people; hence, the failure of the "electronic cottage" concept in business (Forester, 1989). This does not necessarily indicate this would be the case with education. For example, teachers take courses, workshops, and other forms of training to fulfill recertification requirements or additional hour's requirements. Using telecommunications technologies that permit teachers to work from home or school allows teachers to "transcend the walls of isolation that separate teachers and extend formal and informal learning opportunities" (OTA, 1995, p. 16).

While the vision of the student and professor working alone--isolated, yet interconnected through telecommunication technology--may not be completely plausible, it is a technique for addressing the ever-changing student profile at the university level. As students with varied backgrounds enter college and seek education, universities need to look for ways to serve this market. Working students with family and job responsibilities would be attracted to and well served by educational structures where they could take courses from the comfort of their home or office and not have to meet the requirements of attending a class scheduled in an 8-5 time frame. Distance education technologies respond effectively to the demand for an increasingly trained workforce and to the busy lives and work schedule of people (Baird & Monson, 1992). Technology may also serve the varied needs of handicapped students, or otherwise impaired students that do not function as well in a traditional classroom. Whether the barrier is English language skills or a shy personality, the use of certain instructional technologies may serve to overcome some of these barriers.

Olson and Krendl (1990) summarized and critiqued research on the effectiveness of computer applications with at-risk students. While the conclusion of their review was that existing research in this area provides a superficial picture of instructional success, it shows the attempt to adopt newer technologies to special learners. Though the studies summarized were K-12 levels, learners at the higher education level may have special needs to which some newer instructional technologies may potentially serve.

Another aspect of student/learner influence on instructional technology use in higher education is the fact that students today have greater access to technologies such as computers at an earlier age. Children are exposed to televisions, VCRs, and computers in the home and in school from the very beginning. By the time they reach the university level, many are very sophisticated technologically. Because of this, university students expect technology to be used in instruction and be available for their use. A 1986 study on computer attitudes and knowledge indicates that student access to computers was greater than that of their teachers, suggesting they were being used to improve student learning as opposed to enhancing teaching (Marshall & Bannon, 1986). They surmised that most students and teachers view computers in a positive light and think they will improve education, but did not address the students' expectations toward the use in the classroom.

Summary. The literature had little information on learners influencing the use of instructional technology in higher education. Trade journals had anecdotal mention of learners benefiting from instructional technologies or technologies used to enhance learning for special needs students, but little about influencing the use. Clark and Peterson (1986) suggested that the teacher's thought process includes perception of student characteristics influencing the causes they attribute to student performance and this may influence preparation. While the literature does not directly address the issue, related literature does provide support for the idea that changes in learners may influence technology use.

Faculty Related Literature

The second component addressed in discussing instructional technology use is the faculty member. The factors offered as inhibiting the use of technologies in teaching are ones directly related to the faculty member. Albright and Graf (1992) cited the following examples: faculty commitment to traditional teaching methods, fear of technology, and hesitancy of faculty members to recognize technology as an integral part of the curriculum and undergraduate experience. Besides the above reasons, faculty members often exhibit a "show me it is better than what I am doing" attitude or require proof that it will be advantageous to the learner (Spotts & Bowman, 1993b).

A survey answered by the faculty of the School of Humanities of the University of Illinois at Urbana-Champaign found that although the humanities was not a technical discipline, faculty in the school were not intimidated by computer technology (Jacobson & Weller, 1988). Overall the respondents had a positive attitude toward computers and were typically self-trained. Perceived obstacles to computer use in the humanities were funding for hardware, quality software, and technical support. The primary interests of the faculty in applications software include word processing, desktop computing applications, graphics, databases, communications and CAI (Jacobson & Weller, 1988). These data agree with what other computing literature indicates with the exception of the low incidence of computer anxiety. It is essential to note that while computer use is high with the faculty, the primary uses of computers were in writing and research, with little instructional application (Jacobson & Weller, 1988).

The thinking, planning, and decision making of a faculty member makes up a major part of the context of teaching. As suggested by Clark and Peterson (1986), this context of teaching includes the conditions within which students learn, teachers teach, and materials and curriculum are interpreted. A teacher's behavior, including planning and technology-use decisions, is substantially influenced by their thought process (Clark & Peterson, 1986). What they think is no small part of guiding their action.

The faculty component of the model includes the faculty member's thought process when planning and carrying out instruction. Teachers are an important factor in the learning process, and how they think and plan relates to the process. Clark and Peterson's (1986) discussion of the teacher's thought process relates teacher thinking to outcome. A teacher's thinking about the worth of instructional technology influences their potential use, which can be part of the learning process. The use of technology could then influence the expected outcome.

Technology such as telecommunications (computers, modems and phone lines) may give teachers and professors access, through networks, to a wealth of information. This ranges from research reports on education, to curriculums, lessons for presentation in class, and other information that can be used to enhance their program and keep current with the most recent developments in their field. In the past, information access like this was beyond normal reach of most faculty members and required a full time assistant to research and record. Using E-mail, conferencing capabilities, and bulletin boards may allow teachers to confer with colleagues, exchanging ideas on a variety of topics from methodology to material topics. Many anecdotal reports in publications have long suggested that collaborations such these that take place over telecommunications networks may ease experiences of professional isolation experienced by many educators (Honey & Henriquez, 1993). Faculty members who understand the advantages of the technology may be likely to incorporate it into their instruction.

Teaching style based on theories and beliefs may also either inhibit or promote use of technologies. Clark and Peterson's review of research on teachers' thought process (1986) implied that teachers do have theories and belief systems that influence their perspectives, plans, and actions. Consequently, it seems that faculty members constantly seeking change and improvements derived from new theories, and experiment based on these theories and beliefs, may be more likely to try new technologies without waiting for empirical evidence of its effectiveness. Methods centered on the student as opposed to a teacher-centered model may be more suitable to adaptation of technologies.

The process is reciprocal in that the faculty's action will also influence their thoughts. As suggested in Bandura's social cognitive theory (1978), the action will influence the cognitive process, much as the cognitive process influences the actions. Experience may be related to an thinking on technology use when planning instruction, which will be related to the decision to use the technology. Likewise, the success or failure of the decision this time will contribute to future use.

Fear of technology or anxiety may also influence use of technology in instruction (Albright & Graf, 1992, Spotts & Bowman, 1993b). If faculty members experience anxiety with new technologies, such as computer anxiety, they will be less likely to use them in their instruction. This anxiety may be grounded in the fact that higher education administrations are caught up in the fever of offering the latest computer technology to stay competitive, and expect technology use in classroom instruction. Faculty members are concerned with the issue of delivering computer-based instruction to their students, who are sometimes more literate than their instructors. As a result, they are compelled to learn about the new computer technologies as quickly as possible and as adult learners, may experience anxiety and frustration during this process. High levels of anxiety can inhibit learning and prevent individuals from becoming proficient in the use of the computer (Honeyman and White, 1987). With students more technologically capable than many faculty, instructors seek to avoid uncomfortable classroom situations where the students would be showing the instructor how to operate the equipment. Teachers feel the need for greater knowledge of the equipment and greater knowledge of what technologies to use and where to use them (OTA, 1995).

In addition to inhibiting a faculty member's ability to become a proficient computer user, computer anxiety is also going to interfere with that person's ability to be an effective instructor if teaching with technology. In a study conducted over a two-year period, Honeyman and White (1987) examined teachers, school administrators and college staff in computer applications courses. The study indicated that lowering the anxiety level occurs over time and that the timing of this change differs according to the level of previous experience of the participant (Honeyman & White, 1987). The experience faculty has with the equipment or software may definitely affect the decision to use the equipment.

This suggests that if technology is to be infused in the classrooms in higher education, one thing that should be considered is the potential anxiety of the faculty members expected to use the technology. Faculty members need time to learn to use the new technologies like computers until they feel confident to bring it into the classrooms comfortably. Faculty members often cite lack of time to learn the new instructional technologies as a reason for not using them. As suggested by Honeyman and White (1987), "If it is our intent to have the computer become an integral part of the educational process in today's schools, teachers must be given time to learn the appropriate uses of the machine. Without adequate time to learn to use the computer, teachers will remain wary and fearful of the new technology" (p.137). The many factors suggested need to be considered before instructional technology is readily adapted to teaching. Acceptance is not necessarily a quick process. According to a national survey in 1990, conducted by the Center for Technology in, it takes an average of five to seven years to become comfortable and confident with using educational technology (Honey, et.al, 1993). The faculty members in higher education are often hesitant to adopt new instructional technologies until it is proven more effective than current practices.

<u>Summary</u>. Literature was supportive of the influence of faculty on instructional technology use. Though limited, related literature listed faculty thoughts, anxiety, time, and attitude as potentially influencing adoption of newer technologies in teaching.

<u>Technology Related Literature</u>

The <u>third</u> component affecting use is the *technology* itself. The technologies used in higher education may be categorized into groups, such as the following: older technologies like audio, video, films, and television (it is assumed that other technologies, like the book, chalkboard, and overheads are in common use in the classroom by the majority of instructors and are not considered in the older technologies category); newer technologies like computer assisted instruction, multi media, online conferencing, email, and similar technologies, most commonly computer driven or utilizing computers in some fashion; and tool software or toolware which are technologies that are used to help organize and manage classrooms, prepare materials for instruction, keep records, and similar activities that benefit the instruction process.

At the University of Georgia, a program called LITMUS (Leadership Infusion of Technology in Mathematics and Its Uses in Society) encourages university faculty members to use technology. The program shows teachers ways to make mathematics more dynamic and to increase the student's ability to visualize ideas. In the past, little graphing was done in the regular classroom because of time required. However, using newer technology like hand-held graphing calculators and PCs with graphing software, the teachers can do many graphs quickly increasing the potential of fuller and deeper understanding. Projects such as these document the effects of using technology in the classroom instruction and in teacher education (Ashburn & Cilley, 1991). Here the learners were teachers, and the technology allowed greater student understanding in the limited time. The situation of the learner has made an instructional technology a suitable means to solve a problem. Addressing the student needs and demands appears potentially to have some influence on instructional technology use.

Some technologies are practical for only certain uses and dictate that use to some degree. Interactive video or two-way interactive television production is suitable for distance education situations. As such the technology determines how it is used. The interactive ability, that is permitting a teacher and student to see and communicate via electronic technologies, determines how it is used differently than other technologies. This characteristic makes the technology more suitable for distance education applications than perhaps other technologies would be.

Other technologies may be used to make class preparation and organization easier. Word processing, spreadsheets, and similar software are used to do tasks that have always been done. They do these tasks generally faster and more effectively than past methods. These software technologies have also been established for some time and are relatively easy to use, or more "user friendly" now. For example, class overheads, notes, tests, and like documents may be prepared and stored more effectively using word processing. Because of their ease of use, many instructors are now doing tasks that in the past they have given secretaries. In these cases, the characteristics of the technology encourage their use.

Today's technology offers the potential to change the way we teach in higher education. It promises not only to ease the way we currently do things, but also to potentially transform the relationships between teachers and students (David, 1990). While Sheingold (1990) argues that the introduction of technology into education in any degree is going to require restructuring of our present systems, history seems to indicate that transformation is unlikely to occur simply because the instructional technology exists (David, 1990). For example, Cuban (1986) and Cohen (1988) have argued that computers will have little effect on our schools because of the flexibility of computer technology. It will be bent to fit existing practice (such as the use of word processing and spread sheets as management tools) and where it can't, it will not be used (Collins, 1990).

The suggestion by Staman (1990) that technology use in pedagogic environments is not commonplace and developing at a slow rate still appears to be valid and in part affected by technology itself. The characteristics of the technology, such as ease of use, adaptability to subject matter, and interactivity affect how readily a faculty member is willing to incorporate it into their teaching. Gentry and Csete (1993) present an optimistic view, predicting that "as applications of educational technology become more user friendly, many educators who are easily frustrated by instructional technology will become adopters" (p. 29). Little research actually describes this related to actual level of use of instructional technology in higher education institutions.

While not all inclusive, reactions to computers do appear to be representative of the situation regarding adoption of all technologies into instruction. As Dalton (1989) noted, "Few innovations have impacted society as greatly as computing technologies. Computers have permeated all aspects of our society and culture. Yet their influence on daily educational practice has been relatively minor" (p.20). Because computers in higher education have been the subject of discussion and study more than instructional technology as a whole, it is important to look at what research has been done on the use of computers in higher education. Likewise, the review of computer use in education in general, including k-12, will be helpful in understanding applications in higher education. Because of the close link, it is fair to say that many of the findings about computer technology in higher education and general education is directly transferable to instructional technology use in higher education as a whole. As such, a review of the subject of computers in higher education and in education in general is in order.

Computer Use in Education

A common question that arises in higher education when discussing the use of technology in the classroom is whether the newer technology is more effective or as effective as what is being done now. Studies have been conducted comparing media, dating back to the turn of the century. These studies are typically aimed at comparing the effects on learning one medium has as compared to another. While these studies have some value in examining technology use in education, comparison studies of different visual media, slides vs. film for example, contribute little to satisfying the concerns of faculty in utilizing more current technologies in the classroom. In addition, most early comparison studies, from the 1920s to the 1960s, suffer from problems such as faulty theoretical assumptions, deficient experimental designs, and lack of consistently significant findings (Thompson et. al., 1992).

Kulik and Kulik and Schwabb (1986) conducted a meta-analysis of studies on the effectiveness of computer-based education (CBE) in adult education, where training adults in the military or in private corporations. Basically, the meta-analysis showed that CBE, which was defined to include computer-assisted instruction (CAI), computer-managed instruction (CMI), and computer -enhanced instruction (CEI), had a positive effect on adult learners. CBE raised final scores on an average of .42 standard deviations. This was found to be identical with Kulik & Kulik's earlier meta-analysis on achievement at the elementary level but higher than average effect size in a meta-analysis of high school and college findings (Kulik et.al. 1986).

Perhaps a more significant find of this study was reduction of instructional time associated with CBE. Twelve of the thirteen studies in the meta-analysis reported on average the time associated with CBE to be about 71% of the time required for conventional teaching methods. While this finding might play well with administrators looking to make higher education more efficient, it also fuels the fear of some higher education faculty that think technology will be used to reduce their numbers, i.e. replace teachers with machines.

Kulik and Kulik did an updated analysis of the effectiveness of computer-based instruction (CBI) in 1991. This was a meta-analysis of 254 controlled evaluation studies that included conclusions from their earlier meta-analytic reviews, studies located using a database, and studies from bibliographies of studies located in the reviews and computer searches (Kulik & Kulik, 1991). The studies analyzed covered learners from all levels, kindergarten to adult. The results indicated CBI programs raised student examination scores by .30 standard deviations in the average study. Effect size varied, typically larger in the published than unpublished studies, in studies with different teachers teaching the control and experimental sections, and in studies of shorter duration (Kulik & Kulik, 1991). Other findings were CBI also produced small positive changes in the student attitudes toward computers and the teaching in general and time needed for instruction was generally reduced (Kulik & Kulik, 1991).

Several other descriptive studies of technology use in schools have provided useful information. Henry Becker and the Center for Social Organization at Johns Hopkins University conducted three large national surveys of computer use during the 1980s (Thompson, Simonson, & Hargrave, 1992). Becker noted in his 1985 survey report that teachers rarely used computers to provide students with instruction in traditional subjects. His 1990 survey found that the major development since 1985 was toward the use of computers as productivity tools. He also noted that the progress of change had been slower than computer technology adherents "would like to believe" (as cited in Thompson, et.al.,p.52). One of Becker's major conclusions from the 1990 study was that only a small minority of teachers and students could be said to be major computer users, which he defined a using technology to accomplish a large portion of instruction, learning, or productive class work.

In the area of computer assisted instruction (CAI), Kulik and Kulik (1991) conducted a meta-analysis of the research and implied that tutorial software teaches about one third more material in one third less time. Some educators counter, though, that the computer didn't so much bring about this achievement, but rather it was the mode of the instruction the computer made possible, that is individualized, self-paced learning with regular feedback.

In 1990, Garland conducted a survey to measure the extent to which professors in educational finance use computers in their courses (1991). She states that professors in educational finance, using computer technology, can effect positive change in curriculum and pedagogy. Key factors appear to be the degree to which faculty members are skilled in the hardware and software applications, making training and support vital. The results of the national survey indicate microcomputer and mainframe applications are typically integrated into school finance course content, which appears to support her assertions about training and support (Garland, 1991).

Summary. Because computers are a dominant technology, much of the literature reviewed focused on computers in education. Since many instructional technologies today may be driven by computers or require computers for use, I thought the studies reviewed involving only computers were important. Some studies implied the effectiveness of computers, which is an important issue for educators. If computers are determined as effective in instruction, educators are more likely to accept technology in the classroom. The literature reviewed also suggested that computer-based education might save time, which could be an influential factor in faculty member's decision to use a technology.

<u>Environment Related Literature</u>

The *fourth* important component is the *environment*, or situation in which the technology is used. For example, the environment of distance education, by virtue of its separation of instructor and student, dictates how instructional technologies are used, and what ones are most suitable. The separation aspect of the situation requires use of technologies that potentially overcome this obstacle.

Many distance education technologies may be suitable to higher education. Emerging technologies include digital technologies such as hyper media programs, data bases accessible through internet, e-mail, and eventually "dial up" video programs, audio materials, databases, and software that allow individuals access from home or work (Miller, 1992). Many of these systems such as interactive TV require major capital investment and a great deal of expensive equipment, both at the sending and receiving end, which limits their adoption. Other systems offer lower investment and a more flexible arrangement. Computer systems utilizing telecommunications technology offer great potential, lower overhead, and may be readily utilized immediately in instances where funding is limited. In higher education, the particular university-funding environment would influence the type of technology used.

Faculty perception of the environment may also be a significant factor in use. The use of instructional technologies in the classrooms of higher education represents change and humans, as a rule, are resistant to change. Edward Spicer (1952) has suggested the following generalizations about change:

- People resist change that appears to threaten basic securities.
- People resist proposed changes they do not understand.
- People resist being forced to change.

These generalizations may apply to faculty resistance to instructional technology in the classroom.

In 1992, The National Center for Technology in Education at Bank Street College conducted a nationwide survey of K-12 teachers using telecommunications for professional development and student learning. More than two thirds of the educators responding report integrating telecommunications technology into their teaching made a real difference in their teaching. It allowed them more individual student time, decreased their lecture time and encouraged students to work independently (Honey, et.al. 1993). Of the greatest barriers to use of telecommunications technology, these teachers suggested lack of time in the school schedule and insufficient financial resources as the greatest problems to use. The conclusion of the report was that for telecommunications to be widely used as an educational resource, administrators and policy makers must set up the following: training and support for the teachers; centralized planning for telecommunications use in instruction and administration; time for professional and student learning activities; effective assessment measures; financial support; and phone lines or local networks.

The above study surveyed only K-12 teachers and focused on only those that currently use telecommunications for either professional development area or for student learning. While K-12 is not higher education, the study does highlight instructional use of telecommunications technology and as such has some implications. It is important to note that highly educated, motivated, technology-experienced users, functioning in most cases in technology rich environments, acknowledge the need for financial support. They also cite scheduled time to work on projects, training and technical support, and high level planning as necessary to promote wide-spread use.

The use of newer technologies in instruction is sometimes seen by the administration of colleges and universities as a way to attract students and a way to make teaching more streamlined and efficient (Green & Gilbert, 1995; Norris & McDonald, 1993; Sliwa, 1994). This can be viewed by faculty as a challenge to their domain (the classroom) and an attempt by the administration to justify an increase their work load or reduce the number of faculty. Any change that threatens a teacher's control of the classroom, and hence their basic securities, may result in some resistance (Cuban, 1993).

The availability of equipment, training and support typically influences the use of technologies. If an university is unable to provide the support structure (workshops, seminars, consultations, and other programs to enlighten faculty about resources available and how to use them), it is unreasonable to expect faculty members to acquire and use instructional technologies, let alone be interested in them (Albright & Graf, 1992).

The relatively long time it has taken for instructional technology to become integrated into the higher education classroom should, perhaps, not be surprising, given the basic conservatism of many colleges and universities. Regarding the particular relevance that technology and change have for institutions of higher education, Block said "...fundamental changes will come to realization, in most cases, only in a gradual and often evolutionary way, rather than by some instantaneous sea change. Educational institutions and those within them who learn, and teach, and administer, need time and experience to incorporate these new ways of learning into their individual social and economic patterns of behavior" (Gentry, 1987, p.6).

Arguments have been proposed as to why education does not readily accept instructional technologies. The most frequently mentioned is that education, as presently structured, presents many obstacles to change. The current system of instruction is much as it was when our parents and grandparents experienced it, surviving many innovations predicted to change it. Nothing, as our education system exists, makes improved technology necessary (Kolderie, 1990). The way to make instructional technology more readily adopted by teaching faculty is to make it in their own interest.

Other reasons offered include the conservative nature of institutions, the lack of recognition for teaching improvements, insufficient financial resources, the rapid pace of change, the complexity of some technological based instructional systems, shortage of high-quality software in the area, and inadequate support services (Albright & Graf, 1992). It appears that the teaching environment or situation, with regards to the university atmosphere, has an important part to play in determining the use of instructional technologies.

Evans (1982) notes that early studies of change among institutions of higher learning have shown that these institutions rarely include mechanisms for facilitating change. While institutions of higher learning are charged with imparting knowledge, both old and new early studies have shown changes in educational methods to be extremely slow. One would expect that because of their mission of imparting knowledge, they would be leaders in effecting frequent changes in instructional methods and content. Professors and administrators alike are assumed to be experts in evaluating developments in higher education, and as such they should be able to select among numerous innovations those that show the greatest pedagogical potential (Evans, 1982). As such, universities are expected to be leaders in using instructional technologies, but the extant literature does not support this notion.

Evans found that overt acceptance and institutionalization of an innovation are two quite different stages that have a number of intermediate steps. Some innovations might be preliminarily accepted, remaining in place for a period of time, but may never be institutionalized or become part of the institution, being terminated as soon as a convenient excuse is available or found. Bringing it back then becomes unlikely, despite available hardware. (Evans, 1982)

In 1982, Evans surveyed and interviewed administrators and faculty from a heterogeneous sample of ten universities about the resistance to instructional innovation (including open- and closed circuit television, videotapes, computerized instruction, and information storage and retrieval) in higher education. Little empirical evidence was found supporting the notions that institutes of higher learning were dynamic organizations, leading in the adoption of instructional technologies by effecting frequent changes in methods as well as content (Evans, 1982). Nor did Evans (1982) find that professors and administrators were experts in evaluating new technology developments in higher education, choosing among the technologies to select those with the greatest pedagogical potential.

Evans (1982) suggests that higher education systems are organized more to continue the traditional approach to instruction as opposed to adopting innovations.

> The basic reason for resistance apparently lies in the fact that higher educational systems are organized to accommodate a traditional instructional process. This process relies heavily on professor-centered instruction, which in turn depends primarily on the use of printed materials. It is heavily geared to the transmission of skills and information through these traditional media. Any intrusion of an innovation in this system may be regarded as controversial and threatening by many (perhaps most) individuals at each level of the system (pg. 95).

If evidence did not exist to suggest otherwise, it would be assumed that universities, through which many innovations have been produced by research programs, would be pioneering the application, when and where possible, of new instructional technologies in its own endeavors (Evans, 1982).

A national survey of 3-12 grade teachers conducted in 1989 identified four factors that made exemplary computer using teachers more likely to be present: congruity among users, school support for using computers in consequential activities, resources available for staff development and computer coordination, and smaller classes (Becker, 1994).

Becker also found certain factors in the teachers' backgrounds, such as interest in computers, educational focus, and commitment to lifelong learning, that were related to the probability that they were exemplary teachers. Regardless of whether the mentioned factors are inherent or extensible to other teachers, Becker emphasizes the need for money to promote widespread computer-based teaching (Becker, 1994). Money is necessary for staff development to create a core of computer-using teachers through which to promote exemplary practice. Money is necessary for support personnel and technical support needed by the users, for equipment and staff time to learn and use the equipment, and for reducing class sizes. It is needed to solve the new problems arising from extensive and inventive computer use in teaching and to recruit new computer-using teachers that show the potential and interest in using computers in teaching (Becker, 1994).

Summary. It seems apparent that the environment in which a faculty member teaches has some influence on their use of instructional technologies. Outside of the obvious factors such as equipment and software availability, the training available, support system, and incentives to use technology seem important also. If the university environment does not recognize teaching related endeavors or accomplishments, the likelihood of faculty changing their classroom teaching to incorporate a new technology is minimal.

Value

In Teachers and Machines (1986), Larry Cuban suggests that the presence of more constancy than change in teaching can be explained by what he calls "situationally constrained choice." Two components of this explanation that seem relevant are the school and classroom structures and the culture of teaching, including the social and individual beliefs of the teacher. The basis for situationally constrained choice is that teachers make changes that will help them in the classroom, that is if it helps them solve problems they see as important without challenging their authority. If change is irrelevant to their practice, increases their burdens without adding benefits to their student's learning, or weakens their control of the classroom they are unlikely to incorporate it into their teaching (Cuban, 1986). As such, faculty members are unlikely to adopt new technologies in their teaching unless it is evident that they are advantageous to them in the classroom; that is, that they improve student learning without increasing the burden on the teacher. The components mentioned by Cuban--structure of the classroom and culture of teaching--encompass the situation in which the faculty member teaches, the beliefs and philosophy of teaching held by the faculty member, and social factors that influence teaching.

Those who enter the teaching field, either as a university faculty member or formally trained public school teacher, are aware of and inclined toward the educational classroom structure, accept the limited monetary rewards, and like the flexibility offered by the traditional academic schedule. People entering the field tend to stabilize rather than oppose or change the traditional framework (Cuban, 1986).

From the very start, new faculty members are operating alone in the classroom, without any guidance or supervision from administrators or colleagues. The individual faculty member must establish practices in the classroom that allow them to maintain an orderly, effective teaching situation. With little or no guidance, they use practices they have been exposed to or remember. If advice from an experienced colleague is available, this typically serves to reinforce the established standard and expectations of the university and what is necessary to survive (Cuban, 1986). This process tends to prop up the current practices and discourage new practices such as use of new instructional technologies.

Cuban (1986) also argues that beliefs shaped by teaching experiences emphasize interpersonal relations as essential to student learning and view technologies as minimizing this relationship. Teaching is viewed as an art and anything that is perceived as detracting or replacing the student-teacher relationship is viewed negatively. Add the fact that the origin and dominance of many technologies is entertainment media, and instructional technologies get an even more negative reception in the classroom.

Reinforcing the above explanation is that innovations, or instructional technologies in this case, are often introduced to the faculty by promoters of its use, whether they are university administrators, computing or technical support, or sales people. The use of the particular technology may be promoted based on a sound theoretical basis, economic reasons, unsubstantiated claims of student benefits, or a variety of other promises. Seldom do the promoters consider the personal costs, the meaning of change, and conditions and time it will take to develop new practices (Fullan, 1991). Faculty members typically have rational reasons for their hesitancy to use new instructional technologies that rival the reasons of the promoters. Often those advocating use overlook the experience and vantage point of the faculty member or teacher that will be expected to put the technologies into everyday practice.

Faculty members confronted with new instructional technologies will likely estimate the technology's <u>value</u> based on whether they think that it is superior to what it supersedes. This, depending on the individual faculty member, could be determined by numerous factors, each of which holds different value to each individual. Some of these factors could be contribution to increased student interest, efficiency, perceived effectiveness, case of use, level of involvement necessary to initiate use (i.e., time to learn, availability of equipment, materials, etc.). As such, for it to be used frequently or on a regular basis, faculty members at the university need to perceive a new instructional technology as essentially superior (based on factors important to them) to an existing technique or instructional method (Evans, 1982).

How the faculty members perceive the instructional technology consistent with their existing values and past experiences also relates to its compatibility. For example, if a technology like computer assisted instruction (CAI) is perceived as inconsistent with university teaching as faculty members see it, this might slow the adoption of this technology by teaching faculty. If faculty thought it lacked personal contact (teacher/student), student feedback, and proper supervision, which were important to this faculty member, it would not receive consideration (Evans, 1982).

<u>Summary</u>. The final component, value, seems to be a big influence on the adoption of instructional technology in teaching. Whether it is effective or not, unless the

user perceives a value to within technology, its use is unlikely. As Cuban (1986) relates, teachers use what helps them solve problems without usurping their authority in the classroom. A benefit needs to be realized if a faculty member is to use something new to replace their current methods.

<u>Other Related Literature</u>

Most of the literature about specific components could be included in several areas because they discuss various factors. Usually they are related in some way to the component under which they are discussed but would fit just as comfortably under others. As such, some of the works cited combinations of factors and are discussed in the general area.

In a study conducted at a British University, Schwieso (1993) found at least 50% of the education faculty members were regular users of information technology (IT). The users were basically self-trained beyond basic skills, each developing primarily in a particular area of use that they needed. About 30% have become dependent on IT for much of their professional work. This study reported respondents made use of IT for a variety of tasks including research, teaching and administrative purposes (Schwieso, 1993). Faculty attitudes were positive, generally viewing IT as a practical tool. No general information was offered as to any faculty perceived barriers to use, though a small percentage reported a perceived institutional pressure to become IT literate.

The 1993 survey of Desktop computing in higher education, a national survey of academic computing directors, found that colleges and universities want software, course-ware, and information technology resources to support instruction. The computing directors, however, view software development as less important to teaching and instruction than faculty efforts to use information technology resources provided from outside resources (Green & Eastman, 1994). This indicates that faculty look outside of campus for instructional technology resources rather than develop their own. Faculty members want technology in their classrooms, but the institutional support and rewards system for faculty efforts do not encourage this endeavor.

While almost half of the colleges and universities provide some support to faculty to develop instructional resources, this has grown little over the four years that this continuing survey has been taken. A key point is that, according to the survey, only about 15% of the campuses actually reward or provide incentives to faculty to develop software or courseware and that it has been virtually unchanged since the start of this annual survey in 1990 (Green & Eastman, 1994).

According to Green, while the demand for instructional technology resources is strong, higher education is not expanding their investments in these areas to create new materials. While some of this may be attributed to budget cuts due to financial problems at institutions, reported budget cuts have continued to decline for the last three years (Green & Eastman, 1994). In addition, institutions continue to purchase computers without an amortization plan. The percentage of campuses with such plans has changed little over the past three years. Most institutions deal with computers as a one-time budget allocation, with little consideration of updating equipment (Green & Eastman, 1994).

The survey also indicated that expanding campus networks remains a top priority for all institutions and that student and faculty ownership of computers continues to rise at a slow pace (Green & Eastman, 1994). The survey was based on responses from computing directors of 1011 two- and four-year colleges and universities in the United States. While not surveying the faculty users of instructional technology, the survey does give indications of the demand for instructional technologies and some of the problems of adoption by faculty in higher education.

New instructional technologies mean change for individual faculty members. The faculty member must change some of what they are currently doing in the teaching process. For example even the simple activity of using word processing software to prepare and store their lecture notes requires a faculty member to learn the software and hardware and have access to the hardware and software at their convenience. This is a change for many that in the past have relied on handwritten notes, and on a department secretary and filing materials.

Change is by no means an easy pill to swallow. Lortie (1975, p.234), in his sociological research on teachers, states "Teachers are like practitioners in other fields- they are reluctant to try new approaches unless they feel sure they can make them work and avoid damaging their reputations; obvious mistakes embarrass established practitioners in any field." Faculty in higher education may look at using new technology in teaching the same way. Typically, there are a number of internal and external factors reacted to a faculty members decision to use technology in teaching.

Use of innovative processes or technologies in education is primarily dependent on the individual instructor. While the administration of a school or university may encourage or even dictate that new instructional technologies be used in the classroom by faculty and teachers, the teacher is the primary party in the decision and the one that will make it successful.

If the instructor is willing to accept some change in operating procedure, instructional technologies may be integrated into the teaching process. For the individual to change their current routine there must be some value in it for the individual faculty member. Some may require that it ease their burden; that is, it does something more efficiently. Others may need to see that it improves student learning or that there is a clear advantage over the previous method. Whatever the requirement, a new technology is not going to be used unless the faculty member expects some advantage from using it.

Faculty members are often mired in the traditional methods of teaching and utilize the established technologies or tools of teaching, such as lectures, chalkboards, books, and overheads. because they work and the faculty member has always used them. The introduction of a computer, whether for preparation of materials or as a delivery medium, requires the faculty to alter his or her established procedure in some fashion. Essentially, using new instructional technologies is a change. A brief discussion of change follows.

What is meant by 'change'? One way to look at this issue is to identify various types of change (Schaller, 1972). Thomas Bennett (1962) suggests that there are four types of change, change in structure, change in technology, change in behavior, and change concerning assumptions and values.

"Change in structure" refers to changing the formal and established arrangement of persons in an organization. If one arrangement is inadequate, a new one is developed. This typically occurs so that work is done more effectively. Internal discontent and external trends generally bring about organizational change.

The second type of change Bennett describes is change in technology. Technical changes are usually suggested as a way to improve efficiency and productivity of an organization (Bennett, 1962), such as the introduction of automated computer processing of billing in professional services or retailing. The impact of technical change, however, may be traumatic to those people whose traditions, customs, skills and even sense of self esteem may be challenged (Schaller, 1972).

The third type of change is in behavior. Changes in organizational structure and technology involve people. These changes tend to cause behavioral changes, whether directly or unintentionally. They usually require the people involved to develop new ways of behaving and new relationships among people (Bennett, 1962).

The fourth type of change, in assumptions and value, is essential before any individual or organization can be changed substantially. If people's behavior changes, they must sometimes change the assumptions and values that guide behavior (Bennett, 1962). Assumptions are what people think they know in advance about other people or situations while values are individual estimates of what is important to self and others.

Initially, technical change seems to be the only type of change related to a discussion about faculty use of new instructional technologies. However, all the types of change described are related to technology use. Changes in structure may be necessary to accommodate use of an instructional technology in a classroom. For example, use of computers in instruction may require more student participation and less instructor lecture. The instructor may serve more to guide the learners in their learning and be assisted by technicians in developing material. If technology is to be utilized effectively over time, changes in the relationships of people and how they work will occur. For example, faculty may need to depend more on support service from people in different departments, or need to work closely with colleagues sharing certain equipment. Change in behavior is necessary in many cases if technology is introduced and utilized in teaching. Patterns of past behavior or relationships between faculty and students, administration, support, and even other faculty. In some cases may very well have to change if technology is used. Assumptions about teaching, learning, students, and other related factors may have to be altered to accommodate technology. This can only happen if there is some perceived value by the major figure in the formula, the teacher. The decision of faculty to use new instructional technologies appears to encompass all the four types of change described above.

Summary

The skepticism of higher education faculty to new technology is by no means a new phenomenon or restricted to university level. Aversion to change or resistance to the adoption of technology has a long history in education. Even the medium of writing was resisted when it was introduced to the educational system of ancient Greece (Carey, 1991). In the Republic, Plato argues forcefully for banning poets from society and for in favor of the written word in the then oral-based education system of Greece. Plato referred to the poets we picture--the artists of rhythmical and metrical language of feeling--but the bureaucracy that maintained the oral system of education and knowledge (Carey, 1991) which was resisting change to the long standing system of oratory dominance (Havelock, 1964). At other times, questions were raised about the use of the abacus and the slide rule weakening the mind, much as some people question the use of calculators and computers (Snider, 1992).

The use of new instructional technologies is a multidimensional problem, as is the introduction of any innovation to education. It encompasses the possible use of new or revised materials (curriculum, resources), the possible use of new teaching approaches (teaching strategies, activities), and the possible alteration of beliefs (pedagogical assumptions and theories underlying new technologies) (Fullan, 1991). Whether a faculty member implements one or all of the factors is dependent on the faculty's individual and organizational context and holds the key as to the outcome of the use of technologies. Like Fullan's (1991) observation about the reality of educational change, the reality of instructional technology use is in the relationship between the new instructional technologies and the faculty member's individual and organizational contexts and their personal histories.

Adoption or hesitation to adopt new instructional technologies by faculty involves a complex system involving multiple variables, as represented by the five-component model in chapter 3. Each use scenario has a different combination of the components that may account for level of use. For example, in a large class this decision may be influenced by the professor's technology experience, the receptivity of the students, the availability of resources, the technical support, compatibility of the technology with the subject matter, and the ease with which the technology may be used.

While specific literature on instructional technology use in classrooms of higher education is not that abundant, related technology literature seems to indicate that the use of instructional technology in the classrooms is limited. Trade publications feature examples of exemplary teachers and exciting applications, but among the mainstream of faculty in higher education the story is different. Literature related to computing, K-12 education, and specific technology applications at the university level imply obstacles to use that are teacher, student, technology, and situation related. Research is needed to examine the factors related to technology use so we understand what is involved in determining instructional technology use at the higher education level. This may provide clues as to how to produce more effective material and effective development programs for encouraging faculty use.

CHAPTER V

METHODOLOGY

A Qualitative Approach

While survey research offers a wealth of information about technology use patterns and faculty demographics that help describe individual users, technology use, knowledge of technology, and what encourages or discourages use, it does not readily provide answers about why a faculty member decides to use technology.

In this study I use a mixture of qualitative and quantitative research methods to examine why some faculty members seem to embrace instructional technologies while others do not. In-depth interviews were used to collect qualitative data but quantitative techniques like frequency counting were used in coding, reducing, and organizing the data.

A structured interview approach is used with open-ended opportunities for response. This allowed the faculty member to take the interview in the direction they wanted to, discussing what was important to them. However, it allowed me to redirect the faculty member if they digressed too much. This provided an approach to analyze individual faculty members' accounts of their perceptions of factors related to instructional technology use. Their own words describe how they interpret events, their attitudes and beliefs, and suggest motivation for their actions.

Though the data in this study is from a limited population, it helps describe what is occurring with instructional technology use in higher education. The study produces information that can be used by those who design instruction about technologies for faculty. Study information may influence and benefit to those trying to encourage increased use of instructional technology in higher education classrooms. It will also be useful to those trying to bridge the gap between the early adopters of technology in the classroom and the mainstream faculty who have not yet totally embraced the use of technology in the classroom.

Population

The population for this study was selected from the 760 full-time teaching faculty members at mid-sized Midwestern University. This did not include non-teaching faculty members such as counselors and librarians. The university is a public, Carnegie classification Doctorate-Granting I institution enrolling approximately 26, 000 students with approximately 25 per cent at the graduate level. The Carnegie foundation for the Advancement of Teaching, in Princeton, New Jersey, classifies Doctorate-Granting I Universities as those that, besides offering a full range of baccalaureate programs, include a commitment to graduate education through the doctoral degree. These universities award at least 40 Ph.D.s a year in five or more disciplines.

The participating faculty members were respondents to a 1995 Office of Faculty Development survey on faculty use of instructional technology. When the 1995 survey was mailed to the faculty, it included a letter explaining the survey and requesting an interview. A consent form, requesting permission to follow up the survey at some point with an in-depth interview was also included , to be returned with the survey. The survey return was 48% (367 of the 760 sent), of which more than one hundred consented to interviews.

<u>Sample</u>

To select the participants to interview, I had to identify different levels of instructional technology users. I decided to classify the respondents into three groups: high, medium, and low level users of instructional technology. While high and low level users' perception differences were originally the focus, I thought the medium level users might provide useful information and have more to say. High and low level users represent the two extremes, but it is the medium level users are the faculty members who typically represent the greatest number. These are faculty members that have not quite made up their minds whether to reject technology or adopt it. As a group, their perceptions may provide valuable information into what they require to motivate use.

To identify the different use levels, I used data from the above-mentioned survey. A copy of the survey form is included in Appendix II for review. This data provided basic information about the population and a way to identify technology use levels. Technologies surveyed included audio, film, video, multimedia, distance learning, computer aided instruction (CAI), electronic mail (E-mail), computer conferencing/bulletin boards, word processing, computer spreadsheets, Internet, presentation software, and statistical computing.

The survey asked respondents to rate their knowledge and experience with these technologies on a Likert scale, with one being none and five being expert. A question on the survey also asked the respondent to rate their frequency of use of the technologies on a Likert scale, one being never and three being frequently. These were to assess the faculty member's familiarity with and use of instructional technologies. To decide level of use for a faculty member, the response to the knowledge and experience question was multiplied by the frequency of use response for each technology questioned. Summing the products across all the technology questions then produced an index representing level of use for the respondent. Values ranged from 13 to 160. The lower 25% of the values represented the low level users, values in the middle 25% represented middle level users, while the upper 25% were high level users of instructional technology. To check to see if this index was accurate, respondents were asked during the interview if they thought they were a frequent, moderate, or an infrequent user of instructional technologies. The index rating based on the responses to the survey correlated well with the interviewee's own assessment of technology use.

After the level of the users was determined, those consenting to be interviewed were identified and their forms were separated from the total population. The selection of participants to interview was a stratified selection process, which is random selection within the three groups of participants consenting to be interviewed. Seven were randomly selected from each category--high, medium, and low--for a total of 21 in the sample. These became the participants interviewed for the study. Subjects selected had to have signed an interview consent form included with the earlier survey. A copy of the consent form is included in Appendix II.

In selecting the sample randomly from the different use levels, demographic differences are evident that potentially influence instructional technology use. For example, some disciplines are technically oriented and others are not. Some instructors are tenured while others are not. But random selection was made to try to prevent generalizations about older faculty or faculty from a non-technical discipline. As seen in Table I, the high users had a higher average years experience that the medium or low users and a higher number of tenured faculty.

Demographics

Gender	Yrs. teaching	Tenure	Rank	Discipline	Use level
f	15	y	assc.	speech	high
m	24	y	full	geography	high
f	3	n	asst.	biology	high
m	3.5	n	asst.	business	high
m	29	y	full	history	high
m	7	y	assc.	manufact. engineering	high
f	14	y	full	economics	high
Avg.	13.6				
m	5	n	asst.	geology	med.
f	10	y	assc.	managem.	med.
m	10	y	asst.	physics	med.
m	19	y	full	psychology	med.
m	11	n*	inst.	business	med.
m	21	n*	spc.*	engineering	med.
m	4	n	asst.	pub. admin.	Med.
Avg.	11.4				
f	3.5	n	asst.	ed. psych.	low
m	17	y	assc.	physician's asstistant	low
f	15	y	asst.	intrerior design	low
m	3	n	assc.	ind. design	low
m	30	y	full	English literature	low
f	2	n	asst.	mathemat. education	low
f	11	y	asst.	science education	low
Avg.	11.6				

Table 1. Demographics of the sample

Confidentiality of the subjects was protected throughout the study. A master list of survey form identification numbers and names was made so that survey basic information could be related to those consenting to participate in the interviews. Once the study was completed, the master list was destroyed. No names are associated with the findings.

Pilot Study

Following standard research procedure as prescribed by general literature (Gay, 1981) I conducted pilot or exploratory interviews. The purpose was to test the interview format and revise it before conducting the project interviews. By doing this I could see if the factors I focused on were considered important to a higher education faculty member when deciding to use instructional technology.

The pilot consisted of two in-depth interviews with university faculty members that consented to be interviewed, one a high user and one a low user. The high level user was categorized based on their score from responses to the preliminary survey. The low-level user was a departmental colleague when I knew, from experience, to be an infrequent user of instructional technologies.

The results of the pilot interviews did suggest some differences in how high and low level users perceived factors related to technology use. While both faculty members discussed similar topics based on the questions asked and had similar complaints, there appeared differences in their attitudes. One faculty member saw positive points where the other saw negatives. It must be remembered that teaching in different situations and with different levels of students is an important determinant. Each faculty member's situation regarding students, support, and communications with colleagues, software, and training played a part in shaping their comments. While not especially showing individual characteristic differences, the interview format appeared to provide information about how the faculty member perceives situations and what they think is beneficial or valuable. This was important.

Reviewing the pilot interviews suggested some changes in the phrasing of the questions. The idea of the format used was to get information about what influenced faculty decisions on the use of technology without directing them to say what I thought were the reasons. If the questions were too direct, I might unconsciously lead the respondent and interpret the responses to fit what I thought were the reasons. The idea of open-ended format was to allow respondents to talk about changes occurring that they perceived important to them. If the respondent continued to talk about certain factors more than others do, these may be more significant to them. The challenge was to see how these perceptions influenced their technology use.

I rephrased questions to let the respondents take the answer in the direction they wanted. I modified the interview questions in the direction of focusing on change. Instead of asking direct questions about use of technology, the format was altered to ask about changes in the component areas of the model that may influence technology use. This allowed the interviewee an open-ended opportunity to discuss the issues they thought were important rather than me specifying the importance of a topic.

While this was effective, it occasionally allowed the respondent to digress, but I could later direct more specific questions if the interview got too far off the theme. I also added summary questions at the end of the interview that directly asked what areas the interviewee thought were most influential in their technology use. This helped my later interviews to return to the intentions of the study and data collection.

The pilot study also helped me look at how I might analyze the information. For example, I looked for phrases or recurring themes in the interviews. I counted the number of times that the topics occurred in the interviews to see any similarity or dissimilarity between the two levels of users. After comparing the frequency of the topics, I assigned values to topic statements based on whether the topic was mentioned positively or negatively. I then tallied the values and compared. The value was a judgement call on my part, which would suggest bias. To try to reduce this potential, I included questions in the interview format that asked the participant if they thought a subject or statement was positive or negative.

The pilot study analysis helped me restructure part of the questionnaire to help me bring more validity to my study analysis. Doing the two interviews also allowed me the opportunity to rephrase some questions so I would be less leading. After some changes, I thought the format and structure of the interviews was suitable for collecting data for the study. A draft of the pilot study results may be found in Appendix IIa.

Interviews

In-depth interviews were then used to collect such as data. Detailed information about the faculty interviewed, their perceptions about changes in factors related to the use of instructional technology, and confirmation of their technology use level. Subjects selected to participate in the interviews were contacted to schedule times. The interviews were typically held in the participant's office and were approximately one hour long. The interviewees were asked to sign another consent form and interviews were recorded with the consent of the participant. Parts of the tapes were transcribed for use in the discussion.

Interviews are the core of the study, the primary source of data. Interview data provides insight on faculty perceptions of change in the factors related to technology use. The interviewing process focused on: 1.) What and how much is changing? 2.) How faculty members perceive this, why they think this is occurring, and 3.) Is this related to using instructional technology in teaching?

Interview questions addressed the components of the model previously described, and the faculty members' perceived change in these components over time. Categories of inquiry were the learner, the faculty member, the technology, and the environment. General introductory and summary questions were included at the beginning and end of the interviews, but for the most part the interview questions were specific to the areas mentioned.

For each model component, learner, faculty, technology, and environment, questions were asked about a faculty member's perceived changes in the areas. For example, a learner question asked the faculty member if they perceived any changes in the subject skills of their students in the last five years. This gave the faculty member an open-ended format to discuss student change that may influence technology use, if that were important to them. They could take the question where they wanted, emphasizing the topics that were important or influential to them. Similar questions were used in each of the mentioned areas.

No direct questions were asked about what the interviewee perceived as valuable, to prevent leading the interviewee. By being non-directive to this issue, frequency of mention and the way topics were discussed could suggest perceived value. Faculty members were asked about positive or negative thoughts on some topics and, at the end, which of the listed components they considered the most influential. This helped suggest what a respondent perceived as important. While open-ended questions were initially asked, more specific questions were asked if the respondent failed to address the issues. The format for the interview questions may be found in Appendix III.

I used an interview format because I wanted to look deeper into what faculty members were saying about why they did or did not use technology in their teaching. While the survey information helped show whom on the faculty used instructional technology and when they used it, it did not answer why. Were there characteristics that made them different from those that did not use instructional technology? Facing the same barriers to use, some managed to be high users while others did not.

Interview data helps show why they decided to use the instructional technologies. Accounts of what the faculty members said show what they think is important and what they think prevents or encourages them. The interview data may suggest: 1). The way faculty members are using or not using instructional technology and 2.) Why or why not certain faculty members use it and others do not. I used the interview format to measure if in fact my model components are suitable. It helps to probe deeper into the motivations of the faculty and their reasons for responding as they did to the survey questions on instructional technology use. From the information, inferences that have explanatory value can be drawn to answer questions about why some faculty members are more frequent users of newer technology in teaching. This provides material for a description of the status of technology use in higher education instruction.

In summary, the in-depth interviews were 'non-directive' and probing. They focused on changes in four component areas of the model but allowed the interviewee to converse naturally. The respondent had the potential to carry the conversation and talk about associated matters that he or she thought were related to the subject. If the interviewee did not respond or take the interview in a direction of technology use, more direct questions refocused the interview. This approach allowed the respondent to address general areas of factor change without the researcher defining or assigning relevance or significance to the areas.

Data coding. To help with the analysis of the interviews, I took notes during and after each interview on the nature of the interaction. These were quick notations of contextual data that could affect the interpretation of the interview content. When reviewing tapes of the session, the audio recording did not always reflect the atmosphere or mood of the session, so the notes aided interpretation. For example, audiotapes do not relate information like the following: Did the interview go well or not and why not? ; Was the respondent or interviewer distracted, comfortable, nervous, relaxed, wary, etc.? ; Is the interviewer getting beyond the respondents scripted answers and to underlying thoughts? ; Did the data all seem to ring true, etc.? (Jones, 1985). If the person was extremely agitated about something that may have occurred on that particular day, they may seem less optimistic and their response could seem negative. It helped to have notes on the mood so I could assess my interpretations.

I reviewed the audio tapes individually and personally categorized and coded the data. The interviews were reviewed for references to change in each component of the model and in subtopics, like past and present comparisons or similar key mentions of change. I listened to the interview tapes and went over the notes taken during the interview. To organize the information, I made an interview contact form, completing one for every interview. On these forms I had a section after every question to note significant statements in response to the questions. I also noted the tape numbers and index position of the important statements so I could easily find them on the tapes later for reevaluation. In another column I would write any of my thoughts or reactions that occurred. I also made notes about the setting, the way the interviewee responded, and about how the interview went. After listening to the interview and making notes on the form, I condensed important points or topics from the interview information onto a single-sheet contact summary form. On this form I tried to focus on the salient points made by the respondent during the interview. I highlighted what I needed to know from this interview contact and how it related to my primary premise. Examples of both the interview contact form and the contact summary form are available in Appendix IV. In hindsight, I should have completed these sheets after every interview, before engaging in the next. This would have given me insight into the process and allowed me to make adjustments each time to obtain information better. In fact, I did the forms after most of the interviewing was done.

After organizing the information on contact interview forms and summary sheets, I examined the data again. Data volume was so huge that I had to find a way to reduce it for closer comparison between the levels. This involved coding data to categorize and eventually reduce the data to a more manageable form. A great deal of statements all seemed to say diverse things, so I needed to condense them to look for potential patterns.

Coding the data is one way to search for patterns, themes, or meaningful data. It involves differentiating and combining data and researcher reflections on the material. I initiated my coding scheme when I designed the interview format. In dividing the interview questions into different categories, general, learner, faculty, technology, environment, and summary, I made my first categories. These six question categories became the initial data codes. I made a spreadsheet and set up the codes as headings. As I played the tapes again, I noted frequently mentioned topics and references to change, as the subject responded to questions. The frequently mentioned topics, ideas, or themes related to the category were noted and these became sub codes of sorts. The sub codes were then put below the category headings in the spreadsheet and became variables. My spreadsheet was a variable by case matrix, with variables across the top and the respondents or cases down the side. An example of the spreadsheets can be found in Appendix V.

The indicators or references to change were tallied in categories for frequency counts. This technique of quantifying the data was to order and structure the data to ease further interpretation of the data. I was also being alert for unanticipated categories from the respondent, trying to avoid structuring the data from a priori definitions (Jones, 1985). From this, conceptual categories emerged that are inclusive of both the model designated categories and the ideas suggested as important by the interviewees (Jones, 1985). This provided information on what perceived changes motivated or inhibited faculty use of technology in the teaching process.

A dichotomous coding technique was also used with the matrix to help reveal patterns. The data statements or frequently mentioned topics were coded positive and negative in each of the different categories. I would assign a value of +1, 0, or -1 each time it was mentioned, in the particular cell, depending on whether this was mentioned in a positive (+1), noncommittal (0), or negative (-1) context. Because this was a judgment call on my part, I would often directly ask the respondent how they felt about the topic, whether they thought this was positive or negative, to verify my judgement. I found that my judgement was accurate. While this was not practical for every statement, it provided some validation to my judgement. This data was then examined and manipulated, seeking any differences if evident.

Data reduction. This case by variable matrix format allowed a display of relevant responses by different level users for comparison. Though initially it was quite large, looking for only the most frequently mentioned items from each category reduced it. Totals were tallied for individuals and then these totals were summed for all the high, medium and low level users. New tables with just the sums were made to allow easier comparisons between the levels of use. Then, topics with a frequency count of 15 or greater were separated and tables of these factors were formed.

Topics that were similar in nature were also combined to reduce the number of topics. If faculty members discussed equipment, software, supplies, resources, and funding together, these might be combined to one summary topic like support. This permitted an easier visual assessment of the tables.

Data analysis. The data analysis was almost totally visual and not a statistical treatment. Tables were visually examined to see if patterns existed that could differentiate the levels of users. From the matrix, the topic frequency and value numbers show areas important at the different use levels. High frequency count shows that a particular topic was of interest to that level of user. A particular topic mentioned more by one level of user might be more important to respondents in that category.

Value sums for the topics show the number of positive or negative statements. This value can show attitude toward a topic for a particular use level. The attitude may be the influential factor in the decision to use or not use instructional technologies. The positive or negative values also help show if that level of users perceives benefit in technologies under discussion. If users are negative toward support in their environment, yet still use a technology, their perception of benefit from using the technology must exceed the inhibiting factor.

The frequency and value numbers in data reduction tables were used instead of the comments when analyzing the results. Numbers, though quantitative, offered an alternative representation of the qualitative data. It was a method of reducing the data so that it did not take up a huge amount of space and be unmanageable. It represents the qualitative data in a tabular form. The analysis is a mixed qualitative/quantitative approach. Quantitative aspects are primarily to simplify the reduction of the data. The reduction of data is to put it into a form that patterns can be visually recognized. Examples of the tables are available in Appendix VI.

To look for differences in high, medium, and low users, I looked at the most frequently mentioned topics in each question category and compared the frequencies and value sums for each level. I also made tables to compare the initial value when the topic was mentioned with the overall topic value. This suggested if a high or low user might be positive initially on a topic, but later become negative. Examples of these tables are available in the Appendix VII.

The data was reviewed for statements from users that would help show why they decided to use or not use newer instructional technology. Tables were used to support the statements and this information was used to write accounts of the faculty members and what they said in the interviews. These accounts focused on what they perceived as important barriers or incentives to the use of instructional technology. Accounts were supported with quotations from the interviews. Descriptions and accounts are in the results chapter.

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CHAPTER VI

RESULTS ANALYSIS

General Overview of Information

In analyzing the interviews, different topics mentioned were identified and counted. I identified 135 different topics mentioned by the faculty members interviewed. Of these topics, 64% or 87 of them, were mentioned 15 times or more in the discussions. Some topics were mentioned in more than one category. For example, time was mentioned in each interview category (general, learner, faculty, technology, environment, and summary), and therefore accounts for six of the 87 frequently mentioned topics or six of the 135 total topics. Total counts of topic statements in each group can be found in Appendix VIII. Table 1 of Appendix VIII shows the number of counted topic statements in each category and Table 2 of Appendix VIII shows same for topics mentioned 15 or more times. The tables separate the topic areas mentioned in each category related to the question category or that might fit into another category.

During the interviews, the topics discussed often included a variety of topics, not just the area the questions were about. Though the interview sections were structured to questions in each of the model component areas, the person being interviewed would often discuss topics other than that specific component. Table 2 shows that faculty members did not limit their discussion to topics unique to the component category areas by comparing statements about the category topic to those that were not unique to the category topic. For example, when talking about learners (the learner category), a faculty member might reference their personal desire to do more with students, but not having enough time because of university requirements in other areas. This might lead to a discussion on university requirements for promotion and tenure that is not unique to the learner section.

The general and the summary interview categories were not specific to a model component and included all areas. The general section of the interview format consisted of questions to collect demographic information and the summary section focused on having the person interviewed summarize their thoughts regarding influences on their use of technology.

When focusing on only the topics mentioned 15 or more times by all level of users, the numbers shift some. Learner and environment categories show most topics unique to the category, but overall the table shows faculty members discussed a variety of topics in each area that may impact their technology use. This suggests the model, with multiple areas acting together, may be useful in explaining technology use.

Table 2

Total topics mentioned

	General	Learner	Faculty	Technology	Environment	Summary	Totals
Topics Unique to the category		8	16	16	22		62
Topics that fit other categories	9	10	11	12	8	23	73
Totals	9	18	27	28	30	23	135

Table 3

Total topics mentioned 15 or more times

	General	Learner	Faculty	Technology	Environment	Summary	Totals
Topics unique to the category		6	10	10	19		45
Topics that fit other categories	5	2	10	10	3	12	42
Totals	5	8	20	20	22	12	87

Tables 2 and 3 provide a quick overview of the number of topics mentioned in each category of the interviews, showing where the most topics were mentioned. In looking at both tables, the general and summary categories show all topics mentioned as fitting other areas. This is because the questions allowed faculty members to expand and comment on areas that they thought to be important. In the general area, although the questions were about demographic information, respondents started talking about instructional technology use. The summary questions asked about the model components important from the previous sections of the interview, so all the topics fit other components.

Total Factor Counts

The next tables show the total topic frequency counts for the different sections of the interview and the values assigned. This is the sum of the frequency for all the different topics mentioned and the sum of all the values is shown. The values assigned suggest the context of the statements. I would assign a value of +1, 0, or -1 to the topics, reflecting the tone of the statement, depending on whether this was mentioned in a positive (+1), noncommittal (0), or negative (-1) context (see the Methodology section for more information). These tables also separate the different levels of instructional technology users--high, medium, and low--so comparisons can be made between the use levels. The study examines the question of whether differences between high, medium, and low users are evident and these tables are the first to include information about the different levels of users. With this, basic direction or focus can be examined.

In summary, all the topics listed were mentioned 3,128 times by all users with an overall positive value of 127. High users mentioned the listed factors 904 times with an overall positive value of 116. Medium users mentioned the listed factors 1046 times with an overall positive value of 53. Low users were the most talkative and mentioned the listed factors 1178 times, with an overall negative value of -42. Based on this overall summary as seen above, high users appeared to have more positive comments, medium users were less positive, while low users seemed to take a generally negative tone.

The most frequently mentioned topics (mentioned more than 15 times) were referred to 2,711 times by all the users and had an overall positive value of 156. When compared with the 127 overall values for the total of all topics, this implies the most frequently mentioned topics were more often positive in value. High users mentioned the listed factors 808 times with an overall positive value of 115. Medium users mentioned the listed factors 928 times with an overall positive value of 46. Low users were the most talkative or mentioned the listed factors 975 times, with an overall negative value of -5. Again, based on this overall summary, high users appeared to have more positive comments, medium users were less positive, while low users seemed to take a generally negative tone. Considering either the total topics mentioned or the topics mentioned 15 or more times, those that were lower level technology users spoke the most and in an overall negative context. High level users spoke less, but generally were more positive in what they said. As seen in Table 4, with consideration to just the frequency of mention and the valence, a difference between the high and low level users may exist.

Table 4		
	All Topics count (value)	Topics mentioned 15 + times count (value)
High	904 (116)	808 (115)
Medium	1046 (53)	928 (46)
Low	1178 (-42)	975 (-5)
Total	3128 (127)	2711 (156)

Table 4 is the first to provide information that allows a comparison between the different levels of instructional technology users. The focus of the analysis is to see if differences between use levels would help explain why some faculty members use instructional technology while others do not. The information in Table 3 shows some overall differences between high and low level users. It shows that the high-level users total frequency count was less than the low level and that the total value was positive while the low level was negative. This could imply low level users have more to say and are typically negative about their situation regarding technology use in instruction.

Tables 5 and 6 separate the total frequency and value numbers for the topics into the different interview sections. In the general question category, the different topics were mentioned 168 times and the overall value was 82. For the learner category, total mentioned factor count was 379 with an overall value of 118. Questions in the faculty category yielded a total mentioned factor count of 712 with an overall value of 214. In the technology category, the total mentioned factor count was 622 with an overall value of -50. Questions in the environmental category had a total mentioned factor count oF 747 with an overall value of -238. As for the summary questions, the total mentioned factor count was 500 and the overall value was one. Categories with the most frequent mentioned factors were the environment, faculty, and technology with summary section next. Of the categories, technology and environment yielded the negative context. It must be noted that this does not consider the number of questions asked in each category. The following Table 5 summarizes the total counts and values in each category for the different levels of users.

Table 5

	Gen. sum	Learner sum	Faculty sum	Technology sum	Env. sum	Summary sum	Total
High value	32	35	72	-46	-24	47	116
count	50	114	188	193	204	155	904
Medium value	29	28	88	42	-101	-33	53
count	65	141	231	225	258	126	1046
Low value	21	55	54	-46	-113	-13	-42
count	53	124	293	204	285	219	1178
Total value	82	118	214	-50	-238	1	127
count	168	379	712	622	747	500	3128

Table 6 summarizes the count and value numbers in each category for the most frequently mentioned topics (those mentioned more than 15 times). In the general question category, the topic count was 121 and the value was 67. In the learner category the count was 323 with an overall value of 91. The faculty category yielded a factor count of 641 with an overall value of 223. In the technology category, the factor count was 550 with an overall value of -21. The environmental category had a factor count of 685 with an overall value of -203. As for the summary questions, the factor count was 391 and the overall value was negative one. As table 5 shows, the categories with the most frequent mentioned factors were the environment, faculty, and technology with summary section next. Of these categories, technology, environment, and summary yielded the negative context. Table 6 summarizes total number of the topic mentions in each category and the resulting value at the different levels.

Table 6

Respondent	Gen. Sum	Learner Sum	Faculty Sum	Technology Sum	Env. Sum	Summary Sum
Sum of HU values	32	33	68	-33	-20	35
Sum of HU counts	36	106	177	171	193	125
Sum of MU values	20	17	89	37	-93	-24
Sum of MU counts	48	115	214	205	239	107
Sum of LU values	15	41	66	-25	-90	-12
Sum of LU counts	37	102	250	174	253	159
Total values	67	91	223	-21	-203	-1
Total counts	121	323	641	550	685	391

Tables 5 and 6 summarize the total topic counts and values in each category of the interviews. Total topic counts for the environment, faculty, and technology model components were the highest, which implies that faculty members spoke most about these areas and suggests these may be important factors regarding their instructional technology use. Environment and technology have negative overall values that imply faculty members were more negative about these areas than others. The negative context can suggest problems in these areas that possibly inhibit instructional technology use.

A comparison of the single most frequently mentioned topic in each category (Table 7) does show some slight differences between the users. For the general category, the student topic was the most frequently mentioned topic. High users seemed to have less to say about the students, as medium and low users mentioned students more than the high users. All the values were positive. Talking about students overall was the most frequently discussed item in the learner category. While both the high and low users were positive, medium users registered a negative value. Both medium and high users talked more about students than the high users. When answering questions in the faculty category, all users mentioned technology use frequently and with a positive context. The most frequently mentioned topic in the technology category was attitude toward technology. While high and medium users mentioned this the same number of times, medium users seemed more positive than high users. Low users mentioned attitude less, but were negative, unlike the others. Support was the most frequently mentioned item in the environment category. It seems high users generally were positive about the support they receive, while medium users were negative. Low users overall value was positive for support, but barely. E-mail was frequently mentioned in the summary section of the interview, with positive values in all the levels of use. Medium and low users, though, had small positive values, while the high users showed all positive statements. The noticeable differences occur with technology, environment, and summary topics. With the technology, attitude was in a negative context for the low uses, but positive with the others. Environment saw support as a negative issue with medium but positive with high users and barely positive with the low users. Summary had E-mail as a highly discussed item, but the positive value of this with medium and low users was not total as with the high users.

Although the numbers may suggest some potential differences, it must be recognized that these figures do not show how many faculty members in each level of use were participating. Multiple mentions of a topic may be from one faculty member, or many. This will be examined more as we look at the categories in more detail.

Table 7				
MFT	High count (value)	Medium count (value)	Low count (value)	Total count (value)
General student	7 (4)	18 (14)	11 (10)	36 (28)
Learner student gen.	32 (10)	37 (-3)	22 (6)	91 (13)
Faculty tech. use	29 (16)	22 (20)	29 (13)	80 (49)
Technology attitude	23 (3)	23 (14)	19 (-1)	65 (16)
Environment support	24 (11)	34 (-11)	19 (1)	77 (1)
Summary E-mail	20 (20)	12 (3)	25 (1)	57 (24)

MFT - most frequently mentioned topic in category

An overall look at the tables reviewed to this point does suggest that some differences may exist between the different levels of instructional technology use. The total number of times topics were mentioned, as shown by the previous Table 4, shows that the low level users like to talk more and were overall negative in their comments. High level users spoke less, but were more positive. This can imply that the low-level users may be more negative than high level users. High level users may just be more optimistic about technology use.

A closer look with Tables 5 and 6 reveal some differences within the categories between high and low level users, based on frequency count and value. The summary category, shows that the low-level users talked more and were negative in context, compared with the high level users. This means that the low-level users talked more about influences on their technology use and these statements were negative in overall context. Based on the small negative value it shows they had positive things to say also. They were more negative in context in the environment category, but since the high level users were also negative, it means that they may share many concerns. The low-level users just talked more and were more negative about it. Other similar small differences exist, but overall, no great differences were evident that would suggest any conclusions. Typically low level users said more than high level users, and the technology and environment areas showed more negative statements than the other categories. Table 7 provides a different perspective by looking at the single most frequently topic in each interview category. Again, some differences do exist but none great enough to make general statements. In the following discussion I will look at each interview category in greater detail.

General Introductory Questions

During the introduction in the interview, I collected information about the respondent while introducing myself and the purpose of the interview. Sometimes it would amount to casual talk, but often respondents would launch into topic areas, talking about their use of instructional technologies. While the focus of the questions was not change, faculty members would start to talk about conditions in their working situations that influence them. In cases like this I tried to follow up with the questions from that area so as not to be redundant. However, I tried confining my introductory questions to demographic ones, validating the survey index score, and questions about instructional technology activities.

Even with this attempt to confine questions to background type information, several faculty members at all levels started discussing the factors right away. Most frequently mentioned topics were the students, faculty interest in technology, availability of technology, developing student skills, and time. Each topic was mentioned more than fifteen times by all levels of the interviewees. The overall flavor of the statements was positive, except time and availability was not as near positive as the other areas.

As seen in Table 8, low and medium users mentioned the topic student more frequently than high users, although the context was a positive value for all. Judging from this (frequency count), medium users talked as much about students during the general introduction questions as the high or low users combined. If considering the value of the topics, medium users were very positive, as were low users, but high users were marginally so. However, only four of the high level users discussed students while six and seven on the medium and low level users talked about students.

Table 8

	General							
	High		Medium		Low			
Topics	Freq.	Value	Freq.	Value	Freq.	Value	Total count	Total value
Students	7	4	18	14	11	10	36	28
Interest	13	13	11	11	4	4	28	28
Avail.	8	8	6	-2	11	-2	25	4
Dev. St. Skills	5	5	5	5	7	7	17	17
Time	3	2	8	-8	4	-4	15	-10
Totals	36	32	48	20	37	15	121	67

Table 8 provides not only frequency and value numbers, but also the number of faculty members at each level who discussed the topic. This was done because sometimes only one or two faculty members at that level would make many statements. However, in the later sections of the interview, topics that were similar were often combined to reduce the size of the tables and make them easier to read. In doing this, the combined number of faculty members making the statements was larger and appeared confusing compared with factors that had not been combined. Because of this, those columns (number of faculty members) will be eliminated from future tables to reduce the confusion and make the table easier to understand.

Overall, faculty members (all levels) talked positively about the students in this section. Most emphasized the satisfaction they received when students use or apply ideas that they have gained in class and when students finally grasp the ideas. All levels of users were similar in their discussion of the students. One high-level user recalled the reward of seeing the student grow while a medium level user spoke about students sometimes making them more aware of newer technologies. Low users talked more about encouraging students to use technology through requiring assignments that use technologies such as E-mail.

At least two medium level users dwelled on how students were the encouragement for them to use what little instructional technology they did use. They mentioned that they had students doing presentations for class and that students used presentation software such as Microsoft PowerPoint™ or Aldus Persuasion™. One professor even mentioned that she did not know anything about his type of software until the students introduced it to her. Both were encouraged, however, to pursue use of it for their classes because of the student use in their class.

High users seemed to discuss students' growth, while medium users seem to talk about how students have helped them learn about instructional technologies. Low users talked more about encouraging students to become more familiar with technology by requiring them to use it for assignments. As for frequency of mention, medium level users seemed more interested in talking about students than either the high or low users.

Overall, what the different levels of users said about students did not pertain to their technology use. All level of users expressed similar positive attitudes about students. While some used technology to become more acquainted with their students, others learned more about presentation software from students who used it in class for presentations.

It seems both high level and medium level users were interested in talking about their <u>interest</u> in technology, as six high level users at each of those levels mentioned this topic while only four of the low level users did. Among the six high level users that talked, three faculty members were responsible for mentioning it ten of the 13 times and all expressed similar positive thoughts. Low level users spoke less about their interest in technology. It was mentioned only four times by three of the seven low-level users participating.

All levels of technology users expressed positive sentiments about their interest in technology during the general questions. A medium level user expressed intense interest in computers and associated technologies, while another expressed the desire to use technologies more than they were currently (I would have to assume that meant inhibiting factors prevented this). Other medium users wanted greater availability of equipment for use and high level users wanted to build greater skills using spreadsheets and E-mail. Low level users expressed the desire to use more applications and presentation software. All levels of users were very positive about their interest in technology.

Most of the comments about developing student skill could probably be grouped with comments about students. Most talked briefly about using E-mail as a requirement for students to build student skills with communications technology, requiring all work to be prepared on a computer, or applying skills developed.

Availability also was an important item in the general discussion. This seems to suggest the possibility of concern about the working environment and about which equipment to use. Both high users and medium users mentioned it, but low users mentioned it more frequently. All of the statements from high users were positive, while low and medium user statements were predominately negative. This seemed more important for the low-level users, since six of the seven low-level users commented on availability and only about half that many did form the high or medium level group.

While high use level faculty members talked positively about the availability of equipment, medium and low level users spoke about unavailability of technology as an inhibiting factor to instructional technology use. It appeared that the high level users did not typically experience problems getting equipment for the technologies they were using. Medium level users mentioned that lack of university infrastructures to support use of certain technologies, while low level users complained about not having sufficient or suitable equipment, buying their own equipment, and other inhibiting factors such as that.

One high level user volunteered that without receiving an Apple Grant to purchase an office computer and without presentation software won during a university training session, she probably would not have been motivated to use instructional technology in teaching. Another high level user mentioned the fact that with site licenses that made the software less expensive, his department can make it available for use on the lab machines and could require students to use it. With this availability the professors can use it in class.

Medium and low level users were negative in talking about availability in this category. Medium level users' discussion was sprinkled with complaints about lack of materials and the university not having the infrastructure to support a high technology use in the classroom atmosphere. One low level use faculty member stated that while VCRs were available to show videos for class, she had to purchase videos with her own money for class. Others complained that overhead projectors were the only equipment available and that computer projection equipment was not available for presentations. This was emphasized as inhibiting the use of instructional technology.

Summary of general category. In summary, the general questions, asked while introducing myself, did hint at some subtle differences between users the levels of users or suggest reasons faculty members use instructional technology. Of the most frequently mentioned topics, all were discussed in a positive overall context, except time. Though few faculty members from each group talked about time, high level users were positive about it while medium and low level users were negative.

Availability, while positive for all users, had a negative value for medium and low users. This seems convenient, as one would always assume that high level users must have access to equipment while low to medium users, because of limited access to instructional technology equipment, would be less inclined to use it. The positive overall value came from the fact that high level users spoke most frequently about availability, emphasizing the importance of having equipment and materials. This difference in value and the difference in the number of faculty members talking about it suggests that this may be an important factor in influencing use of instructional technology.

In responding to general questions, more high level users expressed an interest in using technology in instruction than the low-level users. Though both levels had positive comments about this topic, twice as many high level users talked about it and mentioned it more frequently. This may be interpreted as an indication of high level users having greater desire to include instructional technology in their teaching.

Issues did surface that were important to users at all levels. Students, time, availability, and interest in technology all came up, but the emphasis of the questions was demographic and general background. These fit my model learner, environment, faculty, and technology components. These also continued to appear during questioning in the other categories. The topics mentioned in the general discussion reinforced the model components and may be an indication of what the faculty members are concerned about in discussion of instructional technology use.

It was encouraging to have model component topics brought up by the participants this early in the interview. Although the focus of the introductory questions was demographics, the model components came up in discussion. Faculty, early in the interview, began talking about these issues. The model components must be important for the participants for them to discuss them without prompting questions. It not only reinforced the model as an explanation, but also suggested that the influences of the topics may differentiate the levels of use.

Learner Model Component Questions

In addressing the first model component, I asked the interviewees about any changes they perceived in students. The rationale was that if the changing student profile made some instructional tasks more difficult, instructional technology might simplify the execution of these instructional tasks. For example, non-traditional students with outside responsibilities that limit their participation in classes and activities during the traditional class schedule of the university, might be served by E-mail that would allow communications with the professor outside the standard office hours. It would also serve as a way for students to interact with one another if schedules did not permit regular meeting outside schedules class hours. Also if they commuted a distance to class, E-mail would provide a channel for interaction without having to be physically on campus.

The directions of the questions were toward student changes in subject knowledge, technical skills, motivation, etc. and any anticipated effect on the use of instructional technology. The questions and resulting topics were intended to suggest that changing types of students the faculty teach might influence a faculty member's use of instructional technologies. Overall, the students were assessed positively by all levels of users, except for specific student subject skills. Most users expressed concern for what they saw as a decline in subject skills, with some low-level users thinking that students were improving. Some faculty members distinguished undergraduate and graduate students as to skills or competency. Throughout the discussion, faculty members would mention the factors influencing the type and caliber of students they had in class. Some of these were the environment, exposure to technology, administrative policy, and real world experiences. Again, even when the topics discussed in this section were different from learner topics, they fit the model components. The same types of topics were expressed in the other areas as influencing technology use in the classroom. Not only does the faculty perceive these as affecting some of their use, but also influencing the students' use.

In the learner category, student subject skills, student computer skills, general student statements, environment, technology exposure, administrative policy, time, and use of real world examples were frequently mentioned topics. All these topics were mentioned with overall positive references except student subject skills and time. Table 9 provides frequency count and values for the most frequently mentioned items.

Table 9

	Learner							
	High		Medium		Low			
Topics	**Freq.**	**Value**	**Freq.**	**Value**	**Freq.**	**Value**	**Total count**	**Total value**
Stud Gen.	32	10	37	-3	22	6	91	13
Stud Comp.	16	4	21	17	15	13	52	34
Stud.Subj.	16	-2	19	-8	12	5	47	-5
Env.	15	7	15	1	13	1	43	9
Exposure	12	3	10	2	10	8	32	13
Real Exp.	4	4	8	8	11	11	23	23
Time	9	5	4	0	7	-7	20	-2
Admin. Policy	2	2	1	0	12	4	15	6
Totals	106	33	115	17	102	41	323	91

High and medium users implied similar thoughts on the students' skills. Subject skills may be declining, but computer skills or technology skills are improving. While improved computer skills may potentially induce the faculty to use more technology in classes, this was not implied in the comments made by faculty members during these questions. The faculty said little about it during these questions. The majority at these two levels stated similar perceptions, though some individual faculty members at each level may express an opposite or different view. Low level users differed from the high and medium users, in talking positively about both student subject skills and student computer skills. About students overall (general), high and low faculty members expressed positive thoughts about work habits, living skills, and their attitudes. Medium users, on the other hand, expressed a negative overall context.

In talking about the students, faculty members discussed them in general terms: student subject skills, and technical or computer skills. Medium users spoke the most frequently about students, with high level users and then low level users in order of frequency. Overall comments about students from all level users were positive except talking about student subject skills. These values were negative for high and medium users and positive by low level users. High and medium level users perceived a decline in student skills in the subject areas compared with students of five years ago. They thought students were less prepared in the subject areas, weak in some affiliated areas like math and writing, and generally requiring more preparation. In contrast to this, low-level users talked of improved and more informed students, attributing this to the raising of the entry standards for the programs in which they are. They mentioned that they have access to more information due to technology and they bring more to class as a result.

While the faculty members at all levels discussed the students and any changes they perceived, they did not necessarily relate the student change to their use of instruction. However, environment and exposure to technology were cited as probable influencing factors on the students. These factors again reinforce the model, although here it is not faculty use of technology, but student use. For example, most faculty members interviewed talked positively about the computer proficiency of the students. They credited everything from high school exposure, increased access, and more affordable technology, to the fact that technology is everywhere or an integral part of our society. Faculty members also credit the administrative policy raising requirements as contributing to the improved computer skills.

In general discussions about student work habits, life styles, motivation, and other factors, high and medium level users talked the most. Low level users spoke frequently, but not as much as the other two levels. Medium level users talked about general student habits in a negative tone while high and low were positive. Medium level users discussed lack of motivation, low tolerance for difficult assignments, too much partying, and similar topics. High and low users talked about students being more competitive, better work habits, more serious, and other similar descriptions.

In discussing student subject and computer skills, high users mentioned each topic frequently and in each case, this represented six of the seven-interviewed faculty members. Though each time two faculty members were responsible for most of the statements, the others did speak out. The context of the statements was negative for the student subject skills and positive for the student computer skills.

Medium users seemed more talkative about the issue, but similar to the high level users. Medium users were negative about student subject skills but positive about student computer skills, much as the high level users. Also, like the high users, six of the seven interviewed talked about these topics.

Low users mentioned student subject topics only 12 times and computer skills only 15 times. Like medium level users, six faculty members addressed student subject skill and seven addressed student computer skills. Again, comments came from most all users with no one saying particularly more than anyone else. Low users did differ in talking about student subject skills, being positive while both high and medium users were negative overall about student subject skills. Low users joined ranks in being positive about students' computer skills though. Student computer skills show all levels of users were positive, but the high users, unlike the medium and low users, showed only a small positive value.

In questioning faculty members about the students, topics such as the environment, student exposure to technology, real world examples, time, and administrative policy were talked about as well. Overall, these topics were viewed positively by most of the faculty members at all levels of use. Some subtle differences are evident with such topics as administrative policy, time, and the use of real world examples. Time, however, is the only topic where the value or context of the statement is noticeably different.

Administrative policy was mentioned infrequently by high and medium users, but had greater importance with low users. While only one high level user made two positive statements and one medium level user made a noncommittal remark, four low level users commented on administrative direction. Although the overall value was positive (value 4), one faculty member was very negative, making three of the statements. The comments from this faculty member focused on lack of administrative support, class scheduling problems, and E-mail problems. The other faculty members in the low group spoke of improved admittance standards from the administration, better selection process, and similar statements.

A point of interest is that time is referenced 20 times in the student discussions. Of the topics in the learner category, only time was discussed in overall negative terms. Mentioned least by medium level users (four compared with nine for high and seven for low users), they were ambivalent about it, with statements neither positive nor negative (positive and negatives typically canceled to 0).

High users typically mentioned it in a positive context, usually reflecting the desire to be able to do more in given time, being aware of time, and wanting to schedule time better. The high level users' comments were made by four of the seven faculty members interviewed. Two faculty members accounted for seven of the nine counts. The context was positive overall, except one comment by a faculty member who only made that sole comment.

Medium and low users, while mentioning time less than the high users when discussing students, were noncommittal (medium level users) or negative (low level users) in context. Medium level users' comments were from three of the seven faculty members and neither positive nor negative. Low level users' comments were all negative, but made predominately by one faculty member accounting for six counts. Unlike the high users that spoke of saving time or wanting to do more with their time, one medium user referred to students having more time to explore technology. They also added that students waste their time on TV or drinking. The one low user's comments included the heavy faculty member burdens, how overwhelmed they are, and that students never show up during scheduled office hours. In contrast to this low level user, high level users focused more on trying to accomplish more in their scheduled time rather than lamenting the fact that their time is being lost.

All level of users emphasized using <u>real world examples</u> in classes when discussing learners. They were all extremely positive about it. High level users only addressed the topic four times; one faculty member spoke of it three times while another mentioned it once. All were positive statements. Medium level users mentioned real world examples eight times, with three accounting for the positive mentions (value 8). The low level users' eleven comments were evenly divided over the five faculty members with one faculty member making an extra comment. Once again, all comments were positive. The use of real world examples seemed to be more important to low level users than high level users.

Summary of learner category. Few faculty members expressed the fact that changes in the students were influencing their behavior in using instructional technology. Most faculty members, at every level of technology use, expressed overall positive sentiments toward the students. In fact, I was impressed with the sincerity of all the faculty members and the interest in students. One faculty member, a high level user, used E-mail technology as a way to learn more about his students, their cultural and family backgrounds, so he could better address different potential learning styles.

Some, such as FM 340, expressed that they were using technology to serve students' needs better. This use was said to be both a result of the student change and the desire to do more current in-depth work and save time. It provided the faculty member something of value to them, and as a result made technology use practical and beneficial.

FM 340: ... so it is not just the time saving, it is also the depth of work . . .

Time was mentioned in this category, related to the learner. It was this topic that appeared to reflect some differences in between high and low level users of technology.

High level users mentioned benefits of technology in timesaving but low level users frequently bemoaned the loss of time. The four high level users talked about doing more, the awareness of the students, and being available for student access always. The three medium and two low level users comments on time were about student having more time, students wasting time, or students objecting to class work because of being overwhelmed. This was a distinct difference in the high and low level users of instructional technology. Put simply, high level users talked optimistically and the low-level users were negative concerning time.

Benefit. Although not readily evident in this section, faculty members who expressed interest in using technology more saw some value or a benefit to using technology in instruction. Often, other factors impeded the use of instructional technology by faculty members, making it too much of a hassle so that the benefit could not be easily realized. Nevertheless, some still realized the value and expressed this in their discussion, although they were not using it. This is illustrated in a statement made by one high level faculty member who had been on the faculty only about 2-3 years. FM 74 said that students had changed little and she has not shifted any of her teaching because of this. However, since she joined the faculty, she has wanted to do more with instructional technology. Without me asking why she had not, the conversation turned toward what has changed in the teaching. She expressed the desire to lecture less in class and do more group work with the students. She said she was constantly changing things so she cannot just pull out what she has done in the past and teach. Here the conversation shifted from students to more about herself as a faculty member.

Interviewer: So, really there hasn't been much change as far as your students?

FM 74: No, I just haven't been here that long and I think in what I 've seen there hasn't been a major shift . . .

Interviewer: So that hasn't influenced a shift in anything you're doing your teaching?

FM 74: No, I think ever since I've got here I've wanted to do more of that kind of stuff just because I thought maybe I could interest people who hadn't been interested before.

Interviewer: I'm going to focus more now on . . .

This makes me question why she has not, but I learn more of this later in our interview. She expressed the desire to use more presentation instructional technology to increase interest in the course material. She also mentioned how she is constantly changing content, to which software may offer some advantage or benefit in making it easier to change material.

While questioning another high use level faculty member about changes in student population, the notion of the number of traditional vs. non-traditional students came up. A traditional student refers to the 18 - 21-year-old full time day student while non-traditional refers to an older student with job and family responsibilities and who may not attend college full time. In response to this question, the faculty member discusses how increased student skills have made it more demanding on the instructor, who has used technology in the classroom to be more efficient and to present more difficult or in-depth problems. This reinforces the perceived value component of the model. This faculty member, a high level user, realizes a value or benefit in using the technology and, therefore, has incorporated it into their instruction. Also, they attribute some reason for doing this to changes in the students they are teaching. This reinforces the learner component of the model, in that learner's may influence the use of instructional technology.

FM 340: I do find more numbers of these students (non-traditional) today than I did 5 years ago.

Interviewer: Has that required you to change anything in your instruction, and how you approach the students, or assignments you make?

FM 340: Yes, perhaps it has. The assignments you give students today are more practical and more real world oriented than they used to be in the past. And, that may be because of the higher proportion of non-traditional students who have real-world experiences. They don't want hypothetical examples, they want real examples. So I do think it has necessitated some change.

Interviewer: How do you feel about that change, positive or negative or what ever? The type of student you are getting, or some of your other changes, that they're more computer literate?

FM 340: I think the changes are positive. Students today are aware of more things than they were in the past. Also I find non-traditional students are more conscious of the time value of money than they were in the past. They realize that they've incurred a cost to sit in this classroom. They've forgone an income somewhere else. They could have worked somewhere else and earned a certain wage but they've given that up to sit in the classroom. So they are more demanding on the instructor. And ah..., therefore the instructor has to deliver more than one could have got away with in the past.

Interviewer: So you've responded to that in some way?

FM 340: Yes, I think so.

Interviewer: By?

FM 340: Well, first of all by, you know, making use of more technology in the classroom so that more material can get through in a shorter time. Using transparencies instead of the blackboard for example. Using computer assignments instead of calculator assignments. It saves time, So yes, I think the instructor does need to respond to these changes.

Interviewer: So... Uhm...if I'm reading correctly, some of the technology you use, having incorporated those in some regards have been time savers, or making more efficient use of your time?

FM 340: Well, yes, they have been time savers as well as they have enabled me to do work that was not possible in the past with out technology. For example, more sophisticated calculations are possible on a worksheet, than you could using a simple paper, pencil, calculator. So is not just the time savings, it is also the depth to which you can go. It is much more now that it was in the past.

In mentioning time, this faculty member's comments reflected three of the four high level users' thoughts on time as helping them work more effectively. They implied that technology lets them do more in a shorter time. One high level user did mention time, concerning making accommodations for the students to contact them. The following is an example of this point.

Interviewer: In regards to the type of student, older, younger, seen any changes in the type of student you are getting over the past five years?

FM 432: I'm seeing more in graduate schools, in fact, under graduate classes also. I'm having students, uh.., uhm..unusually, uhm.. highly made, so to say.._

Interviewer: Oh, uh maybe returning to school?

FM 432: Oh, absolutely, absolutely. Yes, for example this year I have a young lady in my undergraduate class who is a mom of 3 kids and each of these kids are going to college.

Interviewer: Uhm, with these outside responsibilities that some of the older students have, have you had to adjust or respond to that...

FM 432: Yes.

Interviewer: And how is that?

FM 432: Yes, for example they are scheduled, for example, I have a lab and lab hours are to meet the requirements of graduate assistant in the lab class schedule, and for majority of class, there are these students in the class; but then one or two students in the class like this, I have to specially accommodate their needs in terms of special hours for the lab and, and give them the freedom to call me anytime possible.

Interviewer: Now you mentioned, since you brought that up, you mentioned you communicated, network things of that nature; have you used E-mail to ah, communicate with your students more or...

At this time he motions to his computer monitor that has approximately 29 E-mail messages stacked up waiting to be processed.

Interviewer: Oh, ha!! Good luck.

FM 432: Ho, ha, ha, hah. (laughter).

Interviewer: You're going to take a while to get through those, but ah, so you regularly communicate and offer that as kind of ...

FM 432: It's 24 hour job. My computer at home is frequently on to check the messages at all times. Students have access to me even in the middle of the night! And, it is not uncommon, students call me even at 10:30/11:00, or the weekends, other the weekend.

Though this appeared as infringement on his time, this faculty member did not stress that point but stressed access and being available to the student. Again, this faculty member perceives technology use as beneficial to them in permitting them to be most available to the student. This is important to them, being available, and E-mail technology makes this more possible. This was often the difference in high and low users, in that high users would stress the more positive aspects, here the availability, rather than the negative aspect, infringement on personal time.

This difference is illustrated by examples from medium and low level users. Low and medium users alluded to time, but the context was different. Only three medium level users commented on time, and in a noncommittal context. For instance, one medium level user mused about students having more time to explore technology. He had just answered questions related to students' subject ability not being as good. He emphasized that he has adapted to this by "watering down" or "dumbing down" the course work because students are less able or prepared. I followed this up with a question about student's technology skills. I thought this was important to provide some different comments that reflect the diversity of ways students and the time factor are perceived.

Interviewer: How about as far as oh, students' experience with technology, computers, and the like? Has there been any change?...

FM 385: I think they're much better versed. I've seen improvement. I think they're riding the technology pretty well, and they're fitting in and they're taking the time to learn it. Uhmm... they know more of some of the intricacies of the programs than I do. Uhm, you know, so I think it is the typical thing you hear that the faculty member has to ask the student about the programs. They sit down and goof off on it more. So I think they learn it more so they are keeping up with it. They pretty much ride the wave with it.

Interviewer: So they probably have it, like you said, almost like a hobby, or they have more time they can spend?

FM 385: Yeah, more time.

Even while saying the students' have improved technology skills, the suggestion that they take the time to learn it was followed by one implying they "goof off" at it more. This I do not interpret as positive. The time factor here refers to student's time, but indirectly reflects the faculty member's time situation. In saying students have more time, it is implied that the faculty member might not have enough time to learn the technology. Time here reinforces the model component of both faculty and environment. The faculty member may not use as much technology as they like because they do not have the personal time (faculty component) to learn it. The lack of time may be because of the working situation.

Comments from one low level user were quite negative. This faculty member mentioned that what students think is a demanding course is not what she thinks is demanding. She also pointed to the low student expectations from the other faculty, how they imply this is not a Columbia University (or from wherever that faculty happened to graduate). Again, this does not necessarily represent the view of many faculty members, but the fact that this faculty member was so intense about this implied the type of atmosphere in which she was working. I thought it important so to illustrate the different conditions that might exist for faculty members. Even on the same campus, different working situations between departments and colleges vary. The support and availability of equipment in one department may encourage use, while two buildings over a "Spartan" environment may discourage use. This reinforces the environment component of the model.

FM 188: I don't care. I'm hired to teach. Given my expertise and background, this is what I think you need. You know, and ... so, and I understand where they're coming from (the students) in that they have families, they have all this other stuff and the idea of asking them to do one more thing, one more book, is just overwhelming, and I ... but I tell them do you want to go to a surgeon, who was overwhelmed and didn't want to read that book or practice that technique? You know... and they happen to be trying to get your gall bladder out! I , I don't know what to do. I can't solve this... about why we have to meet once a week, from 6 to 9. Why that is magical. Why we can't meet on sequential Saturdays, or . . . I don't know. But, here it is. Sometimes I feel stuck, because I know I am a representative of a system and which I don't always agree with.

I attempt.. You know I always say, you know... just because, don't come to me if they have too much to do, because everybody in this class had that. However, if you have a personal...

While she mentions time in context of the students, it almost seems she is harboring something beneath the direct answers. The stressing of students complaining about being overwhelmed leading then to class scheduling suggests some difference with what the current policy is. This is part of the work environment, a component of the model. The reference to being stuck and not agreeing with the system suggests that it runs deeper than at first thought. Being at odds with the system may influence attitudes toward other factors (faculty component). Although she did not say anything about instructional technology, the potential to be influenced by unfavorable working environment exists here.

Although major differences between users were not evident in the learner category, the statements about time began to show some differences in how high and low level users perceive certain factors. Besides this, model components kept being discussed even outside direct references to the learner. The faculty members brought up time, environment, and other topics that fit in the model, but the focus of the questions was the learner component. This begins to reinforce the model since these often influenced the use of technology. Perceived benefit also provided some incentive to use technology, as with FM 340 who sees technology use as a way to provide efficient and in-depth instruction to more demanding students. FM 74 also saw value in technology use as a way to interest the student in the course.

In summary, great changes in the profile of the student may not be driving faculty members to high levels of instructional technology use, but some faculty members interviewed related instances that reinforce the model components. Also, in discussing the learner component, topics that fit with the other model components were frequently discussed which lends support to the fact that the model may be helpful in explaining instructional technology use. In discussing time related to learners, differences were evident between high and low level users in how they talked about time.

Faculty Model Component Questions

This section focuses on the faculty members, their thoughts, style, and concerns. I found that faculty members enjoy talking about what they know best, themselves and their work. Many statements fit under various topics because they mention a variety of areas. For example, a statement made when discussing a faculty member's attitude or perspective on technology may be equally at home in the technology section. However, this only seemed to reinforce the components of the model and how it may help explain why faculty members use technology.

When I asked questions related to the faculty members, some faculty members in all the user levels spoke about how they thought their teaching had evolved or was changing. Many faculty members expressed the attempt to involve students more and lecture less. Cooperative learning and participatory learning were notions frequently mentioned. Faculty members at all levels of technology use mentioned little about changes in teaching style that affected their technology use.

It seemed that interviewees were extremely talkative when discussing themselves. In looking at numbers in Table 5 shown previously, the faculty section had the second largest frequency of total topics mentioned (712), only behind environment (747). If considering only topics mentioned 15 or more times, 641 topics mentioned had an overall positive value. Topics or ideas mentioned more than 15 times include the following:

teaching style, technology use, personal style, adult learning, interactive (technology), involvement (personal), administrative pressure, encouragement of use, secretarial and staff support, use of technology for grading and management, time, survival, politics, students, environment, availability, resources, information explosion, faculty role, and support.

Because of the similarity of some topics and the large number of topics, I have grouped the following topics into broader headings listed below:

technology - tech. use and grd./mgt.

personal - teaching style, personal style, and involvement

resources - resources and availability

environment - politics, environment, survival, and admin. pressure

support - support and sec./staff sup.

This was to prepare the following table so that it did not become too big and hard to follow because of the number of topics. By reducing the number of topics the table is reduced in size and easier to read.

With combining topics, the most frequently mentioned areas were personal (teaching style), technology, environment, and resources. Of these four, environment and resources had negative values. Of the remaining topic areas, all were positive but for support. So as faculty members discussed issues related to themselves, topic areas that were primarily responsible for the working situation, such as support and resources seemed troublesome to faculty members and were talked about in a negative context. Table 10 provides frequency counts and values for the topics in the faculty category.

Table 10

	Faculty							
	High		Medium		Low			
Topics	**Freq.**	**Value**	**Freq.**	**Value**	**Freq.**	**Value**	**Total count**	**Total value**
Personal	37	26	61	39	58	28	156	93
Technology	42	27	36	31	44	10	122	68
Environment	22	-5	27	-7	31	-11	80	-23
Resources	8	-1	11	-3	24	-6	43	-10
Role	14	0	14	9	13	5	41	14
Stud.	12	6	18	4	10	6	40	16
Support	8	-4	10	-5	17	-6	35	-15
Encour. use	13	11	7	7	14	12	34	30
Interactive	3	3	9	9	17	15	29	27
Time	8	-1	11	3	8	2	27	4
Adult Lrn.	3	3	4	2	11	11	18	16
Inf. Exp.	7	3	6	0	3	0	16	3
Totals	177	68	214	89	250	66	641	223

All faculty members at every level of technology use mentioned personal topics, like personal and teaching style frequently. This area combined three topics, so the number of faculty figures in the table represents the number out of 21. All levels of users were positive in their statement with little difference noticeable between the levels. Medium and low level users did speak more frequently than high level users.

Faculty members at all levels spoke frequently about technology use, such as spread sheets for grade management, with little difference between them as far as frequency of statements. Context of all statements was positive.

When talking about the environment (work situation), all levels were negative and spoke freely about their respective situations. Low users said the most and had the highest negative value. Resources, which include equipment and supplies, also affect the work situation so it is closely related to environment. Low users again said the most, three times as much as the high users. Both high and low users were negative about resources, although low users had a higher negative value. It must be noted that more faculty members in the low level group spoke.

About the same number of faculty members spoke at each level about technical, secretarial, and staff support. Low level users spoke of it about twice as much as high level users, and had a higher negative value. Like the resources and environment topics, support affects the working environment. If we look at the frequency of all these topic areas together, low level users spoke more about them than high level users and were more negative. This implies that the working situation for low level users was not perceived as well as for the high level users. Although high level users generally had negative statements about these areas, they were not as negative as the low level users.

Time was mentioned again, but not as frequently. Faculty members were content to talk more about themselves and style, and less about time. When mentioned, it was about technology applications potentially saving time. High level users talked both about time saving and being busier. One faculty member even spoke about using the lack of lab equipment as an approach for teaching students about scheduling. While some high level users spoke positively about time, they also made many negative statements were made also. Medium level users mentioned positive aspects of time savings using software, but some prefaced this by mentioning that more time for research became available. Thoughts on how your time is not really yours slipped in, though the conversation was overall positive in context. Low level users mentioned how new technology allows getting more information out more quickly.

Summary of faculty category. When talking about themselves, most respondents talked about their thoughts on teaching (style) and their personal thoughts (style). The two areas seemed to blend. The main themes, at all levels, were encouraging more student participation, interaction, discussion, and even mention of encouraging adult learning. All levels of users were very positive about involving students in learning, wanting to do this at a greater level. Low level users seemed to talk more about getting students involved, participatory learning, and interaction, as seen by their higher frequency in teaching/personal style and adult learning in Table 10. The consensus was to get away from strictly lecture-based delivery and involve the students more in the classroom. Even the topic adult learning, as used by the faculty members interviewed to mean students taking greater responsibility for their own learning including the finding and developing a variety of resources, fit this pattern.

The initial questions regarding their perceptions of changes in their style, personal beliefs, and learning theories yielded little information about motivating factors in technology use. The faculty members seemed interested in talking about their style but did not necessarily relate it to technology use. More direct questions about using technology brought mentions of word processing, E-mail, using spreadsheets, showed faculty members at all the levels did similar things. In answering these questions, faculty members mentioned topics about the environment, technology use, support, and time that reinforced the model by showing that these factors were important when discussing instructional technology use. This is noted by the frequency of those topics in Table 10.

Some faculty in each group did use spreadsheets for management functions such as grade recording. All faculty members used word processing for preparation and assignments. E-mail was actively used and primarily mentioned by the high level users. Medium and low level users did not speak about using E-mail for their benefit. Some later commented that they had just been hooked up, so their use would be minimal.

Benefit. I looked at the numbers and thought, "What is really missing here?" I look at the number of times factors are mentioned, I look at what they are saying about style, students, and personal beliefs at each level, and what the different use levels were saying seemed similar. When talking about technologies used such as word processing, and spreadsheets, things also seemed similar, but then breaks started occurring. I looked at some uses of technology and at all levels, even low levels, those that used it seemed to perceive a benefit from it or some value to them. The mention of technology use in this category was positive by all users, as noted in table 10, and the positive statements were typically about value. This value may not be especially a personal benefit such as timesavings, but may be something they think is important and that perhaps others may not value as highly.

For example, one high level user did not use presentation software because of the lack of equipment, suitable classrooms for presentation, and the hassle or trying to arrange portable equipment in classrooms that lacked wiring, projection, and the computer. These are all common inhibiting factors cited by low and medium level users.

This faculty member though, was an extremely high level user in other areas, such as E-mail, computer graphics to enhance materials, and information technology. Like Cuban observed about teachers using computers, this faculty member used instructional technologies as an aid where favorable conditions exist. Where unfavorable conditions exist, use was limited (Cuban, 1986, pp. 99). The E-mail in this case is available, the faculty member perceives something of value or benefit to them by using it, so he uses it. The E-mail helps him in meeting teaching and personal goals of more contact with the students and learning more about the students individual learning styles. Presentation software uses, on the other hand, is inhibited by unfavorable conditions such as limited classroom facilities, so trying to use this technology was a hassle. Any benefit perceived from using it does not exceed the disadvantages or barriers to use. Presentation software might potentially provide an enhanced presentation or increased student interest, but the value does not exceed the inconveniences of the situation.

FM 371: Of course, in my classes, they're required to use E-mail, they're required to use word processing.

Interviewer: How do you require, as far as E-mail?

FM 371: They, ahh . . . , there are two ways, one is that I get everyone an E-mail account before the semester begins, so they're waiting for me in my mail box now. When I see my class the first day, I'll hand out their pass word, which they will have to log on and change. So that they'll have their account established and then send everyone a message and tell everyone they have to respond to me. And it's, it's more than just a hello. I ask several questions about them. This is my way of getting to know them as well.

Interviewer: That's a good idea.

FM 371: Developing the personal touch through the computer, because the computer can be somewhat remote and , and abstract for the students.

. . . and another example.

FM 371: ... the other (way my teaching has improved) is I think, E-mail, because it is personal, has enabled that personal contact increase, and while I don't try to play the role of the counseling center, and I refer students to the counseling center, if it looks like they have some considerations that need to be addressed by some one who is professionally trained. I don't discourage students from talking with me about , on the computer, about things that are interfering, or they see as interfering with their studies. But...

When discussing using technology in the classroom for presentation, this faculty member said the following:

Interviewer: In what ways has perhaps your teaching changed in the last, say 5 years or maybe more?

FM 371: In the last 5 years there have been a couple of impacts on my teaching with regard to technology. One, of course, is through the E-mail contact with students and actually giving students information, advice, sometimes assignments over E-mail, and ... the second however is the way in which it has impacted the traditional classroom approach, which I use in the large group instruction. We've never had a room where I could have TV, or a computer monitor with high resolution screens to do things on a keyboard, with software so students could see it right there, but what I have done is to use the computer to enhance and improve the graphics that I use in class. So everything from, from maps to graphs, to ah, the lecture notes or the discussion notes I'm going to use are done in a way now that, that, the font is large enough, it's bold enough, that the students who are sitting......

and about the presentation---

Interviewer: How about your presentation delivery? You mentioned a few things that changed a little bit. Can you elaborate on that? As far as delivery in the classroom, has that changed any? You use overheads?

FM 371: Yeah, I use overheads more, I use slides. I think with ah, what technology has enabled me to do as well is to, to, uh prepare an aid, an outline or an account of what I'm going to do in class, that I make available then to students. But going back ten years, sometimes I'd do that but then I wouldn't, ah, be too anxious to revise it the next term because if that's going back and retyping the whole thing, on a IBM Selectric Typewriter. Going through that whole process, where as now you can just store it and you come back, review it, make your changes in there, you do your upgrading of it, your fine tuning of it, then you go back with it.

Interviewer: Now do you try to make like slides up using some of the software the Power Point and that? Do you use a lot of that?

FM 371 Yeah, I haven't used, used ah Power Point but I, I have used Mc Draw, and Claris Works.

Interviewer: But usually then you have the slide made up as opposed to trying to use a computer screen.

FM 371: Yes.

and later he added,...

FM 371: Even when I go to the Fetzer Center, and the business college, which are probably our 2 premier examples of technological application, I don't see very much that where technology really enhances the delivery or ah, the content or the concepts, or the theories, to the students.

I don't think we've moved ahead in that direction (presentation).

Here, a high level user uses E-mail because it enables him to do something he thinks is beneficial or important and is of primary interest to him. Nevertheless, where he does not see an obvious benefit or the conditions are unfavorable, his use is extremely limited, such as with the presentation software in the classrooms. He also makes a strong point in favor of model components when talking about presentation above. He notes that he does think technology has not enhanced delivery of ideas, of content, or of theories to students. It seems he is implying that he does not, at this time, see improvement or value to the degree it is worth the inconvenience of trying to get the equipment to do the presentations.

This held true for the low level user also, in that the unfavorable conditions and limited perceived benefits restrain technology use. One low level user, when asked whether they use technology to help grading and classroom management, implied she did not use spread sheets because she did not like to play with computers. When asked whether she encouraged the use of E-mail, since her students are professional and take evening classes, she responded just about the opposite of the high level user. She does not encourage E-mail because she thought it took too much time and that the messages are a nuisance. In both cases, perceived value or benefit was absent.

Interviewer: Being most of your students are professionals with families and limited time, have you responded in any way uhm, perhaps do you encourage use of E-mail to contact you, say extend your office hours type thing?

FM 188: Well, we have a requirement of 8 hours of office hours a week. So I can't see extending them anymore.

Interviewer: Right, but what I was referring to is using that E-mail as a student's opportunity to get a hold of you, uh..

FM 188: I have not encouraged it because I am doing some committee work, our department is now on E-mail, I have three listserves, and the few students who have found their way to me through E-mail, sometimes I don't get to them, and I don't know that they're on there, and ... plus there are other demands and so they could sit there. I think it is a whole lot, if you want me to be responsive, what I happen to say call me on the, on the voice mail. Leave me some times, when I can get in contact with you. Uhm, we have a lot of people from Grand Rapids, Grand Haven, we go all over. I say "there is no reason why you, why you have to drive that way to see me for a half hour for quick questions. Call, let's set up a phone appointment."

So I try to be responsive that way. E-mail, takes up too much of my time to compose an answer. Cause they all have the same basic questions. Uhm, and it's whole lot easier to do it by phone. Now it's a whole lot more expensive, but if my time is worth money, then I look for the most efficient way. If it's not, which is some of the messages we've been getting in our department, is that our time is not valuable. Uhm, we, we have to do a whole lot of stuff, you know, I'm, uh, I empty my own basket and garbage can!...(pause)...

In reference to spreadsheet use for grade management, this low level user did not see or imply a benefit to doing it.

Interviewer: Uhm... as far as your using that computer to organize or manage your grades on it, like a spreadsheet or anything like that?

FM 188: No, I don't do that. I do type up comments that I hand the students sometimes, but I haven't done a spread sheet because our, I know some faculty who do but, .. I don't like to play with computers a lot, and we have these grade sheets, these pink things. And I just write it down there, because I take stuff home, and you know, grade... and I do a lot of hand written comments on papers and... so I write a grade, and so it's a whole lot easier to write it our on a piece of paper than coming back in to enter on my computer...

Interviewer: so then I assume you do not have a computer at home?

FM 188: Oh... I do have a computer at home but, in order to get my data transcribed I had to bring it here and set it up someplace else, so my students could use it for transcription,... cause no one had any space for equipment for my students to use to teach transcription use except for this and I can't vacate my office to get that done,... so my home computer is here.

Again the emphasis is on what the faculty member perceives as unfavorable conditions, that limit the use of the technology in both cases. Here, in contrast with the high level user, a benefit or value was not realized that would induce the faculty member to use a technology even in unsatisfactory conditions. Here, the faculty member's assessment was that doing it another way was easier and more efficient or that this method or style of grading did not lend itself to use of technology. As she stated, she perceived it as a lot easier for her to continue to keep her grades as she is currently doing. No benefit was seen.

Both of the above instances were affected some by varying conditions on factors that may have influenced their use of instructional technology. The high user had seen some value in using it where as the low user cited had not realized a benefit from using it. The high level user had an interest in getting to know students' backgrounds and culture so they could learn more about students' learning styles. Although they taught large classes, they saw E-mail as a vehicle by which to increase personal contact with the students and learn more about them. Using E-mail eased accomplishing something of interest to them, or something they perceived as important. Using presentation software, on the other hand, was inhibited by lack of suitable classroom facilities and did not provide enough perceived benefit for high level users to try to overcome the barriers and use the technology. The user did not see that delivery of the content was greatly improved to justify using the technology. Enough value to using this technology over what they are currently doing is not realized and so they choose not to use it.

The same situation seemed evident with the low level user example. In this example, neither using spreadsheets for grade management nor E-mail for extended communication provided a more effective way of doing a task for this person, so neither were used regularly.

At face value both examples fit the scenario that expected value may serve to motivate action, here to use of technology. The difference in the high and low user in this example, is that the high level users did use a particular technology because he saw a benefit, though he did not with another one. The low level users saw no value to the technologies discussed, not using any of them as a result. Further comparisons in other areas reveal attitude and environment differences that could also contribute.

These are just two individual examples, one high level user and one low level user and can hardly be generalized into representing the two groups. They do show how perceived benefit influences the decision to use a technology. Noting what they focus on and how they expressed their answers is important.

Now, do keep in mind, the high level user here is an established, tenured full professor while the low level user is a younger, new faculty member on tenure track.

Based on that fact alone, it is understandable that their perceptions on what is of value and how they should spend their time is going to be different. A tenured professor need not be as concerned about doing the activities necessary to achieve tenure as an untenured faculty member would be. As a result, the tenured person has a little more freedom to direct their time toward activities that they value or want as opposed to the things necessary to get tenured, like publishing, research, and during committee work.

The questions focus on the faculty component, the faculty members' perceptions of changes about their beliefs about teaching, their style, and their class management/ organization. The high level user appeared more positive, even in discussing the area such as presentation, where he implied facilities have inhibited him. He did not dwell on the issue, but moved ahead on how he does use technology in another way to enhance presentation.

The low level user seemed to spend more time describing why they do not use the technology, from an almost defensive stance. This tone or attitude toward technology I thought was negative, where as the high level user just stated why that situation did not permit use and moved on. It may not be so much what the two said differently, but how the two levels of users said it. Of course, many factors including those in the model, influence an individual's experience on an issue. For example, good administrative support overall can temper one's statements toward an issue even if it is in an area where support is the weakest.

Typically, adopting a new instructional technology means a change in how something is done, which would require work or effort to make the change. An important circumstance, such as a changing of student profile or incorporation of a new curriculum, might make using the new technology logical or helpful. Then, it seems logical that using new technology would benefit the faculty member. However, other factors that inhibit use may prevent using the technology. For example, the faculty's own perceptions of themselves and the technology could cause the use of a new instructional technology to be difficult by affecting their attitude. Circumstances in the work environment can also serve to make it difficult to incorporate a technology into your teaching. For example, it may be that no recognition or reward is readily realized by the faculty. The Campus Computing Survey, 1997, reports that only about 12.2% of colleges or universities recognize or reward faculty instructional technology efforts as part of the faculty review and promotion activities efforts (Gilbert, 1997).

According to Green, "The vast majority of campuses are sending a clear, if somewhat punitive message to faculty: do more with technology, but learn the skill on your own time and do it in addition to your other professional responsibilities" (Gilbert, 1997). With no perceived benefit or value by faculty members, it is likely that use will not occur or be restricted. This may also be influenced by the interaction of learner, faculty, technology, and environmental factors. Perceptions of changes in these areas may motivate or inhibit the use of the technology.

The low level user above, in other categories of the interview, complained about lack of support, the administrative pressure to get grants for equipment, and general dissatisfaction with the working situation overall. All these factors fit the model, and contrast with the high level users typically. As expressed earlier, it is not just one component that is going to decide instructional technology use, but a mix of many factors.

Technology Model Component Questions

The technology section focuses on users' perceptions of technology and their attitudes toward use. Questions concerned interactivity of technology, ease of use, the faculty member's experience with technology, and their attitude. As seen earlier in Table 4, the total number of comments in the technology question section was 622 with an overall value of -50. This was the third largest number of comments, following the environment section and the faculty section. Medium level users said the most, with 225 comments on topics with a positive value of 42. Low level users' comments amounted to 204 and the value -46. High level users made 193 comments and the value was -46. This value of the topics was not consistent with the previous sections, where all the levels of use show positive values in the general, learner, and faculty categories. This value pattern does exist if we consider only those technology topics mentioned 15 or more times. In that case, as seen earlier in Table 5, high users mentioned topics 171 times with a value -33, medium users 205 times with a value of 37, and low users 174 times with a value -25. The noticeable difference is that medium spoke the most about technology and positively, contrasting with both high and low level users.

Topic areas that were frequently mentioned in questioning interviewees about technology include: the improvements of technology, comfort, ease of use, use as a tool, product application, anxiety, attitude, time, survival, support, hassle (of use), creativity, politics, faculty age, facilities, technology access, resources, use to enhance presentations, the human factor, and technology teaching interface. As with the faculty component topics previously, similar topics are combined to reduce the number of topics in the table. The following topics were combined for convenience:

products - improvement, comfort, and ease

Env. - support, resources, hassle, facilities, politics, survival, and access

tool - tool, product application, teach/technology, and enhance presentation

This was done in part to reduce the size of the following table and make it easier to read.

The combined topics--environment, tools, and products--are now the most frequently mentioned. Environment had a negative value while tools and products were positive. Of the remaining topics, all had overall negative values but attitude and creativity. Table 11 provides frequency counts and values for topics in the faculty category.

Table 11

Technology							
High		Medium		Low			
Freq.	**Value**	**Freq.**	**Value**	**Freq.**	**Value**	**Total count**	**Total value**
63	-36	44	-23	39	-18	146	-77
20	2	37	23	39	-7	96	18
25	15	33	28	36	18	94	61
23	3	23	14	19	-1	65	16
20	-12	23	-9	15	-9	58	-30
5	-4	12	-2	12	-8	29	-14
4	1	15	15	7	7	26	23
5	-4	13	-10	2	-2	20	-16
6	2	5	1	5	-5	16	-2
171	-33	205	37	174	-25	550	-21

In looking at the combined <u>environment</u> topics, the high users had the most to say followed by the medium and low users. This combined topic covered many things that affect working situations, such as the resources, access to equipment, and support. Politics, and the ever present need to survive or gain tenure, were also included. Each level of user was overall negative, with the high users being more so. High users did, however, mention these topics more. About the same number of faculty members in each group discussed the environmental topics.

The combined tool topic includes using technology as a tool, the product application, incorporating technology in teaching, and using it to enhance presentations. High and medium users were positive about this, but the low users were negative. While the high users and some medium users were positive about technology in teaching and its potential, the low users were negative. They seemed to talk more about problems, said things like the pretty pictures were not worth the hassle or time, or that it was not useful for what they were doing.

The product topic is what the faculty members said about whether technology is improving or not. It included the comfort and ease of use and if faculty members thought the products were becoming more useful. About the same number of faculty members in each use level talked about these topics, with medium and high users saying more. All levels were also positive in their statements.

Attitudes toward technology were frequently mentioned also. Most faculty members in each group talked about the issue and were positive, except the low-level group. The low-level group mentioned the topic less, and the value was negative. Some low-level users implied they were overwhelmed by technology and trying to keep pace with the upgrades in software. They also reported frustration in getting support, which they admitted, influenced their attitude.

The topics of time and anxiety were both negative. When talking about time, the ones who spoke about it at each level seemed to express frustration in finding time to do what they wanted. Some expressed that technology is a time saving device, but it takes time to learn the technology and keep up to date with it. Anxiety related to technology sometimes influence the use of technology. In this discussion, all levels of users expressed a negative tone toward it. Low and medium level users talked more about it than high level users, but all seemed to express similar concerns, trying to stay current or dealing with technical problems causes the anxiety.

In discussing the technology questions, environment topics, time, and anxiety were topics that were of negative value for all levels of users. Concerns were similar and the topics were typically negative value, regardless of level of use. Topics such as faculty age and the human factor in technology use (balance in life, friendlier technologies) which were mentioned less, also had an overall negative value, but not all levels were negative. The high level users, in spite of expressing negative aspects of some topics in this discussion, must have enough positive value in other areas of the model to perceive a benefit in using instructional technology.

Summary. In questioning the faculty members about technology, many topics came up that may be equally well placed in other categories, but are related to the actual technology used. Many things interconnect in the conversations during this set of questions, and serve as suitable examples of what the faculty was thinking. Not only do faculty members discuss the technology, but they relate how attitudes toward technology may be influenced by lack of support. This of course relates to the working environment, another component in the model. In each section of the interview format, topics are brought out that fit in with the other components of the model, reinforcing the model as an explanation of instructional technology use.

Time is a good illustration. Since technology was the factor discussed, mention of time may detail time saved or lost due to new technologies. This was the case, but comments also concerned personal concerns about time being spent related to technology. For example, a user might imply time saved by technology, but lament about the time necessary to learn a new technology. It worked out that all levels of users were overall negative when speaking of the aspects of time. Each level had a proportionate mix of statements revolving around time, predominately negatives, with a few brief positive expressions put in.

Time has been mentioned in each of the other categories, as positive in some and negative in others. All level users talk about time savings with technology, but frequently talk about losing time from other things when learning the technology. Negative comments are frequently about not having enough time, being overwhelmed, and having to spend more time to learn the technologies. Positive comments, like some from the high users, were more often about technology, enabling them to save time.

Benefit. In the example below, a high level user seems optimistic toward technology and work saving potential. She implies she has an open attitude toward technology because she thinks of technology as a labor saving device.

Interviewer: How have you, in regards to technology, changed in the five years as far as knowledge, experience, or your attitude towards technology?

FM 703: I think some people, especially my age, think Ohhh!, I have computer phobia. But I have never felt that way, I don't know why. I, uhmm, and I've always been open to find out what new labor saving devices are out there, so ah, I think my attitude has always been one of openness and ...

Interviewer: How about your feelings on technology in teaching, effectiveness? Has that changed any?

FM 703: Uh!! I'd like to do a lot more with it for teaching, than I have time to get things set up. I'd like to have some instructional stuff on computer, but there just is not the amount of time available to develop what my students need individually, so ...

I think there are a lot more things I could be doing I'm not doing.

This faculty member is tenured and in a secure position so essentially is not as concerned about how they devote their time. However, another high level user, a younger faculty with only a few years at the university, seemed to express greater concern about how her time is spent. Although she would like to use presentation technology, she does not see enough benefit to overcome the time loss involved in arranging equipment and setting up for one lecture. Besides time, she expressed concern that facilities were not available to use some presentation technologies. After praising technology improvements and the greater cross-platform accessibility of technology, this faculty member expressed frustrations toward the university about inability to use technologies because of facilities problems. While this surfaced in the questions about technologies, it was apparent throughout this faculty member's interview, that although she is a rated high user, her use in some areas of technology is greatly restricted by environment.

FM 74: ... all those things I think are really positive. I'm very frustrated in the university in that they're encouraging us by setting up this instructional technology group and giving seminars and brown bag lunches, and say "do this, do this, learn about this,". . . and then when you go implement it they have 4 classrooms on campus that you could teach like that in. And you can't get into those rooms! I had to go on a waiting list to get into the rooms that I got into. We do have some equipment that you can get for day or something, over from Dunbar, but you have to sign it out and go get it and bring it over, and set it up, and you know, I did it for a demonstration in a class. I gave one lecture and then I went and got all the stuff; It took me , you know, 3 hours to get ready to give a 45 minute lecture just to show that what you can do with Power Point and those kind of things, and, I , I just think they , they have to start putting their money where their mouth is. You know they say "we want you to improve your teaching and get these different technologies up and running, and we're going"... It provides resources galore and , I guess each faculty member has so many

> dollars that they can use in terms of time, personnel time, and stuff like that preparation over it instructional technology. And they've been very helpful, but the thing is you get your presentation and there is no where to present it. You can't use it...

This high level user is frustrated in that she does not have the opportunity to use some instructional technologies, such as presentation software, because of limited facilities. This instance illustrates not only concern for time spent arranging to use technology, but also the frustrations of the limited facilities. The comments illustrate the components of technology and environment appear to influence this faculty member's decision to use certain instructional technologies. Although the category of discussion is technology, environment is a major part of the discussion, reinforcing the multiple components of the model. She appears willing to use presentation software, but lack of facilities inhibits this. While the technology appears to offer her a benefit in large class instruction, the environment inhibits the use for this faculty member. So while a benefit is seen, the value is not enough to overcome the inhibiting factors.

Other high level users expressed similar concerns at time lost. Again, they are positive toward technology and potential time savings, but negative about their own time lost. They comment on the fact that, with a Graphic User Interface (GUI) such as Windows ™, there is not the need to memorize commands, but then they continue to mention that the technology has also caused more work. I am focusing on the high level users to illustrate that often they are saying similar things that the low level users are (such as negative expressions on personal time lost) on some topics, yet find other areas where technology is beneficial or find reasons that make the positive aspects outweigh the negative aspects of technology use. This could be personal satisfaction, a better work situation, or just a better attitude.

FM 432: ... not enough divisions to our programs to really keep up to date with the changing technology. And, that is probably resulting into some eager students and the faculty who want to keep up, do more work on their own, with out them having available resources that, okay, where you can go an take one class, and can learn this new tool, and apply here for the development work for our thesis. So, the students and, I think, most faculty who are eager to be with the changing technology, have to work on their own more.

Interviewer: What do you think of that? Is that positive?

FM 432: Well, ehh, looking at the medium to long term benefit, putting in the extra hours now, is going to be still positive.

Interviewer: But overall?

FM 432: Overall it is , it is caused , uhm, problems in terms of available resources, basically time. I mean, instead of working 12 hours a day, to 12 to 18 hours a day.

Though a high-level user and expressing some benefit to using technology, this user also expresses the negative factor of personal time lost. They comment that a resource, time, is not as available.

Medium users expressed similar concerns, as did low level users. Some comments focused on the negative aspects of losing time, or asking the question if the new technology is more effective rather than this being the consequence of another problem. Some of these users seemed to question the use of technology as a benefit to them concerning time, where the high level users seemed assured of this and did not question whether they should use it or not. The examples below illustrate this view.

FM 385: On of the biggest problems with technology, we'll take the Internet for example, if that's what you consider technology.

Interviewer: Yes, that is included.

FM 385: I think the biggest thing about the Internet is, there is a lot of stuff out there, but there is a lot of garbage out there. And you have to work through this garbage to get to the good stuff. Uh, that's been one of my, one of my biggest things about doing searches and stuff. You just end up on somebody's home page that's garbage.

Interviewer: That's time consuming too?

FM 385: Yeah,..Yeah!

Interviewer: Have you changed in regards to technology in the last five years? Experience, knowledge, your attitude toward it?

FM 385: No! I've always been a willing adopter and user of technology. Uhmm... basically just time limitations, that is probably the biggest hinderance to this.

Uhmm... , you know to learn about this, it's you know, I'd just like say going through the net, that takes a while, a lot of time. There is some good stuff out there, and ... but it does require time to really formulate this.

In talking about another topic, a low level user was positive in expressing the changes they perceived in technology. They said they were becoming more comfortable and technology is easier. However, frustrations were expressed toward the time it took to get hooked up to E-mail and other technologies. She was concerned about the support issue in that the wait to get E-mail capabilities was extensive. This factor and others seem to have influenced this user's attitude toward instructional technology use so that positive aspects are not beneficial enough to outweigh the negative factors. This shows how the multiple components of the model all combine to influence the decision to use a technology. If enough factors inhibit use to the point that the faculty member does not think any value or benefit to using technology is worth the effort required, they will not attempt to incorporate it into their teaching.

FM 188: It took awhile to get E-mail. Because.., you know I got this new computer, and I was told I had to get it connected, and to go through a particular way, and I did, and I waited 6 months after that and I called UCC, ask for people to call back, I did that 3 times and nothing happened. And finally there was a technician, hardware technician, around here one day, and I said "would you pleaseeeee have pity." So he said "okay, I'm not supposed to do this." Went over to UCC, got what he needed, came back and got me hooked up. It was 6 months. I was livid. They were so unresponsive. And he had pity and helped me. So my attitude toward technology sort of waivers with the service.

Lack of support here seems the most influential in using technology. An environmental topic, it appears in the technology section discussion also. Without adequate support, the technology is not available or useable and attitudes are shaped. It is not only a matter of making E-mail available, but here it may potentially influence future use because of an attitude toward technology developed from the poor initial support. Later she adds . . .

FM 188: So no, I haven't gotten over this attitude of mine (laugh), that it's, you have to put up with a whole lot of frustration and bother. You have to be willing to do that. Uhmm, because we, the technology is changing, uh, that's another thing. The technology is changing so fast you're never up-to-date. I mean as soon as I bought my Mac it was out dated. It drives me nuts....

And . . .

FM 188: I'm not going to spend my.., it's like a typewriter to me. Any piece of technology, I don't want to figure out how to , I want it to run. I don't wanna have a stranded computer like a stranded car and then I have to figure out how to get it running again.

While this user expressed positive aspects about the technology, a great deal of the conversation focused on negative aspects of having to wait for E-mail hook up and the attitude that has been ingrained toward technology. The high user, while frustrated about trying to use technology, focused frustration on working with the system. The medium user expressed his willingness to use technologies, but said that much garbage comes with certain parts, which was time consuming. He implied a good/bad scenario to technology. The low user however, commented on ever changing technology and expressed a poor attitude overall.

The examples above reinforce the study model. They show that during the discussion, which is to focus on technology, topics that could also be in other component areas are discussed. As the model suggests, factors from all the components influence the attitudes toward technology and potentially the decision to use technology. These examples also contrast the high users from the low. Both relate similar experiences that have a negative context about time. High users must find some benefit where the value of using the technology can overcome the frustrations mentioned. Their attitude has not soured toward technology and they often use technology in another area where conditions are more conducive. The low level users, however, have not found technology use beneficial enough to overcome the prohibitive factors they discussed. Often, the negative experience with technology in one area, has shaped their attitude and influences their assessment of other technologies.

In this section of questions focusing on technology, the topics of technology as a tool and attitude toward technology were both frequently mentioned items, and a difference between the high and low users was evident. While both levels frequently mentioned the items, high level users overall value was positive while the low level user's value was negative. This suggests that high level users spoke more positively about using technology while low level users did not have as many positive things to say about this topic. For example, one low level user mentioned how she was not a "computer scientist" and needed support in labs to help correct problems. Her overall attitude seemed negative, which I think influenced her use of technology. When asked about using presentation software in class, she mentioned difficulties and crashes in labs.

FM 499: Okay, okay, I (tried) . . . basically a few times, I gave up.

She seemed frustrated and as a result did not project a positive attitude toward instructional technology use. I discussing personal changes in knowledge and experience with technology, she at first seemed positive.

Interviewer: . . . has your knowledge and experience with technology changed any in the past 4-5 years?

FM 499: Yes . . yes! Uhm, it has increased in the areas of both computers and calculators.

Interviewer: Why?

FM 499: Because all of a sudden its just as though there's a massive explosion of activity, you know all around the country using graphing calculators and computers to look at these important topics such as calculus. The kids looking at pattern recognition and different kinds . . .

Interviewer: Do you consider yourself a high user of technology?

FM 499: I probably know about as many ways as anyone, how to use a computer to teach math class, but I wouldn't call myself a frequent user. There are things that discourage me from using labs when there aren't lab assistants there. I need a lab assistant! I'm more a mathematician than I am a computer scientist. I need someone there to help out if the software is incompatible or things go wrong or what ever. Uhm, I was at another institution before coming here that was very very rich in computer resources. You just went and called up in the morning, "I'm bringing a class over tomorrow." You arrive there, there is someone in the lab. You taught, you didn't worry about, you know . . .

. . . I was spoiled . . . I was taught that way.

FM 499 has an attitude toward technology influenced by previous situations. She implies that the technology is a tool when she states she is more of a mathematician than a computer scientist. I think this is an important statement in seeing what her attitude toward technology is and what her expectations are. She wants to teach and not be concerned with the dynamics of the technology system. It also reinforces the thought that many faculty members are teaching the way they were taught in college so accepting the change, apparent when using instructional technology in teaching, is often hard.

This example also reinforces the model as a useful tool in explaining instructional technology use. Many things, including her attitude, her experiences in the past, and the lack of support, influence this faculty member's non use of instructional technology. These fit the faculty, technology, and environment components of the model. Similar to

Bandura's social cognitive learning theory's reciprocal determinants, several components may be influencing this faculty member's limited instructional technology use.

FM 499: . . . I go over to some of the other buildings, I was using labs there because we did not have a math lab here at the time, and uh, you know, could be perceived as being demanding. I was expecting that there a graduate student would be there, or that an undergraduate. Or someone! But there is no one!

Yet network labs have all kinds of glitches. You have to know how to work that network. I didn't know, and I wanted to put software on; I come in and wanted to put it on the machine and go, and . . . Oh no, . . . no! You have to come over find so and so get their permission, and blah, blah, blah. And I'm thinking I'm <u>faculty</u>!

Interviewer: So you think you would be a more frequent user if . . .

FM 499: If it were easier, . . more support.

I think this again reinforces what was said previously about model components being influential factors. Perceived changes in the components all influences the situation.

Interviewer: Do you use any technology in your classroom presentations?

FM 499: As I mentioned earlier, I want , I began using another faculty member's grant achieved lap top hooked up to a beautiful overhead display, but that meant I had to find him every time I was going to teach the class. And I wasn't comfortable with that enough. He helped me set it up. And I would get in the class, and sometimes it would bomb, and I would have to go find him.

Here again, the faculty member's attitude is more negative toward instructional technology use in the class because of the hassle. Unsatisfactory arrangements in the past have influenced this faculty member's attitude toward attempting to use this type of technology again. Any value she perceives in using presentation software for class is negated by inadequate arrangements for equipment. No potential benefit is realized to using this technology, so the faculty member does not use it.

When asked what they related as the most influential component, FM 499 said: "Having the equipment and having support for it." She was a low level user, whose area of expertise is application of computers and graphing calculators to math education, who is negative toward instructional technology use. This was related to a mix of components that included the factors of attitude past teaching experience, and present working conditions. These support the mix of the model component of faculty, technology, and environment as explaining non use. The example also emphasizes that she does not perceive enough value to using instructional technology to overcome the inconvenience of unavailability of equipment, lack of facilities, and limited support.

Contrast the attitude of the above low user with that of FM 74, a high user. Both had been teaching at the university for a limited time and were not tenured. Both had the same pressure of tenure requirements to deal with. One difference between the two that aids in shaping attitudes toward technology would be their working situation, as each department or college differs in policies. First, this high level user talks briefly of the same types of frustrations expressed by the low level user. She expresses the frustration of not having equipment or facilities readily available. She mentions the university encourages use of presentation software, helps some with resources, but after preparing presentation, facilities to use them are not available.

FM 74: . . . you get your presentation, and there is not were for you to present it. You can't use it in the classroom.

She continues to talk about the difficulty of accessing the few classrooms that are equipped.

Interviewer: So how do you feel about this? Frustrated?

FM 74: Yeah! I find it very frustrating . . . that, that, the idea is, oh yes, please do all this stuff, then there is not where to do it.

She mentioned you can check out equipment but . . .

FM 74: . . . but when we have 10 minutes between classes, you just don't have the time to set your technology, unless there is no class in there before yours

. . . the time that you need basically to have everything ready to have everything ready to go, because in 10 minutes, usually less, you don't necessarily have your full 10 minutes to prepare . . .

This may have been too leading on my part, because I suggested "frustrated" to her. I tried to guard myself from being too suggestive so as not to compromise the validity of the study, but being a relatively inexperienced interviewer, this was difficult. Later I asked:

Interviewer: So this has influenced your use quite a bit?

FM 74: Well, well . . .

The reply was in the tone that was almost like a question suggesting "shouldn't it?" About anxiety associated with failure of the equipment to function properly, this high level user said:

FM 74: Oh, I worry about, I guess, knowing equipment, and I've had enough problems with the simple overhead projectors not running, that I worry the more we get, like you get in there and your computer doesn't work and your . . . uhm, but you just have to be ready with back up, overheads and things to do. I'm not afraid of, you know, those kinds of things. I don't mind ghenking around with them a little.

I do think if you have too much of that you have to do, like every day you have things breaking down or not running, or it takes you 15 minutes to get started and you only have 5 so you start late every day. I think the students would get fed up with that pretty quickly, but . . .

I think it is interesting that though addressing the same problem as the low level users, this high level user seems unfazed by the possibility of equipment failure and suggests the need to have back up materials prepared. The high level user also suggested that students would get tired of equipment failures, expressing concern not so much about her frustration, but that students might not be well served.

Interviewer: Your attitude toward technology though is pretty positive?

FM 74: Yeah! I went to meetings about it where I've seen how it's been used in smaller schools, even that have used it very extensively. It's amazing. It's wonderful. So it can be done.

Here the high level user has just spent several minutes expressing frustrations, admitting some anxiety about breakdowns, yet expressing a positive attitude toward technology. Unlike the previous low-level user, this high level user was optimistic. She just implies that you have to be ready to deal with problems, like having backup lessons or materials.

A medium level user, when asked about attitude toward technology offers a different perspective.

Interviewer: Your attitude toward technology, has that changed any?

FM 596: No uhm, the technology is far faster, it's getting better, faster. . couldn't be happier.

I mean I don't want to substitute technology for the subject matter. Technology is here to serve the worker in whatever subject matter you have. It's got to be creatively adapted to that, but there is a lot of creative adaptation going on. I have been, as I've said, disappointed with some of the stuff that is available, for the introductory course in engineering. I don't think that textbook publishers are doing a very good job. Basically they're trying to sell textbooks.

The medium level user expresses disappointment toward material suppliers rather than frustrations with equipment and other situations. His attitude is excellent, by his assessment, but his concern is with the suppliers of educational materials to use in classes. He does not address developing his own efforts, but only mentions the supplier.

The above examples illustrate differences between the high and low users in discussing technology. Both faculty members expressed frustrations but the high level user managed to be more optimistic about the situation. While frustrated with lack of facilities available for classroom presentations or computer use, she remained optimistic and commented on maintaining positive attitude toward technology because she realized what was possible. The low-level user was less optimistic, even negative and commented on how, as faculty she should not have to be concerned with hardware/software failures. The high level user just implied that one needs to have a backup to cover those situations. This was often the noticeable difference between high and low level users. High level users seemed to accept the situation and work with it, while low level users often focused their discussions on the inhibiting factors. Low level users appeared overwhelmed, while high level users were positive and optimistic. Since the two levels commented on the same problems and were often frustrated by the same factors, the difference was in how they reacted to the circumstances. This did not necessarily translate to major differences in the value numbers that established a pattern, but came through in discussions by the way they talked about other topics and moved off the negative issues. The medium level user cited commented on lack of material but did not appear concerned so their attitude did not contrast that much with the high level user.

Environment Model Component Questions

The environmental factors, such as working conditions, teaching situations, the university atmosphere, and other similar factors, was an area that seemed important to all levels of technology users. Why not? The conditions under which teachers or faculty toil on a daily basis, both physical and emotional, influence the way they do things. Larry Cuban suggests this in talking about public school teachers when he states:

> Consider not the importance of classrooms as work places. The issues teachers face daily are anchored in the very nature of compulsory schooling and the organizational settings that have been constructed in response to the demands for mass schooling. As part of their occupational culture, teachers have built informal criteria for what will and won't work in their classrooms. These criteria by which teachers judge what is productive are embedded in an ethic of practicality. Craft wisdom, lore, experienced-based repertories, and formal policies buttress these criteria. While teacher responses change over time as their beliefs alter and as they react to different surroundings, marginal alterations in practice can't be identified over time (1986, pp. 107,108).

Evans (1986), in writing about resistance to innovation in higher education, cites the nature of the social system as an influencing component by which individuals are exposed to, assess, and eventually adopt or reject innovation. At the university, this involves many expectations and political issues, such as teaching/research conflicts or the rigors of the promotion/tenure system. These issues shape the way things are done at a university and are especially influential to newer faculty seeking tenure.

Faculty in higher education are faced with workplace issues resulting from university organizational settings established by practice over time. Modeling their teaching style, technology use, and management style from their previous university experience is normal for faculty members. Most faculty members teach like their classes were taught during their university schooling. Like public schools, universities have been slow to change their practices and continue based on past traditions and policies with little change. Since it is natural to teach as we have been taught, many of our current teaching styles are probably based on what has been done in universities for years. Faculty members also react to changes in the system resulting from students, the administration, and the physical conditions in which they teach, such as facilities and equipment access.

The environment or working condition's category produced the most number of comments of any of the question categories (see earlier Table 5). A combined sum of all the comments tallied in this question category was 747, more than previous sections. Overall context of all the statements was negative, as the value was -238. The most tallied comments were from the low-level user's group with 285 comments with an overall negative value of 113. The medium level user's group followed this with 258 comments and an overall value of -101. The high level user's group had the least to say with 204 comments at an overall negative value of -24.

In the questions involving the working climate or the environment, the following topics or issues were mentioned at least 15 times or more: changing university conditions, equipment availability, class size, training, funding, facilities, support, survival, hassle, resources, students, benefit/reward ratio, time, politics, others using, home office use, money (availability), technology maintenance, expectations, administration pressure, working conditions, and external pressure. As seen in the previous Table 6, even when considering only the most frequent topics, the environment category still had the most comments and retained a negative value.

As with the previous tables mentioned, to reduce the number of topics I combined similar topics. The following topics were combined:

Equipment - availability, facilities, hassle

Support - support, resources, funding, money, maintaining technology

Conditions - class size, working conditions, administrative pressure, external pressure

Politics - politics, benefit/reward, survival

This was to reduce the size of the following table and to make it easier to read.

After combining the similar topics, support, conditions, equipment, and politics were the most frequently mentioned topics in the environment category. Each was negative overall, and in fact all levels of users were negative on these topics except high users, which had a positive value on support. Table 12 provides the frequency count and values for the topics in environment.

Table 12

	Environment							
	High		Medium		Low			
Topics	**Freq.**	**Value**	**Freq.**	**Value**	**Freq.**	**Value**	**Total count**	**Total value**
Support	62	2	64	-23	59	-16	185	-37
Conditions	22	-13	46	-17	53	-20	121	-50
Equip.	31	-3	28	-10	29	-11	88	-24
Politics	15	-9	39	-33	32	-22	86	-64
Time	13	-5	12	-10	15	-15	40	-30
Univ. Chng.	5	-1	16	1	16	-1	37	-1
Training	8	4	10	-4	16	-8	34	-8
Hm./Off.	15	2	5	1	12	-1	32	2
Others use	12	4	5	1	12	7	29	12
Expect	6	-4	4	1	7	-5	17	-8
Students	4	3	10	0	2	2	16	5
Totals	193	-20	239	-93	253	-90	685	-203

The combined topic of support included topics of support, resources, funding, money and the maintaining of the technology. All these items are typically important to faculty members in their working environment. Medium users frequency was the highest, but not by much. What is noticeable is that the high users had a positive value, though it is only two, while medium users were negative, as were low users. This implies that high level users have better support, which is reinforced by the comments. High users typically described the support as fair to good, and resources improving. They mentioned good technical support, but implied funding from the university was weak. Medium and low users talked about the difficulty of getting technical support, equipment, poor software resources, and difficulty getting matching funds.

Conditions, such as class size, administrative pressure, and external pressure, were a frequently mentioned topic that had a negative valence for all level of users. High level users talked less about these topics than medium or low, but the context was negative as it was for the medium and low users. While medium and low level users' frequency of mention was more than twice that of the high level users, the value was only slightly higher. Among things mentioned were: classes were at the maximum level in size, equipment for classes was difficult to get, little change as far as updating classrooms for instructional technology, software not current, and the administration changing times and assignments.

Equipment topics discussed availability, facilities, and the hassle of arranging for equipment to use. It was a negative topic for all level of users. One interesting note is that all levels of users mentioned that the university has made equipment available to the students, but have not kept pace with the faculty members. It was frequently stated that a lack of balance exists in what is made available to students and faculty. The lack of facilities came into discussion at all levels of use. That only four classrooms on campus were set up for presentation software was emphasized, as was the time lag in getting the office hooked-up for E-mail.

Politics includes politics (university direction), the benefit/reward system, and the survival instinct. This topic was negative for all levels, but very negative for medium users. High users did not mention it with the frequency of the medium and low level users, being less than half the count. Some high level users that were established tenured faculty, showed empathy for new faculty coming in and seeking tenure. It was implied that the research focus of the university dictates the requirements for new faculty members. The medium and low level users mentioned the lack of reward or recognition for teaching, the pressure to do research, and pressure to bring in money to the university. These areas were all closely related to the perceived direction of the university, increasing research, and the survival topic.

Other items mentioned during the discussions include time, training, and the changing university among others. All topics show negative overall value except students and talk about other faculty members using technology. While some talked about other faculty using instructional technology, it seemed positive for all if others were doing the same things they were. Though it did not exist for all, most mentioned the benefit of having someone else using technology in the area for the consultation and sharing of experiences.

Summary of environment category. If the university encourages the use of instructional technology, it is positive and may influence members to use instructional technologies in their teaching. If, however, the university and administration fail to follow up by supporting the use with equipment and classroom facilities designed to use the instructional technologies, this may discourage some faculty and in fact inhibit use. As such, these topics were frequently mentioned not only during this group of questions (environment) but throughout the interviews. They influence how faculty members interpret their environment or working conditions related to equipment use.

When asked about changing conditions at the university, faculty members talked immediately about facilities or equipment availability. Many faculty members, some from all levels of use, mentioned frustration with obtaining equipment and finding classrooms that would support some types of instructional technology use. For example, FM 371 was a high level user of instructional technology, but did not use presentation software. FM 371 found limited classroom facilities to support the use of presentation software and because of the hassle to try to arrange equipment, he chose not to use this technology. He did not perceive enough value to justify the effort. FM 371's high level of use was a result of extensive E-mail and Internet use. Both technologies were readily available, fit FM 371 style, and were instructional in enabling him to develop a stronger relationship with the students, something this faculty member saw as extremely important or valuable to their teaching.

Benefit. This example reinforces the perceived value model component. If conditions exist that promote use of instructional technology and the faculty member sees a value to using it, they will probably decide to use it. Yet other component areas, like the environment, technology etc. may inhibit use as much as the expected value is not enough to justify overcoming the inhibiting factors. University support of instructional technology can serve to set the direction. When asked about the university changing, FM 371 said the following.

Interviewer: Do you think conditions are changing at the university related to instructional technologies, over the past five years?

FM 371: I think we're making some great strides at the university in terms of the availability of technology for student use. On the other hand, even when I go over to the Fetzer Center, and the Business College, which are probably our two premier examples of technological applications, I don't see very much where technology really enhances the delivery of the content, the concepts, or the theories to the students. What I'm comparing it to is the building that was built at Indiana University by AT & T, where the lecture halls and everything have computers built in they have large screens for projection of what's.. and high resolution of what's on the computer screen. And the availability of, of data for when students raise a questions the professor can go back to these data; they can do things that you can do with paper and pencil or you can bring in a disk that has information on it, and I just don't think this campus, .. although I think we have had the opportunity. I don't think we've moved ahead in that direction.

The lack of university support or facilities is an important factor to many faculty members. If technology is available and easy to use, they will use it. If the effort necessary outweighs the benefit, they will not use it. This is again supported by the previously cited remarks of the high level user recounting the effort necessary to arrange classrooms to teach in that would support this. Faculty member 74 expressed that the university encourages, user but does not match that with support, which affects this faculty member's use of that particular technology.

FM 74: ... I'm very frustrated in the university in that they are encouraging use by setting up this instructional technology group and giving seminars and brown bag lunches and say "do this, do this, learn about this," and when you go to implement it they have four classrooms on campus the you could teach like that in. And you can't get into those rooms! I had to go on a waiting list...

In both cases, these high level users implied that facilities or availability of facilities may encourage use of some technology. Here a high level user is inclined to use a technology, presentation software, but discouraged by the limited facilities. However, when talking about the issue of support, FM 74 was more positive.

FM 74: I think it's been pretty good about that when I've used it Again, it's hard to get the stuff when you want it where you want it, but other than that, the people who I've dealt with in all these areas, instructional technology, the people in the lab over in Sangren, and uhm, the people who run the educational program and the people who take care of the equipment, they've all been really very helpful and pleasant as best as can be. No, they're busy too, I know _______ is almost impossible to get a hold of...

And...

... so I think, trying to,... I think the biggest problem is not the people, it's just the lack, of course, the lack of equipment and the lack of numbers. There are not enough of them to do everything they are expected to do.

I think all levels of users had some concerns on the working environment. Although many lacked equipment, others were quite pleased with their situation which of course may encourage use. For example, one medium level user could not say enough positive things about the changing university conditions, noting the data or information available. However, it is interesting that this faculty member referenced age, implying she was older.

FM 446: ... there is absolutely everything that you could possibly.. especially an older person like me that hasn't caught up, you could want. It just, you know, I mean libraries are different places than they used to be.

... it is like having the world at your feet.

Interviewer: Do you think the university is trying to support..

FM 446: Oh, yeah, yeah.., well support and encourage and.. Push and nudge and everything they can, and. there are still a lot of people fighting it. And it is just, you know, resistance to change, which ah, you know, organizational behavior the field I was trained in, and people are afraid of the unknown. They're afraid to look stupid. They're afraid to, you know, have to ask questions and all that kind of thing. If you get off the train, and then try to get on again, it's very difficult. And if you're used to thinking of yourself as an expert, and then you have to get in a situation where you're the neophyte, and you don't know anything, it's very difficult for some people to deal with, so they just avoid it.

I had to wonder, based on her references to being older, if she were not in fact explaining her difficulties in coping with the newer instructional technologies. While she seemed positive toward technology and very willing to learn, she also expressed frustrations. She talked about being left behind or not being able to keep up, and expressed the feeling that staying current is very important. This situation, a topic equally suitable for the faculty category, illustrates that sometimes attitude and anxiety may be influential in deciding to use instructional technology. It reinforces the different model components that are interacting to determine the faculty member's behavior. When continuing, the direction went to the working environment.

Interviewer: In regards to your working conditions at the university. How have they changed?

FM 446: Well we used to have a building with 12 foot ceilings that was really beautiful and had rats and cockroaches. And now we have modules with no, uhm, walls, you know, the walls that... are all... (drifts off) sigh... semi-permanent an uhm... but it is very efficient use of space. There is a lot of stuff crammed in this little space. And it's uhm, I actually prefer it. Although I, I just loved the old buildings.

An explanation is probably in order at this point. FM 446 was a medium level user as determined by the survey tool and confirmed by her own admission. Even so, she expressed an extremely positive attitude about instructional technology, the value of using it (in time savings for instance), and the need of faculty members to "get on board" or be "left at the station." FM 446 referred to herself more than once as older, and expressed difficulty for an older faculty to accept changes. I think this was implied even in the remark about being left at the station.

FM 446 also mentioned a recent negative promotion review and the need to publish and do more research. She emphasized that instructional technology and technology overall was a time saving tool that would allow her more time to "do the things I have to." Along with veiled references to people resisting change, these may be an indication of difficulties she might be experiencing in coping with the changing direction of the university toward research and the change in the working environment (move from the old building to new surroundings, and coping with the fast pace of technology). Here, promotion concerns or survival at the university takes some importance in shaping this faculty member's attitude toward technology. It is a need, so she can do what she must gain recognition.

Our interview took place in the faculty member's office, which was in the new business college. The business college had the newest academic building on campus (less than two years old), having been funded by private donation. Faculty offices were very luxurious by most standards, and outfitted with the finest office furniture and equipment such as computers. The offices were modular, being built like large cubicles with walls that did not extend to the ceiling; one could hear fellow workers in the next office. The offices did have locked doors though.

I explain this because before the new building, the business college was housed in the old East campus buildings. The university was not remodeling the buildings at this point, only doing the minimal maintenance necessary to keep them operational. FM 446 had good reason to be positive about her improved working conditions and support. Besides the new facilities, the business college was also enjoying maximum technology support as to hardware and software.

Yet, even with this in mind and with FM 446's outward appearance of "everything is rosy," I could not help but think that some statements in the discussion were implying a different story. FM 446 was speaking from a position of great improvement over previous working environment and emphasizing this, but expressing some dissatisfaction or displeasure in the way some things were stated. It was very neatly hidden by an almost overwhelming positive attitude, but I think, FM 446 thought the university was not as supportive of instructional technology use as they appeared in this situation.

Interviewer: What, ah, building were you in? Were you in East..

FM 446: East Hall.

Interviewer: Yeah, I took a oh, along time ago, a class or two that was over there, and yeah, I like the old campus.

FM 446: But it's not very practical.

Interviewer: You're right. It isn't.

FM 446: So I mean, and I just .., I like my computer (she did this in a sort of musical mocking tone) and all the things that I have here. And we have, you know, just up-grades all the time.

Interviewer: You get a lot of support? And upgrades?

FM 446: Ohhh... yeah! And now, in eh, see like Donna, .. at the library is going to come over and try this Lexus/Nexus and see if she likes it. See if she wants the university to buy it. Nobody comes over and uses it you know. She has to keep sending people E-mail. Oh, I mean what more can you do? People..., but partly it is time. You know Priorities! People don't get all the way through their to do list even though it is on there.

Interviewer: Have you tried Lexus/Nexus?

FM 446: I used them in the olden days, when I lived in Silicon Valley. So I am familiar with it. But , uhm.., I haven't used this new one! (again a musical lilt to this statement)

While FM 446 is positive, I detect an "overwhelmed" undercurrent to what is said. I recognize the fact that I could be biased, being the researcher. I may be reading into this conversation that what some people may think is what I want to find. However, the combined factors of the beautiful new facilities, seemingly ideal conditions, the way the faculty member said some things, the gestures, the body language, and facial expressions, led me to think that the conversation alone did not fully represent this faculty member's feelings. It was as if she did not believe the "hype" she was pedaling. She was very animated, constantly moving, and drumming her fingers on the table. We were sitting at a table in her office that had a pleasant lamp on it. She had arranged this table, lamp, and chairs for informal student conferences. The table was small and round, very intimate, and the lamp was of the household variety, not an office fixture. Two chairs where strategically placed by the table as if to project an informal, inviting, "homey" feeling. During our conversation the faculty member would often lean forward, almost as if she did not want people outside the office cubicle to hear our conversation.

During our conversation we also talked about qualitative research since she was planning to conduct a project in a qualitative mode. It centered on the need to publish, expressed the need to survive, and included the importance of a career. The faculty member implied no pressure to use instructional technologies, but to publish. She perceived the use of technology as making this more feasible.

The situation, besides statements about "older faculty," how much she liked the old building, and the musical lilt in the voice at times during the conversation, made me doubt some of what I heard. A recent negative review and the emphasis on saving time so she could do "what she had to do" seemed to reinforce my opinion that she does not believe half of what she told me.

Interviewer: Now your technical support in the department and that, is it good?

FM 446: Yes!

Interviewer: If you have glitches, or using...

FM 446: Oh, ____ is wonderful! And, our,.. _____ is technical assistant and they are both knowledgeable. An they're always... , Now we have problems because there are certain things where, you know, uhm, we can't have it on our, you know certain programs and stuff they can't get to work right, on the, with the equipment that we've got, it's incompatible for some reason, or infeasible. So we don't have everything. I have Netscape™ and Trumpet™ at home to get on to the Internet. But we can't do that here. I don't know why.

Later I asked about materials, and again, it appeared everything was available for the asking.

Interviewer: You have also mentioned material. Uh, are they readily available? Will they update your software if you required new software for a class?

FM 446: Yeah.. (kind of drifting tone like a sigh). We get computers all the time, and I'm a 486 and you know, they, they, they're good. But you know, you can imagine, business is a, uhm, they (reference to administration) know what's going on in the business and they want to keep up

While environmental conditions seemed ideal for this faculty member, she still may harbor concerns that inhibit greater use of instructional technology. As a medium level user, FM 446 expressed great desire to use instructional technology. However, factors such as time limitations and the need to undertake activities she thought more valuable to her career may have kept this faculty member from using instructional technology more.

Another medium level faculty member echoed some same concerns, but their working conditions were quite a bit different since they remained on the old campus. It offers a different perspective to the same topics.

FM 616 is a well-established professor at the university, so not perhaps as concerned about tenure/promotion issues as some previous medium. In contrast to FM 446 above, FM 616 has an office over in the old campus facilities, where accommodations, I think, seemed Spartan. This faculty member's office was minimally equipped with the standard desk, a telephone, a small book case, and old office furniture that would appear quite at home in the university salvage system. I mention this only to establish the difference in the working conditions between the above faculty member and this one.

Observing the office accommodations as I sat talking with this faculty member, I thought I could probably guess what the answer might be to inquiries about the working environment. I tried to caution myself against reading into this interview before it started, as I do not want to appear biased. What surprised me was that most of the focuses of this faculty member's comments during our conversation on working environment were not on the immediately obvious environment, but the overall university. Whether this was in some way motivated by the present conditions immediately surrounding us, I could not tell.

FM 616 suggested that in fact things were not changing at the university, at least for the faculty. He did concede those technology provisions for the student were improving.

Interviewer: In what ways do you think any conditions at the university related to instructional technology have changed? In the past five years? Or do you think?

FM 616: I really don't think so. Uhm... you know, managed to find some way to keep the very talented people we have around here, uh, gainfully employed. But in terms of having them utilized well, Uhh, you know that, that just doesn't happen as far as I can tell. Howard Poole is incredibly capable in a lot of ways, but , uh, the university, uh, hasn't found a way to make use of that capability, and uh, I've found, I confess. And it's simply because it's not a priority, Uh...

Interviewer: They seem to emphasize student access to technology and that, but uh..

FM 616: But faculty access... yep. Uh, (laughter).., yep! (more laughter) We've got access. I can bring my own computer and plug it into the wall now! (laughter) Will be a lot better than a few years ago! And if I were new faculty, they'd even buy me a computer to plug into the wall,... and that's nice, but uh, .. Na,..

Interviewer: And it seems to end there maybe?

FM 616: Sure. The first access to, ah computers was secretarial staff, and we were told that when the secretary wasn't using it we could. And then we got, hah (laughter), the next level when we could buy our own! (laughter) and nobody would frown and then they gave us places to plug it into the wall. And now they're buying it for new people coming on, but, ah, there's, ah, there's a long way to go.

I am thinking all during this discussion, especially when talking about the working conditions, "man does this guy have a chip on his shoulder or what?" Yet as I think about the simple office conditions, I can imagine how a faculty member might develop these thoughts if they view the discrepancies in accommodations and support across the university from department to department. Again I cautioned myself to be totally subjective, to let the faculty member talk and not to try to be influenced by the persuasive arguments.

> The, the problem, that I, the problem's there, is that, have to do with, uh... survival things and the incentive system, that sort of thing. I, ... and ... uh, as you well know, to use uhm, media well, and up to it's potential takes, uh, quite an investment in time and energy, in something that I am teaching, uhm... What will happen is, uh, I'll get moved off of that course. Uh, and that stuff will never be used, or what ever. There is no way that I can insure that that stuff will be of continuing value. Uh, if I tailor it well to the academic environment that I'm in, uh it won't fit other academic environments as well, so it is not all that transportable. Uh, so the , the uh, the (sigh) the only reason that I would put in that kind of energy is to, if I just love that kind of activity. And uh, but then, and I have, heh (laughter) but it gets very frustrating, and I pulled away, and after that happened a few times, I am basically.., I'm not going to go down that road again, Uh... I will not build something in such a way that somebody can pull me away from it, and have the thing collapse, then no pay-off on that work. It's like raising a kid and you know somebody is going to shoot them when they are 21. You know you (laugh) don't do that often.

I cannot help but wonder what is behind this line of reasoning. FM 616 did seem to reinforce the notion of expected value as a motivating force. This faculty member is extremely concerned with a payoff or something of value for time and energy, which is understandable. He also seems to have had some experiences where this did not occur, and disappointment in that serves as a disincentive for further or continued use of instructional technology. This faculty member, by his own admission is a high level user of technology outside the university in consulting, where he receives some payoff for the time and energy, which acts as incentive for continued use. I would think, though, that he might use some of his personal equipment at the university just to make his situation easier. For some reason, I think it runs deeper than just the surface situation of obtaining some thing of value, or wanting an incentive to use technology. This faculty member is, however, in psychology, which may in some way explain part of his deep-rooted attachment to this subject.

I continue with a question about whether university or individual departments' structure does not provide an incentive to continue putting in effort or time.

FM 616: Looking at the university, the university is an economic machine, and we've got to generate student credit hours, cause a certain amount of money comes in for that. No where is the evaluation system for accreditation for the universities, for funding universities, for rewarding faculty, for rewarding administration, is there anything about "do the students really learn anything." That, that's not considered. It is not looked at, it is not measured, it is not evaluated. And, it is as if we never ask Detroit uh, to show us that the cars will run. And (laughter) that they won't break down in 20 minutes after we buy them, and what is done.

There, there is no quality measurement on the output side of universities. There's ah, you know, there's some funny stuff like uh, we can track graduates of a particular institution and determine that graduates of that institution do better than graduates of some other institution.

Interviewer: Uhm, or that so many get placed in industry?

FM 616: Yeah, we can do those sort of things, and that's a heck of a lot better that nothing. No university does that systematically which, again, suggests they don't value it very much.

The faculty member continues by talking about what efforts are going on at this university to try to assess what students have gained at the university. He suggests this is an improvement and more should be done. A comparison is made here to the research publication process.

FM 616: But, you know, the uh... we don't have a, we don't send in our students to a peer review court (this is said with a laugh), that will examine them and say, wait... but we do our research publications and that sort of thing. So we, ah, as an institution, we just do not value learning. And... because of that, we , we can't uh, provide the kind of support, ah....

It seems, from what the faculty member is expressing, that he is in direct conflict at times with the university and their policies. While I thought some concern might be expressed about the lack of support in the office facilities, this faculty member wanted to express disappointment in the system and what they value. Teaching and student learning was suggested as valuable but it is not, according to this faculty member, what the university values. This faculty member suggests university income has precedence over whether the students graduate as qualified individuals. His attitude toward the university appears rooted in this overall lack of value the university places on student learning, according to FM 616's interpretation. If the university does not value teaching and learning, no incentive to use technologies is there to improve or ease teaching because no reward or recognition is attached to it. FM 616 does not perceive enough value in using the technology to overcome other obstacles to use, such as those associated with the working environment like inadequate computing equipment, or poor support. FM 616 does, however, use instructional technology for his private consulting work. He explains that he has long been using it, but can see some value or reward for use in his business so uses it in those situations.

What seems to come out is that the reasons for limited use of instructional technology are not always obvious. In the one medium user (FM 446), support, equipment and willingness were there but other things impeded use. Time constraints and the need to cope with other issues perceived as more important or of more value to her, such as doing the things necessary to get promoted, inhibited use. The other medium user, FM 616 lacked equipment, support, and facilities, but blamed infrequent use on lack of reward in the system.

Low level users expressed similar concerns. The limited facilities, support, lack of time, and university politics were also topics of conversation with these faculty members.

Interviewer: In what ways do you think conditions are changing at our university related to instructional technologies?

FM 587: Well, I ah, hmm.... I guess I would, from my limited view point, uh, ... I think that uh, without even comparing what I know about here and what I know about some other universities, uh, there's more investment in it now that there was a few years ago. And, uh, there seems to be more commitment, uh, ... money is always, probably always will be the problem. But technology moves faster than you can buy it or pay for it. Uhm.. I think uh, so I think it is becoming more accessible. It's becoming ... a little more universal, I still think it's , you know, ... this department doesn't use nearly as much as some other departments do. I've 3 sons who are students here, so I hear...

Interviewer: Find out what other people are doing?

FM 587: Yeah, and they're in a whole different department. So, uh, so I think it is coming gradually that way.

Interviewer: Why do you think the university is changing?

FM 587: Oh, I think it is just sort of following where society is going. I don't picture the university as learning the parade. I, I picture us as sort for trying to move with it, trying not to get too far behind. Uhm...

Interviewer: Why do you think that?

FM 587: Why it's not leading? I think it is just resources. I, well there are probably some attitudinal changes that need to happen as well. Big university, it is hard to move, ah, the whole thing fairly quickly in any given direction.

This was an interesting discourse, because society often looks at universities to be leaders in technology use, to be showing everyone else what can be done. As people who work for universities know, that is not always the case. FM 587 continued to discuss how student availability at this university is good in comparison with other universities he is knows of. He mentioned that his son, in graduate school at a major university, has complained about the lack of computer labs there compared to the university where he had done his undergraduate work.

Interviewer: ... the university of course like you said has made accessible to students. Do you think they have balanced it,... for faculty?

FM 587: No, I think...

Interviewer: Can you elaborate on that?

FM 587: Sure. The ah, uh, ... part of this may be due to the building we're in, who knows what other things. But, uh, we used to be in Bigelow (Hall). And about 5 years ago, 5 or 6 years ago, we moved over here. Soon as we moved over here the uh, I couldn't get E-mail anymore. And I was with out it for probably 4 years. It just wasn't available.

Interviewer: Couldn't they get you a modem or anything?

FM 587: I don't know what they could have done, but they didn't. I asked and asked. And uh. Most people in this department were put on E-mail in the last 6 months. And uh, a few before that. But, the uh, most of the things that have come to the department as technological advances, whether hardware or software, go first to the uh, and sometimes are there for years before they are disseminated to the faculty, they're put on the chair's and administrative assistant's machines. And we really don't have access to them.

FM 587 does use technology, now that it is available and does see some value in its use. He mentioned he would never have accepted the president position of a professional organization had it not been for the ability to stay connected through E-mail,

voice mail, and fax machines. He appears to imply that support of faculty members in his area has not been as good as he thinks it should be, and this environmental factor has inhibited his use.

FM 587: And that attitude, that the faculty needs these things and will use them, at least here, has only been turning around in the last year.

FM 587 thinks greater support or availability would improve use of some instructional technologies.

FM 587: Even things like, uhm.., oh, making slides from Power Pont™. I didn't, until I went looking at it last spring, I found there were places I could, at the time, one I could do it my self, one I could pay somebody else to do it. But they were there. And I'm curious about the usage of, I mean it surprises me that there are only a couple of places. But maybe that's all there, the demand maybe dictates at this point that there only be a couple of places.

Interviewer: So this has influenced your use of instructional technology?

FM 587: Oh sure. If I ask... could ... availability influences a lot of things. If I could ah, uhm, ... If I didn't have to walk across campus to make the slides I'd probably make more of them.

FM 587 implies he may use a technology such as Power Point™ if it were more convenient. If classrooms designed for presentations, or facilities to convert some materials to an easily usable form were available, this faculty member suggests he may use them. Here, this low level user's use was inhibited by what he perceived as inadequate equipment or facilities to use the technology. While this is similar to some high level users, the high level users were using other technologies that benefited them or were in their areas of interest, having support and equipment in those areas. This faculty member was in contrast in that he lacked support in other areas as well and lacked funding and resources. It appeared that in each case, a unique mix of factors inhibits or made possible technology use.

Nevertheless, other things will also influence use. Some faculty members imply that administrative emphasis is not always on teaching, so pressure is to be doing other things that the university deems more important, as in the following example of a low level user.

FM 188: The current chair, the current interim chair, excuse me, is also attempting to show support..., how that support is now coming through telling us we had better get grants! So we... indirect costs. So now as faculty we also, we have to teach, research, write. We have to find money to make the department go. And that has been pretty obvious, especially for non-tenured faculty. That's the message that we've been getting up and down our college administration. Even to the extent that one administrator is told he should come over here and kick the butts to get us working on grants because we don't do enough..., so morale is...

With this faculty member, the thinking is that emphasis is on doing things other than teaching. Administrative pressure is, for example, on grants or grant writing, which does not necessarily motivate the use of instructional technologies. This was not just implied during one interview, but across several interviews. During the questions on environment, this was mentioned by more low level faculty members (5) than high level faculty members (2). The high level users only briefly mentioned lack of pressure, while the low level users mentioned pressure to get grants, teach more students, do research and the like.

One faculty member was in an area where the college was changed to a department within the education college. Because of this, she stated she had to start work in a new emphasis area This shift in focus, she thought, required the change in her focus for research.

FM 643: Now that change in focus of research means that I will not be able to write papers and produce papers for quite some time because I think will not have a focus inside education for my research. And that has had effect, on my research. In a whole, uh, future in this. Because there has been that change, on emphasis, on research and publications.

In undergoing a change like this, which may be a negative experience, a faculty member may adopt a less positive attitude toward the university that may influence their teaching and other aspects of their position. As she explained why she thought the change form college to a department had occurred, she was very guarded in her statements so as not to sound too negative. So to delve deeper, I asked her if she thought this was a positive change.

FM 643: Not for me! And not for... I don't think so, because I don't think, .. initially there was a tremendous anxiety, not knowing what was going to happen to us. Changing from general education to science education has been very stressful. Uhm, changing from a very large unit to a very small unit of only a few people has been most stressful. It brought more duties, certain kinds for duties, on individuals than before, and so on , so, uhm I think it has been a very stressful change for me. And the fact that of course, uh, my research has suffered as a result, and I have not been able to come up with research and publications, which of course will affect my future, my promotion. It has been, in that respect it has been negative.

Interviewer: Has the focus on research and publications changed the way you do anything?

FM 643: Absolutely, absolutely. I mean, ah, the pressure is so much on me to... the anxiety, uh that uh, it will affect your teaching as a result. You are trying

> to take time, in whole lot of time for your preparation in teaching, to trying for some publish and uhm, I really think it does, affect some people's attitude toward teaching.

> I find the administration does not give much thought to the teaching. Does not take that into account. Okay? If they are going to give you a promotion, the fact that you have been a good teacher, the students speak very highly of you or what, is not going...

> Have you done any research? Have you,... come up with any publications, how many publications have you come up with? The only thing that counts. That has been negative.

The above examples were provided to show how the mix of components affects different faculty members. Every faculty member's situation is different and perceived by that faculty member as different. While an outside observer may view a situation and declare it ideal, the person working in the situation may have a variety of experiences that influence their perception.

I think while the physical environment, such as availability of materials and equipment, has influence on motivation to use instructional technology, so does the general "climate," attitude, or emphasis of the working situations, as demonstrated in the last two examples. Often this is more influential than physical deterrents in inhibiting use, though not as easy to recognize as insufficient equipment. If the morale of the faculty is down and the emphasis of the administrative unit is on different areas, teaching and the things associated with it, such as instructional technology use, may suffer. With this will be a loss of motivation to adopt or use new teaching tools. While this may generalize, I would think that if teaching is not recognized as an important part of our job, why spend time trying to improve or learn to use new technologies related to teaching?

The environment category of questions brought many responses because faculty working conditions are so different. While many high and low users said the same things, many of which were negative, the difference might be in overall combination of factors. High level users are facing the same lack of equipment as low users in some areas. However, they may use technology in another area because the conditions or combinations of factors in that area are positive. Sometimes the overall morale of the particular user may be low based on a unique situation. That may not be the result of one environmental factor, but a mix of factors. The differences are not always obvious because they are dependent on a combination of factors. This is what the model with the components learner, faculty, technology, environment, and perceived value shows. The decision to use a technology to support the instructional process is influenced by the combination of these components. Faculty members that are high users have a mix of influences that <u>motivate</u> them to use instructional technology while low users situations, as perceived by them, <u>inhibits</u> their use.

<u>Summary Questions</u>

At the close of each interview, I asked a series of questions that were to reaffirm earlier comments in the interview. The faculty member was asked how the components have affected instructional technology use, which element was most influential, and what really encouraged or inhibited the use of instructional technology. Often, the interview never progressed to the final summary because a particular faculty member would dwell specifically on some particular frustrations or point that they deemed important.

The summary category of questions had the fourth largest numbers of topic mentions with 500. The previous Table 5 shows that the overall context of all the topics was positive, but barely so with only a one value. Low level users tallied the most mention of comments with 219 and had -13 value. High users were next 155 and a positive 47 value. Medium level users had a count of 126 and -33 value. Earlier Table 6, which shows the frequency a valence for topics mentioned 15 or more times, shows a subtle change in that the total value becomes negative, though only barely at -1. The high medium and low frequencies and values stay very similar. The implication here is that when only the most frequently mentioned items are considered, more are negative.

One question that I asked in the summary section was directed at trying to get the faculty member to focus on what they think is most influential in their use (or non use) of instructional technology. I thought this would give them an opportunity to summarize all we had talked about and definitely state what model component area (learner, faculty, technology, or environment) affected their use the most. The results are summarized in Table 13 below for each level of use.

Table 13 Most influential factors		
High	Medium	Low
availability/learner/self	computer part of life	change in curriculum
availability	appearance of dept./self	industry requirements
survival/effectiveness	survival	technology/availability
awareness/learner/self	reward of contributing	subject/expense-benefit
awareness/self	self motivation	availability
self	environment (availability)	availability
survival/admin. pressure	availability	availability

In just observing the summary to the one question, some differences are noticeable between the high and low level users. When asked which was most influential to their use of instructional technology--the learner, faculty, technology, or the environment--high users noted the situation but also mentioned themselves as part of the motivation. Though they often first mentioned another factor, the discussion would turn to them. They would mention how they loved computers, or have technology helped them do something important, or wanting to interest students more, topics that illustrated the benefit they perceived from using technology in instruction. The faculty member themselves, seemed to want to use the technology because they saw a benefit to using it. They saw technology as a means to help them in something important to them or of interest to them.

Medium level users mentioned mostly factors that were environment related. The availability of equipment, software, and classrooms technically prepared to user technology seemed inhibiting factors to using instructional technology. While some mentioned how technology has helped them reach students or gain their interest, they were very limited in what technology they could use because of equipment availability. Sometimes this would be related to university politics or that teaching is not rewarded by the system like other responsibilities.

Low level users' responses were again dominated by environmental topics. All in this group, except one respondent, implied that the lack of such resources as instructional material was a problem. They also sited the departmental situation, lack of equipment, the teaching situation, the time available, and the overwhelming pace of change as reasons. Unlike the high level users, they did not seem to have an area where technology provided enough of a benefit to overcome what inhibiting barriers there were to using instructional technology.

While this table is just a quick summary of responses to one question, I think it suggests some important differences between the high and low level users. The high level users typically had self interest in technology or something that technology helped them do, that motivated them to use it. They had found enough value or benefit to using instructional technology that made it worth using even when some barriers existed. When the value was not enough to overcome obstacles to use, they typically would not be using that particular technology. Low level users' situations seemed to inhibit their use. Even if the users saw value in technology, it did not justify overcoming the impeding factors. While high level users seemed to go on another area, low level users seemed to dwell on the shortcoming of their situations.

Topics of frequent mention (15 or more times) in the summary question responses include the following: increased work, politics, resources, availability of technology, survival, time, support, convenience, self interest, awareness, learners, and E-mail. The most frequently discussed topics were E-mail, learners, time and politics in that order. Table 14 provides frequency counts and values for topics in the summary category.

Table 14

Summary								
	High		Medium		Low			
Topics	**Freq.**	**Value**	**Freq.**	**Value**	**Freq.**	**Value**	**Total count**	**Total value**
E-mail	20	20	12	3	25	1	57	24
Learners	13	-2	19	2	14	13	46	13
Time	10	-1	8	-4	26	-15	44	-20
Politics	8	-8	22	-22	12	-12	42	-42
Self Int.	14	14	10	10	11	7	35	31
Avail.	10	4	9	-6	11	-5	30	-7
Sup.	13	0	2	-2	12	-4	27	-6
Awareness	15	15	4	2	8	8	27	25
Survival	2	-2	15	-5	9	3	26	-4
Convenient	12	2	1	1	12	2	25	5
Resources	5	-4	5	-3	7	-1	17	-8
Inc. work	3	-3	0	0	12	-9	15	-12
Totals	125	35	107	-24	159	-12	391	-1

E-mail came up frequently in the summary, as many faculty members interviewed used this as an example of technology in their statements. Low level users mentioned E-mail the most frequently followed by the high then medium level users. All were positive in overall statements.

Learners or students were again mentioned in this series of questions. High level users mentioned learners in an overall negative context, while the statements from medium and low users reflected an overall positive tone. The negative statements from the high level users concerned basic keyboarding skills, general skills, and calculating skills. It should be noted that the negative statements were predominately from one faculty member.

High level and medium level users did not mention time with near the same frequency of the low-level users. Also note that more faculty members from the low users spoke

In referring to politics, the term encompasses many things where essentially, the interest or agenda of one group within the system may be the overriding thrust of the organization. This, of course, can be at different levels such as the department level where perhaps chairperson and a select group of faculty members dominate the direction of the department, perhaps putting their agenda above the interests of others and may be even above those of the students. That is when the actions of a group are directed toward achieving control, advancement, or some goal. In this case, faculty members often referred to the overriding thrust of the university as achieving an improved level or position and not being so much interested in the student. Comments like this were often categorized as politics.

Politics topic was mostly an issue of concern with medium users and moderately at high and low levels. Context was overwhelmingly negative on all counts. Although more faculty members in the medium and low level group spoke about politics, all at each level were negative toward what they perceived as university politics.

Self interest and awareness were both positively mentioned topics. Self interest was a frequently mentioned issue with many faculty members from each level making comments. Awareness was mentioned frequently by high users but less frequently mentioned by medium level and low level users.

Availability of equipment, support, and resources were all mentioned in a negative context. A difference is evident in that high level user's statements had a positive value for availability of equipment and a noncommittal value (0) for support, while the other levels were negative. It should be noted that not as many faculty members spoke out at the medium level. However, it implies that the ones who did speak out thought the negative experience was important to convey. Resources were mentioned but negatively, the low level users speaking the most.

Survival, which seemed related to politics judging from the statements, was negative in overall value. Although of apparently little interest to high level users, medium and low level users mentioned it more frequently. All level users were negative except the low level users, who mentioned negative factors, but also added some statements on how technology may help them of some things faster and allow them to do more of the things the university requires for tenure.

The convenience of technology was most frequently mentioned by low level users and high level users, but hardly by only one medium level user. Overall context was positive at all levels of use.

The potential of an increased work load with technology use was also mentioned. This could imply more work created because of the need to learn the software, equipment, or just to answer the many E-mail messages that may be generated. Sometimes, it was that with technology available, a professor's role might change in that they would be expected to do distance learning courses that could increase the preparation necessary to do a class. It was talked about in an overall negative context, but only the high and low users mentioned it.

Summary of summary category. The questions in this section were directed to find out what the faculty member thought was the most influential area to technology use. Often other issues would be discussed and become the overriding topic in the interview. Politics is an example, as it was a topic in which there were strong opinions. Often faculty members would start to discuss this problem when we were talking about technology use. High users mentioned it, but not quite with the frequency of medium and low users. I can attribute this to the fact that some high level users, being tenured faculty members and some full professors, did not have to be as concerned with survival (promotion and tenure) as the low-level users did.

For example, a topic that surfaced several times was the university's desire to achieve a higher level of research status. This would put them on par with other major universities in the state. Most faculty members, no matter what level, recognized this as the goal the university sought and the overriding force behind much of the administration policies. The faculty related this goal to the increased pressure on them to do more research activities and the less emphasis on the teaching aspects. In promotion and tenure discussion, the greatest emphasis was on research, grants, and publications with, according to some, only minimal or token regards to teaching.

Benefit. Some senior, established faculty mentioned this with the caveat that a junior faculty seeking promotion or tenure, would be foolish to devote time to developing instructional materials with new technologies. They should be doing research and publishing. In a statement about training and time, this high level user implies this.

FM 371: I think there are more opportunities for training. The difficulty is that, that uh. ... if a faculty member has a research program under way, they have an instructional commitment to the university, do some public service; then the university offers, ah, whole array of training programs that will take , a, a, ... five days beginning of the semester, or five days over 3 or 4 weeks at the beginning of the semester, and the university, uhm, never comes along and says, "look, this is important enough that we're going to take you out of this instructional role for this period of time, give you training, and when you come back, we will know that you have it and you are going to use it to enhance your instruction or your research, and we've worked out what we are going to for this interim period of time." Industry does this all the time. They pull people out of positions and say, "you're off on a

6 week course to improve your capabilities to do this job." And, university always looks at what to do on our own time. Or do it in addition to what we are doing already.

Interviewer: How's that...

FM 371: ..and I think that's ah, that's a discouragement. That is a disincentive for faculty members to actually go ahead and take advantage of what the university offers, and which is really very attractive, but there is just not time in the day or in the week.

Interviewer: So it's tough to be motivated,..

FM 371: That's right, see they're..

Interviewer: They want this but they are not willing to support it perhaps?

FM 371: Yeah, our faculty development office, for example, they send out a list, and the ah.., the uh, oh other office of instructional development, send out a list of all the workshops and everything that is available. Even when I look at them in terms of my own time, I think it would be real difficult to do that even though I would like to. And then to ah, actually implement this new information or new skills that I've got!

Interviewer: To go to the class is one thing, then to really absorb it....?

FM 371: That's right. But then I think, maybe they are offering these new faculty members who are coming in. But they are even, they're busier than I am. Because..., they've got to get instruction ready, they've got a research agenda for tenure and promotion considerations, and they've got to look at, at the uh, public service and what they are doing with in the department. They can't just be floaters in a department not serving on committees and expect to get a good review.

I think this faculty member summarized what many think, that the demands on a faculty member make it difficult to justify time for training on instructional technologies and for development of instructional materials. When these activities will not benefit or be of significant value when compared with other activities, faculty members are less likely to make the time. Here, this faculty member was established and did not need to be concerned with promotion and tenure, but still realized the inhibiting factors that would prevent some faculty members from considering use. This faculty member was a high level user, but not in using presentation software or multimedia. He frequently used E-mail and Internet to enhance his courses. The high use was influenced by first, the fact that it directly applied to a goal or area if interest so it had some value to this faculty member. Second, it was readily available or easily accessible and he did not have to struggle to arrange to get equipment or facilities to use it. The perceived value to this faculty member of using the technologies exceeded any inhibiting factors.

It was during this, and other interviews, that I had to stop and think about what I was hearing. How should I interpret what I heard? As I mentioned earlier, each faculty member's decision to use or not use instructional technology is influenced by many factors, which I have tried to condense into four areas. Within these categories or areas, the individual faculty member's perceptions of the changes in these factors, and their interpretation are affected by attitudes and experiences. Each individual builds their own schema or framework based on these influences and experiences that help us interpret how we perceive things. The same event, viewed by different participants, is likely to yield a variety of interpretations. A situation or series of events that inhibit one faulty member from using instructional technology may not affect another. The events may be looked at as opportunities and be interpreted differently.

A middle level user focuses on these issues because he is a newer faculty member ultimately seeking tenure. This example emphasizes how what is most beneficial is not necessarily what the faculty member thinks should be.

Interviewer: Which of those areas (students, faculty, technology, environment) do you think is most influential in impacting your use of instructional technology? Or what is most...

FM 385: I, I think which is most influential on me? Probably myself, motivational-wise. Uhm, I think it behooves me to say "I want to use what I can to be an effective teacher." Uhm, I guess the thinking behind that is if I'm an effective teacher, then it may be easier to teach something therefore I can do more research. I guess that's the type of logic that I can come up with. I don't see too much of a change, what, uh, the technology has definitely changed, you know even in their short time we've been here. And I've been trying to keep up with it with the best ability that I can, given the limited resources, that we have. I have not seen that much of a change in the students. Uhm, you know we always again cry that they are apathetic, which there is a certain amount of apathy, and I try to rectify that apathy by more or their self involvement. Uh, but that's a change in myself and my style rather than a change in the student. And hopefully that does effect a change in the student.

Interviewer: .... have you seen any changes in the type of student...

FM 385: No, I don't see that, uhm too much at all. Uhm, I think we pretty much see a student that's in the intro geology course, they're, they're pretty much the younger students. I'd say actually I've polled them..,

Interviewer: So what other kinds of things do you think have affected you, or prevented you from using instructional technologies. You've mentioned the time involved, the support, the availability..

FM 385: Well, yeah,... I think always it is the tenure system. Uhm.., the tenure system does not reward good teaching. In as much as they profess that they do. Uh., the tenure system is definitely based on the research component. Uhmm, I think that's shorting themselves out, by doing that. Uhm..., I think they are missing out on a lot of good people that way. Uhm..I don't think that, I just, you get a feeling that the university doesn't recognize good teaching or teaching at all, basically. It is always a money problem. "Let's get the masses in and let's move them out. I don't care what you do, just get them out."

Unlike another faculty member cited earlier, this faculty member is under the tenure system currently and has that concern that influences how he spends his productive time. So I ask myself, what is it in this faculty member's situation that may influence some of their comments, or what things may be responsible about their decisions or use of instructional technology. This faculty member was rated by the survey index as a medium level user and confirmed by my interpretation of their answer that they do not use it enough.

Interviewer: Do you consider yourself, let's say, a frequent or high user of, or experienced user of instructional technologies?

FM 385: (pause) What do you mean?

Interviewer: Well, of course.. (brief explanation of what instructional technology is defined as for the purpose of this study)

FM 385: I don't use them enough. I, think I have quite a, .. I think I could do it and I would have more experience. Time has been a limiting factor to incorporate it. So, I say don't enough. I think that answers your question.

Interviewer: I think so but what's enough? How do we define that? But the way I interpret that, and if I'm wrong, is that you would like to use it more. You could, there are places you could use it considerably more, but you are hindered by some things that prevent this?

FM 385: Uh huh, uh huh.

He seemed to have a positive attitude about technology;

Interviewer: Have you changed in regards to technology? You know, your experience, knowledge of it, your attitude toward it?

FM 385: No, I've always been an willing adopter and user of technology. Basically just time limitations. That's probably the biggest hindrance.

and...

Interviewer: What is significant change to your working conditions in the last five years, that may have affected your...

FM 385: Significant change? (Pause) Probably getting a computer, and that was a hard thing to get when I first got here. Personally, a computer.

Interviewer: They didn't, when you joined the faculty, ah, supply a computer?

FM 385: No, I didn't get squat. We had 2 faculty, I did, and, one of them got a lot of stuff and one didn't. Which I didn't. So...

Interviewer: Why do you think that.. Do you think there is a particular reason why...?

FM 385: Uh, a black female.

Interviewer: Hmmm.. to try to summarize, and again it might be redundant. Out of the component areas mentioned... which of those areas do you think is most influential in impacting your use of instructional technology.

FM 385: I think which is most influential in me? Probably myself. Motivational wise. I think it ...

Yet, still this faculty member does not use instructional technology as much as he himself admits he might.

Interviewer: Your beliefs about technology in teaching. Any change in that, in the last five years?

FM 385: Uhm!! I think that's a fundamental thing that gets, you know, how much, .. that's a fundamental problem that's always existed, even pre technology, so to say. How much do you like... vs. how much do you show films for example. How much do you expect them to copy or learn or memorize what ever you want to call it from the film vs. what you say. I think that has always been a fundamental... so the question was?

Interviewer: How do you think your beliefs about the use of technology in teaching have changed.

FM 385: I like to incorporate as much as possible, but at the same time I think there are several caveats against maybe over reliance of..., the over reliance of using the technology, the higher technology. Uhm, I think it does take time. I think we need to sit down and look at the short range, uhm, and the long range expectations of what the technology can present to the student and the instructor as well.

> I mean if you develop a course in geology, you could effectively.. I could enter my notes in on the computer, and let my students have access to it, and then have a test on the computer and let them do it. But if that, I mean so I've, I can use that computer, 100% of the time, but is that what I want? I think not and I... students may want it, I don't know, but I doubt it. Short range, maybe they would. Long range, I don't think they would.

This medium level user provides an example of how factors from different component areas affect the decision to use or not to use instructional technology. Bandura's social learning theory suggests that human behavior is not solely driven by inner forces or regulated by external stimuli. It suggests thatcontinuous reciprocal interaction of personal and environmental determinants explain an individual's psychological functioning. The component areas include external forces such as the environment (working conditions), technology, and students, and one's own thoughts, attitudes, and perceptions of themselves and their interaction with technology, students and the university environment. FM 385 mentions a self interest in applications of instructional technology. He sees himself as a willing adapter of technology, but is also influenced by the working situation in which he perceives lack of support. He also mentioned a fellow faculty member obtaining better support, which may influence or affect his interpretation of the working conditions or support, not to mention his attitude toward the university and inner assessment of himself. While he professes self motivation as a driving force to use technology, he seemed buffeted by the external factors of lack of time, support, and what he perceives as the student's needs. FM 385 also suggests time can be better spent on activities recognized by the promotion and tenure system as valuable, rather than develop and apply instructional techniques using newer instructional technologies. While self interest may be in teaching, the other activities are implied to be of greater benefit at this time for this faculty member.

The example above reinforces the model as an explanation of why some faculty members use instructional technology while others do not. FM 385 likes technology, is self motivated, and interested in using instructional technology. He does not use it as frequently as he would like because of a myriad of reasons ranging from support to university requirements. The reasons are accounted for in the components of the model, whether it is support (environment) or attitude (faculty) toward the system. All these combine in determining whether enough benefit will be gained by using instructional technologies.

With the low level users, external factors or the environment seemed dominant in decisions on technology use. The university direction (some call this politics), time, and support were also on the minds of these faculty members. Most noticeable was the continued negative reference to time. Even when reference was made to positive aspects of technology saving time, concern was also expressed, as on the following references.

Interviewer: Which of these (learner, faculty, technology, environment) do you think is most influential, toward encouraging or inhibiting your use of instructional technology?

FM 643: Uhmm..

Interviewer: ....or if you want you can recap on how any of these have influenced your use.

FM 643: I think, uh, I think the introduction, of uh, the use of technology has been the most influential in my catching up with it.

Interviewer: Would that be more less environmental?

FM 643: Environmental, yes.

Interviewer: That again is because of the, your department, doing that and emphasizing that. Incorporating it. Uhm, uh, how about as far as , uh, ... you did mention, I don't , I want to get back to this about you contact the students through E-mail.

FM 643: Uh huh.

Interviewer: Has this become more frequent? Is it something they do, or you require perhaps?

FM 643: No,..I have probably given my E-mail address on my initial information sheet that I hand out to students. An then initially when I talk to them, I do kind of emphasize the fact that I can be reached at, uh, this address, and uh, kind of encourage them to use it, and contact me, if they have any problem. So far it has just been very few students. And this sending a message and saying "sorry I wasn't able to come to class because of this, that, or the other." Only if there has been a problem. But I am hoping that in the future they will be even able to..., and I would like to be able to encourage them, that they write a question that they did not understand, something in the classroom. If something happened in the classroom that they can find they can send me an E-mail message, you know, think like that.

Interviewer: Perhaps encourage, maybe a discussion?

FM 643: A discussion, absolutely, absolutely.

Interviewer: Do you think that students that might be hesitant to speak in class...

FM 643: Yes.

Interviewer: ... might...

FM 643: Yes, and yeah, I'm hoping that's what they will do.

Interviewer: And it also extends your office hours?

This may seem like leading the respondent, which is not what I indented. This was one of the earlier interviews and I may have been too forward in the questions and may have been leading the faculty member. However, the question was posed about extending office hours as a positive thing for students, and not meant to plant a "negative seed" toward time in the discussion.

FM 643: Oh absolutely...

Interviewer: in regards to ....

FM 643: ... and they don't have to come to the office, you see, to see me. They can just pop the question and I can respond to them.

Interviewer: That's good. Do you feel that's though, uh, might become, infringe on your time in any way?

FM 643: It does. It takes time. I mean coming in and checking your... for messages, I mean, .. I can't so much, by the time you respond to them, by the time you get done, all the messages, it's a lot of time.

Interviewer: So how do you feel about that? Positive, negative?

FM 643: In a way it has made life easier. I can stay at home and check my messages, you know. In a way technology has, facilitated that aspect. But time wise it tends, you know... got your day.

Interviewer: While facilitated, maybe you doing it at home when you would rather be doing something else?

FM 643: That's right.

Interviewer: It has virtually, like we said, extended your office hours, but also your..

FM 643: Yes, yes,..

Interviewer: .. work?

FM 643: Yes. Like putting yourself on a leash. Like we talk about medical doctors. Doctors who are always carrying that thing (beeper), and they're on a leash. You know, you go anywhere and you are checking back your messages, to see.., but then it is a convenience also.

Interviewer: So do you feel more positive or negative toward it?

FM 643: It certainly ... , yes I think it is positive in a sense. Uhm, you know, on a cold winter day, and I am not able to come to the office, I can check my messages and respond from home, rather than come into the office. But, uh , in other ways, as you said, it extends your office hours and you know, it infringes on your time, Ohh... when you would rather be free of all those, you know, burden of duty and all that, so...

I thought that maybe I was too forward and putting words into the respondent's mouth. Nevertheless, I also consider FM 643's responses to show what was important or a concern to her by the amount she talked about positive or negative aspects. She first emphasized positive aspects of communicating with the students and the convenience of it, but then mentioned the negative aspects of "being on call." I emphasized extended office hours and perhaps led her thoughts, but I was thinking in positive terms. She at least interpreted it in a negative tone, as in the explanation comparing it with a doctor with a beeper. However, I should not have suggested it infringe on time and waited to see where she might take the discussion.

Some low-level users were inhibited by working situation but also and probably more important, by their perceptions that shape their attitude toward the instructional technology. If past experiences have been negative, future exposure to a technology may be influenced by this experience. This could affect how the faculty member perceives value. FM 188 provides a good example of how a faculty member's perception of value or benefit gained from using an instructional technology, influences the use of that technology. FM 188 is a low-level user by the survey results and confirmed by the interview questions. While she does not use instructional technology in certain areas for reasons ranging from lack of support, time constraints, and the need to concentrate on other tasks, she does use certain technologies when a direct benefit is readily perceived. For example, she referenced training for technologies as available, but she did not perceive them as valuable enough to attend because of time.

FM 188: ... certainly there is a whole bunch of stuff coming out of Faculty Development and UCC, and I sign up for those things and get them on my calendar, uhhhh (sigh), and I attend probably one tenth or what I want because of time. Uhm, so I think... certainly out of Mary Ann's department (reference to The Office of Faculty Development) I get, like there is stuff there, and through our college there is that Jim Basca, or the library or something. There is another series we get fliers on which, "oh, I got to go to this, this, and this." And you know, the latest crisis happens and --- walks in and "Can I get a letter of recommendation for Thursday?" You know, so there are the things that just get... you know shot off the priority list. But, so in that way, I guess,,,

Here she comments on the commitment of the university as positive, but comments on the courses offered:

FM 188: (sigh)... a little piece, some. I always learn something, but I leave there angry and frustrated because I don't know the terminology. And they try,

> you know, "okay, here's the terminology," but then,... you, I'm always like way behind, and I'm always, and, and ... uhm ... so I've kind of given up on those. Even though I've learned from them. But, like for E-mail, it took me going a couple of times, then sitting down with some one. Uhm, the one I'm, I, I do much better one-on-one. When I'm, when I'm looking at the computer and someone tells me what to do, a person's watching. Yeah, I know that's what they do at UCC, you sit right there at the computer and that's what I like about it. Uhm, but it, it ... I guess I bring some anxiety to it, to learning all this technology. And I don't, I only want to know what I need to know. What I think I need to know, at the time. And don't tell me extraneous stuff because it won't stay. Don't tell me like "some day I might want to play with this." I don't want to know. You know? Uhmm, ... kind of let me grow into it? And I know that is impossible for someone presenting to 20 people.

FM 188 perceives some value in areas of technology because she attended some training (E-mail twice). However, her anxiety toward technology and perceived value in what is offered, influences what is gained from this and ultimately influences how much technology might be used.

She later commented that she and a colleague were doing research, so she signed up for Lexus/Nexus (an information database) training over the phone. The research project, because of promotion and tenure concerns, is important to her, and so is learning to use the on-line information database since it benefits her research project.

FM 188: ... Fridays, all day on our project, or projects, what ever we're working on; presentations, papers,... and we just said "this is important," and we scheduled it in, and it's great. I really recommend it. With in that first day we got stuff that we pulled (referring to Lexus/Nexus) out that we are putting in a presentation we're doing at a conference next week. So it was (snap of fingers) immediate.

When asked what has been a most significant change to her working environment she implied that list serve technology was important.

FM 188: My working environment? I mean I'm on this list serve for feminine pedagogy. That's helpful and I'm doing a research project on feminist teaching. So I've talked to colleagues across Canada and the U.S. that's been helpful. I'm not alone in my struggle and so forth. And so that's based on using phone and E-mail. That's been supportive, that's been ah,... helpful uhmmm, it is okay to ...(sigh)... try to do what I'm doing in the classroom, not giving up. Try not to be the only authority, Encourage people to talk.

Changes?

I mean that was a change because it took a while to get, uh on E-mail.

This feminist list-serve was important to FM 188 because it was a source of support for her teaching style and research interests. FM 188 mentioned early in the interview that she teaches for the feminist perspective and that is not accepted or supported by some of her immediate department colleagues. It is an important issue for her, as through E-mail and telephone, she receives moral and informational support. She expects a level of value from using E-mail and list serve technology, so is motivated to use it. Other areas of technology expected value is not as high and so inhibiting factors, whether external, such as lack of support, or internal, such as anxiety feelings, are more influential and the motivation to use the technology is not there. It is this continual interaction of variety of factors that play into the final determination of action, much as Bandura suggests in social cognitive theory (Bandura, 1977).

General Summary on the Levels

High level users. High users showed some important factors to them by the frequency with which they mentioned specific topics. Starting with the general introduction and demographic questions during the beginning of the interview, interest in technology was the most frequently mentioned topic. In the questions about learners, students were mentioned frequently, but high users talked more about students overall than they did about their specific skills. When talking about themselves, high use faculty members talked most about their teaching style and technology use. Attitude and time were the most frequently mentioned topics for high users in the technology category, while support was in the environmental category. In the summary category, E-mail was the most frequently mentioned topic by the high level users. Of all the frequently mentioned topics, only time had a negative value.

Medium level users. Medium users frequently referred to students during the general questions. Like the high users, medium users talked a lot about the students and focused on general aspects. In the Faculty category, medium users talked the most about teaching style, followed by personal style and technology use. Again, attitude and time were the most frequently mentioned topics in the technology category. Like high users, support was the most frequently discussed topic for the medium users in the environment category. In the summary category, politics and learners were the most frequently mentioned topics. For the medium level users, of all the frequently mentioned items student general topics, time, support, and politics were all mentioned in a negative context.

Low level users. Low users mentioned students and availability most frequently in the general category. When discussing students, the low level users, like the others, also mentioned students overall most frequently, more than specific skills. When answering the questions in the faculty category, technology use was the most frequently mentioned topic by the low level users. During the technology category questions, low level users discussed attitude most frequently. When discussing the working environment, low level users mentioned support and politics most frequently. In the summary category, low level users spoke the most about time and E-mail. Of all the frequently mentioned topics above, low level users were negative about availability, attitude, politics, and time.

APPENDICES

APPENDIX A

UCRIHS APPROVAL

MICHIGAN STATE
UNIVERSITY

July 24, 1995

TO: Thomas Spotts
175 W. Inkster Avenue
Kalamazoo, MI 49001

RE: IRB#: 95-363
TITLE: FACULTY USE OF INSTRUCTIONAL TECHNOLOGY IN HIGHER EDUCATION: PROFILES OF CONTRIBUTING AND DETERRING FACTORS
REVISION REQUESTED: N/A
CATEGORY: 1-C,E
APPROVAL DATE: 07/21/95

The University Committee on Research Involving Human Subjects'(UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

D. E. Wright

David E. Wright, Ph.D.
UCRIHS Chair

DEW:kaa/lcp

cc: Leighton A. Price

OFFICE OF
RESEARCH AND GRADUATE STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)

Michigan State University
232 Administration Building
East Lansing, Michigan
48824-1046

517/355-2180
FAX 517/432-1171

APPENDIX B

DISCUSSION OF 1995 FACULTY SURVEY
CONDUCTED AT A MIDWESTERN UNIVERSITY

Preliminary survey instrument

A survey on faculty use of instructional technologies was mailed to the teaching faculty at mid-sized Midwestern University in February 1995 by the University Office of Faculty Development. The survey was designed to provide basic information for the University Office of Faculty Development about faculty knowledge/experience and use of instructional technologies. It was used to provide preliminary information about the population, to identify high and low users of instructional technology, and to access a population for collection of more detailed data by interviews.

The survey was an instrument consisting of 78 questions was designed to obtain information about faculty familiarity and experience with new instructional technologies and about factors influencing the use of new technologies. Besides the above, basic demographic information about faculty gender, rank, discipline, computer ownership, and years in higher education was collected to characterize the faculty responding to the survey.

The survey addressed four general areas:

Knowledge/experience and frequency of use in instruction

Factors influencing use of instructional technologies

Incentives to use technology and barriers to use

Background information

This survey instrument was used first in 1993 to collect basic information concerning instructional technology use by the faculty. The original instrument was designed with the University Office of Faculty Development at the Midwestern University in 1992. The instrument consisted of 77 questions and was submitted to a panel of advisors consisting of the Director of University Computing Services, the Instructional Consultant for Computing Services, and the Director of Media Services. After the panel's suggestions were considered and incorporated when applicable, the questionnaire was submitted to the university Human Subjects Institutional Review Board (HSIRB) for approval. Upon approval, the completed survey was mailed, along with a cover letter explaining the purpose, to all members of the population in January 1993.

This original instrument was reviewed regarding the results of that survey and improvements were made on the 1995 questionnaire. Based on the comments received in the first survey and the revisions made, the 1995 survey provided more consistent, accurate information. The modified survey form was mailed in February 1995 to the same faculty population as the 1993 survey. The new survey gathered up-to-date information for the office of faculty development so comparison with the results of the 1993 survey could be made. It was used for this study to provide the preliminary data and access to the population.

The first part of the survey asked respondents to rate their knowledge about and experience with various technologies. Technologies listed attempted to span the range from current older technologies like video to newer technologies like multimedia. The list includes the following technologies:

audio

film

video

multimedia

distance learning

computer assisted instruction

electronic mail

computer conferencing/bulletin boards

word processing

computer spreadsheets

Internet

presentation software

statistical computing

A brief definition was offered of some technologies on the first page of the survey to reduce confusion over what some technologies are. Knowledge and experience were asked to establish a level of information and familiarity with the technologies and level of experience using the technologies. These were rated by respondents on a Likert scale ranging from none (1) to expert (5). Frequency of use was asked to establish current level of use in faculty teaching and was rated as never (1), sometimes (2), or frequently (3). Importance of technology to teaching was assessed as was likelihood of starting to use new technology in the next year. Additional information about instructional strategy was asked to obtain preliminary information about respondents teaching philosophies.

A second section of the survey was to identify factors that influence the use of technology in teaching. Questions addressed the importance that faculty members place on various factors that frequently appear in the literature when discussing the use of technologies in education and included topics such as ease of use, time, personal comfort level, funding, etc. Respondents were asked to rate the factors on a Likert scale ranging from not important (1) to critically important (5). This section provided an overview of what the faculty thought was important when considering a new technology in their teaching or when changing their current procedures or routine in the classroom to accommodate a new instructional technology.

A third section of the survey addressed the importance of incentives to use new technologies and barriers that inhibit the use of instructional technologies. These were assessed on a Likert scale with a range as mentioned above. The respondents also had an opportunity to offer additional comments about using instructional technologies. This section provided some insight on what incentives may be necessary to encourage faculty members to adopt new methods or continue using newer technology in their teaching. It also showed what some members think prevents the incorporation of newer technologies into their teaching methods.

The fourth section was for basic demographic data. Background information collected was the discipline the faculty member teaches in, academic rank, if they teach in a large class, home computer ownership, years in higher education, age and gender. This information provided some indication of what characteristics are frequently found in what type of users.

The survey and consent form was approved by the Human Subjects Institutional Review Board (HSIRB) at the university and was mailed to the faculty in February 1995. The return was approximately 50% with almost half consenting to interviews.

APPENDIX C

SURVEY INSTRUMENT

Data Mgt. No

Faculty Use of Instructional Technologies: A 1995 Survey

Thomas H. Spotts and Mary Ann Bowman
[redacted]

For the purposes of this survey, instructional technology refers to any technology (hardware and software) used in teaching to achieve instructional objectives. The following definitions, which will be used throughout the survey, are encompassed in the term.

Audio: audio tape, cassette tapes, radio, records, audio CDs, audio labs
Film: motion pictures, slides, filmstrips, photos
Video: television, videotape, video recorders, video cameras
Multimedia: mixture of media, usually text, sound, and visual images, e.g., interactive video, slide-tape programs, CD-ROM, optical discs, digitized slides
Distance learning: instruction from a remote site, using telesource, computer, telephone, cable television, etc.
Computer conferencing/bulletin boards: use of computer to facilitate dialogue between students or colleagues in support of classroom objectives
Internet: use of global computer network to retrieve information and communicate internationally
Presentation software: use of computer-generated screens or slides to support lecture presentation
Statistical computing: use of computer for data entry, manipulation, or analysis

Section A. Knowledge and Use of Technologies

Please indicate your degree of knowledge about/experience with the following technologies.

Technology	None	A Little	Moderate	Good	Expert
1. Audio	1	2	3	4	5
2. Film	1	2	3	4	5
3. Video	1	2	3	4	5
4. Multimedia	1	2	3	4	5
5. Distance learning	1	2	3	4	5
6. Computer assisted instruction	1	2	3	4	5
7. Electronic mail	1	2	3	4	5
8. Computer conferencing/bulletin boards	1	2	3	4	5
9. Word processing	1	2	3	4	5
10. Computer spreadsheets	1	2	3	4	5
11. Internet	1	2	3	4	5
12. Presentation software	1	2	3	4	5
13. Statistical computing	1	2	3	4	5

Please indicate how frequently you use the following technologies in your teaching.

Technology	Never	Sometimes (Less than 50% of semester)	Frequently (50% or more of semester)
14. Audio used in class or assigned to students	1	2	3
15. Film used in class or assigned to students	1	2	3
16. Video used in class or assigned to students	1	2	3
17. Multimedia for in-class presentation	1	2	3
18. Multimedia for student individualized learning	1	2	3
19. Distance learning	1	2	3
20. Computer assisted instruction	1	2	3
21. Email: Individualized contact with students	1	2	3
22. Email: Communications with on- and off-campus colleagues	1	2	3
23. Course-specific computer conferences/bulletin boards to promote class discussions	1	2	3
24. Electronic lists for discussions with colleagues	1	2	3
25. Internet: Information retrieval via gopher, anon. ftp, World Wide Web, etc.	1	2	3
26. Word processing to prepare exams, class matls.	1	2	3
27. Computer spreadsheets to keep grades, records	1	2	3
28. Presentation software to prepare handouts, transparencies	1	2	3
29. Statistical computing to enter, analyze, manipulate data	1	2	3

30. If you indicated previously that you use multimedia, please briefly describe which form of multimedia you are using and how you are using it in instruction.

____

____

31. If you indicated previously that you use the Internet, please briefly describe how you are using it in instruction.

____

____

32. If you indicated previously that you use computer-assisted instruction, please briefly describe what form you are using and how you are using it in instruction.

____

____

33. Overall, how would you rate the importance of instructional technology to your teaching?

Not Important	Somewhat Important	Important	Very Important	Critically Important
1	2	3	4	5

Faculty Development Services

34. How likely is it that you will start using a new instructional technology in the next year?

Not at all likely	Somewhat likely	Moderately likely	Very likely	Highly likely
1	2	3	4	5

35. Which of the following *best* describes your most frequently-used instructional strategy? *(please circle one answer only)*
1. Primarily lecture
2. Primarily lecture and discussion
3. Mixture of lecture, discussion, and small group activities
4. Primarily small group activities
5. Other ____

36. I use cooperative/collaborative learning strategies

Never	Sometimes	Frequently
1	2	3

37. I use problem-based learning strategies

Never	Sometimes	Frequently
1	2	3

38. I use case studies

Never	Sometimes	Frequently
1	2	3

Section B. Factors Influencing Use of Instructional Technologies

Please circle the degree of importance of each of the following in influencing you to use an instructional technology.

Factor Influencing Use	Not Important	Somewhat Important	Important	Very Important	Critically Important
39. Ease of use	1	2	3	4	5
40. Clear advantages over traditional delivery	1	2	3	4	5
41. Compatibility w/existing materials	1	2	3	4	5
42. Compatibility with discipline	1	2	3	4	5
43. Increased student interest	1	2	3	4	5
44. Improved student learning	1	2	3	4	5
45. Time needed to learn how to use it	1	2	3	4	5
46. Personal comfort level w/technology	1	2	3	4	5
47. Frequent use by dept. colleagues	1	2	3	4	5
48. Administrative support	1	2	3	4	5
49. Equipment availability	1	2	3	4	5
50. Funds for necessary materials	1	2	3	4	5
51. Training for faculty in technology use	1	2	3	4	5
52. Info. on matl. available in discipline	1	2	3	4	5

Section C. Incentives to Use Instructional Technologies

Please rate the importance of each of the following incentives to use new technologies:

Incentive to Use		Not Important	Somewhat Important	Important	Very Important	Critically Important
53.	Released time	1	2	3	4	5
54.	Merit pay	1	2	3	4	5
55.	Contribution to promotion/tenure	1	2	3	4	5
56.	Monetary rewards	1	2	3	4	5
57.	Spring/summer stipends	1	2	3	4	5
58.	Student/clerical assistance	1	2	3	4	5
59.	Recognition of [redacted] community	1	2	3	4	5
60.	Recognition of national higher education community	1	2	3	4	5

Please rate the importance of each of the following barriers to use of new technologies:

Barrier to Use		Not Important	Somewhat Important	Important	Very Important	Critically Important
61.	Lack of time	1	2	3	4	5
62.	Lack of interest in technology	1	2	3	4	5
63.	Lack of relevance to my discipline	1	2	3	4	5
64.	Lack of contribution to my professional advancement	1	2	3	4	5
65.	Lack of easily-accessible equipment	1	2	3	4	5

66. My department recognizes use of innovative instructional technologies in promotion, tenure, and/or merit pay decisions
 1. Yes 2. No

67. Please use this space for any additional comments about using instructional technologies.

___

___

Background Information

This information is requested to gain a better understanding of the population being studied. Please supply whatever background information you feel comfortable providing.

68. Discipline: 1. Business 2. Education 3. Engineering 4. Fine Arts
 5. Health professions 6. Humanities 7. Physical sci. 8. Social sci.
 9. Other ________

69. Academic rank: 1. Instructor 2. Assistant Professor. 3. Associate Professor 4. Professor

I teach at least one large class with
 70. 50-99 students 1. Yes 2. No 71. 100-150 students 1. Yes 2. No.
 72. 151-199 students. 1. Yes. 2. No 73. 200+ students 1. Yes 2. No

74. I own the following home computer: 1. None. 2. Macintosh. 3. PC. 4. Other ________

75. My home computer is primarily for: 1. Professional use 2. Personal use

76. I have taught in higher ed. ________ years.

77. Age: 1. 25-35 2. 36-45 3. 46-55 4. 56+ 78. Gender: 1. Female 2. Male

APPENDIX D

CONSENT FORMS

Faculty Development Services [redacted]

[redacted]

Please return this Consent Form if you agree to be available for a follow-up interview.

To be part of the research project entitled A Study of Instructional Technology in Higher Education: A Profile of Use in Teaching on Campus.

Principal Investigator: Mary Ann Bowman
Research Associate: Thomas H. Spotts

CONSENT FORM FOR INTERVIEW SUBJECTS

I understand that the data from this interview will remain confidential and that they may be used as part of a doctoral dissertation. I also understand that my consent to participate in this project indicates my willingness to be asked to participate in in-depth interviews about my use of, opinions about, and thoughts on new technologies in teaching. These interviews are intended to obtain more detailed information about the use of new instructional technologies and about the personal and institutional factors that influence its use. I understand that providing this information will not benefit me personally, but that there may eventually be benefit to faculty through programs on technology use sponsored by the Office of Faculty Development Services.

I understand that the only risks associated with this project are the minor inconveniences associated with giving up time for the interview. As in all research, there may be unforeseen risks to participants. I understand that if accidental injury should occur, appropriate emergency measures will be taken; however, no compensation or treatment will be made available to me except as otherwise specified in this consent form.

I understand that I may refuse to participate at any time without any negative effect. If I have questions or concerns about this study, I may discuss those concerns with Thomas Spotts at [redacted], Mary Ann Bowman at [redacted]6, the chair of the Human Subjects Institutional Review Board at [redacted], or the Vice President for Research at [redacted]

My signature below indicates that I am willing to be interviewed for this study.

Signature: ______________________________ Date: __________

Name (*please print*): ______________________________

Dept. ____________________ Phone: __________ Email: ______________

Please return the signed form with your completed questionnaire, to

Faculty Development Services
[redacted]

Faculty Development Services [redacted] [redacted]

[redacted]

July 27, 1995

Dear Participant:

I am doing a study about faculty use of new instructional technologies in higher education. As part of the study, I am interviewing faculty for their perceptions about factors related to use. The interview is a follow-up of the Office of Faculty Development Services survey you completed in the spring. The following consent form is to reaffirm your consent to be interviewed for this study. I am asking for permission to audio-tape the interviews and make notes. You may decline to answer any question and withdraw participation at any time during the study.

In the analysis, transcripts will be prepared, but no reference will be made to the participants identification. After reviewing the interviews, I may wish to contact you again to clarify or follow up a point.

The data will remain confidential but will be used as part of a doctoral dissertation. At no time will names be used in the reporting of data from the survey or the interviews. There are no risks or benefits for the participants associated with the study. If you have any concerns, you may discuss these concerns with Thomas Spotts at [redacted] Dr. Bowman of the university office of faculty development at [redacted]. Your cooperation is appreciated.

Sincerely,

Thomas H. Spotts, [redacted]

Consent form:

My signature below indicates that I am willing to be interviewed for this study. I have signed a previous consent form and am reaffirming my consent with this form. I understand that data from this interview will remain confidential and that they may be used as part of a doctoral dissertation. I also understand that the interview is a follow-up of the February survey about the use of new instructional technologies in higher education and the interviews are to obtain more detailed information. I understand that I may refuse to participate at any time without negative effect. If I have any questions or concerns about this study , I may discuss these concerns with Thomas H. Spotts at [redacted] or Dr. Bowman of the university office of faculty development at [redacted]

Signature: ______________________________ Date:________

Name (please print): ______________________________________

Dept. _______________ Phone: ______________ Email: _______

APPENDIX E

INTERVIEW FORMAT

D:INTVTEMP

Thomas Spotts

Interviewer: What did you do just prior to becoming a faculty member at this university?

How long have you been teaching here at [redacted]

What department do you teach in?

What is your subject area or discipline?

What is your current rank and how long have you been at this rank?

What is your favorite class to teach? Why?

What is your least favorite class to teach? Why?

Tell me about your most satisfying experience in the classroom?

What do you do, i.e. in terms of use of instructional technology?

How do you do it?

How much do you do?

Since when have you been using it?

What motivated you to start using this instructional technology?

Do you consider yourself a frequent (high) experienced user of instructional technologies?

Learner:

Interviewer: In what ways do you think your students have changed in the last five years? (This will be used as appropriate, that is if the faculSw member is new and has not taught for five years, questions will be tailored to incorporate graduate teaching experience, etc.)

Focus on how students have changed regarding the following areas:

type of student (categorize as traditional or non-traditional)

student outside responsibilities (work, etc.)

learner knowledge

learner motivation

learner experience

Why do you think these changes are occurring?

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Have these perceptions of change influenced your use of instructional technology in any way?

Faculty:

Interviewer: In what ways has your teaching changed in the last five years?

Focus in regards to the following areas:

personal beliefs about teaching and learning

teaching style

class preparation

presentation delivery

class management

class organization

course information gathering

administrative pressure

new learning theories

Why do you think these changes are occurring?

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Has your role in instruction changed over the last five years? Elaborate on how and why.

Technology:

Interviewer: How do you think technology has changed in the last five years?

Focus on the following areas:

technology interactivity

technology ease of use

technology flexibility

technology adaptability

How have you changed in regards to technology in the past five years?

Focus on the following areas:

technology anxiety

technology experience

technology knowledge

attitude toward technology

beliefs about technology in teaching

Why do you think these changes are occurring?

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Why do you respond this way?

Interviewer: In what ways do you think conditions are changing at our university related to instructional technologies in the last five years?

Elaborate on why you think these changes are occurring.

Elaborate on your perception of how you think university attitude toward technology in instruction is changing? Why do you think this is changing?

Have these perceptions of change influenced your use of instructional technology in any way?

Environment:

Interviewer: In what ways have your working conditions at the university changed over the past five years?

Focus on the following areas:

faculty motivation (requesting support, training, etc.)

faculty desire to stay current

administrative pressure

technical support

training

material resources

other faculty doing similar work

funding for projects

recognition or similar support

nature of students

colleagues in the department

resource allocation

administrative policies

Why do you think these changes are occurring?

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Why do you respond this way?

Describe the most significant positive change to your working environment in the last five years that has affected your teaching. Also describe the most significant negative change.

Elaborate on why you think these changes are occurring?

In what ways do you communicate or socialize with your colleagues at the department, college, and university level?

Indicate how the use of instructional technologies have changed over the past five years in the context of home, office and classroom use.

Have these perceptions of change influenced your use of instructional technology in any way?

Final summary questions:

How have the component areas discussed influenced you in use of technology?

How so you think this affects your use of instructional technology? (refer to specific elements and change of elements from interview)

Which of the element areas is the most influential?

What really influenced you, encouraged you, or made you actively use or not use instructional technologies?

APPENDIX F

EXAMPLE OF INTERVIEW CONTACT DATA

D:INTVTEMP

Thomas Spotts

Interviewer: What did you do just prior to becoming a faculty member at this university?

Tape 1A: 18 HS teacher Art (Public)	Education Background; Kazoo	Dem

How long have you been teaching here at Western Michigan University?

Tape 1A: 24 15 years	University veteran	Dem

What department do you teach in?

Tape 1A: 25 Consumer Resource Tecnology	Home economics dept; renamed college of education	Dem

What is your subject area or discipline?

Tape 1A: 38 Interior Design	Subject area more closely associated with art than home ec.	Dem

What is your current rank and how long have you been at this rank?

Tape 1A: 36 Assistant Professor (15 years)	Not much progress; stuck or no desire to advance	Dem

What is your favorite class to teach? Why?

Tape 1A: 39 Studio classes (project) no particular	Cite development of Learner as opposed to class	Learner

What is your least favorite class to teach? Why?

Tape 1A: J2 Least favorite activity grading	Non committal; prevent progress; students work to your expectation	Gen

Tell me about your most satisfying experience in the classroom?

Tape IA: 63 watching student progression or growth	focus learner progress	Gen

What do you do, i.e. in terms of use of instructional technology?

Tape IA: 209 Don't feel use teachers deliver system has potential multimedia- haven't learned how to use	Prof tools, but not commit to use	Gen

How do you do it?

Tape IA: typically small demo around computer; not like projection units	Typical of many inst. Tech. Tools, not meet reg. Or too difficult to use.	Gen

How much do you do?

CAD/CAM part of studio class		Gen

Since when have you been using it?

What motivated you to start using this instructional technology?

Tape IA: 95 Leaner need to know in profession; use as tool in profession; market for student demands knowledge.	Profession require you be literate with tools as opposed to using as an inst. Tool alone	Mot

Do you consider yourself a frequent (high) experienced user of instructional technologies?

Tape IA: 249 Very nominal, so much; 1-10 scale. 360: don't use inst. Tech, but use	Confirm low user, but get needs technology as a tool in profession	Val

tech in field		

Learner:

Interviewer: In what ways do you think your students have changed in the last five years? (This will be used as appropriate, that is if the faculSw member is new and has not taught for five years, questions will be tailored to incorporate graduate teaching experience, etc.)

Focus on how students have changed regarding the following areas:

type of student (categorize as traditional or non-traditional)

student outside responsibilities (work, etc.)

learner knowledge

learner motivation

learner experience

Tape 1 A: 73 Quality: raise standards change type of student; more serious than 1 yr ago; More Comp. Lit.; Non-Trade level same;	Raise req. due to ind. Market. Is Tech. Inc. due to req? Selection process/competition	Learner

Why do you think these changes are occurring?

Tape 1A: 95 Mot./serious	Selection differences; Comp.	Learner

base and portfolio review; Comp. Lit. Part. By job market. Student recognize type of student constant, just chance	Part not due to schools; credit to student (typical teacher/educator: a tribute type to whatever)	

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

IA: 73 Positive as better students resulting from raising standards.		Learn Pos

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Have these perceptions of change influenced your use of instructional technology in any way?

Faculty:

Interviewer: In what ways has your teaching changed in the last five years?

Focus in regards to the following areas:

personal beliefs about teaching and learning

teaching style

class preparation

presentation delivery

class management

class organization

course information gathering

administrative pressure

new learning theories

Tape 1A: 118 Teaching change, get away from teacher base inst. Studio	Constructivist; double edge sword in lecture, spit back, what does she mean: Cites	Faculty

always activity base (123) Prep. rot. Change; Information overload. Material presentation; fewer More material (actual); spd sheet to. Track st. time.	need to apply int. (activities) Sd sheet common for time track	

Why do you think these changes are occurring?

Tape 1A: 118 Push in higher Ed. Due to st., perceptions, exp. Change not know; 153: less sect. Support	Need to use wp more as result	Fac

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

Tape 1A: 24-30 Neg against discipline. "Irritates hell out of me…" 143: Inf. Abundant, we should focus on apply, not gather. 152: no sect. Support (prep). 160: Sd sheet. 165: Video tape support. 176" Memo on use-feel over load.	Traditional mode of thinking where prof. Is leader or knowledge source. Neg in abundant inf.; stress apply. Dot it selves seem common. Use feedback to st. time. Free inst. To water. Easy to arrange. Time surfaces	Fac Neg Neg Neg Pos Pos Neg

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Tape 1A: 124 In lecture base, try to involve student once in process. Searching for things that work well. Bias against discussion; Search for materials , get out to see, share with class.	Strong feelings about discussion; thinks inst. Responsibility to share, rather than discuss others (130)	Faculty Resp

Has your role in instruction changed over the last five years? Elaborate on how and why.

163: Video tape; have support do it. Studio stay somewhat same	Can watch closely if support does video	Fac Resp

Have these perceptions of change influenced your use of instructional technology in any way?

169: Good support encourages furthur use of video; easy to arrange. 174: Encouragement to use by advice, memos feel over load 178: tech based word, teaching must reflect culture 183: Time impacts what able to do 190: Studio class influence what does also	Ease of use encourage continue use of video Must use because it is in culture thought meet students exposure to technology perhaps I led too much, but does think more time help. Situation of class, teach in studio class, tempers what can do, as labor intense, high contact hours.	Fac

<u>Technology</u>:

Interviewer: How do you think technology has changed in the last five years?

Focus on the following areas:

technology interactivity

technology ease of use

technology flexibility

technology adaptability

Tape 1A:195 Inst. Tech vs use of tech in insttruct of discipline(profession) 237: keep rearing change in case of use, no; software using is more complex 279: not windows fan, way learn, key strokes less cumbersom 281: On screen help, doesn't see results go back to directions, confused	Profession area tech tools, so much be part of inst. Find windows reaquire too much liking	Tech

How have you changed in regards to technology in the past five years?

Focus on the following areas:

technology anxiety

technology experience

technology knowledge

attitude toward technology

beliefs about technology in teaching

231: Anxiety- system crash, cause modify class, let go, not worry about , roll wit punches; 245: so much out there, need sabotical to out and use all, overwhelmed seems to flavor attitude, i.e. personally don't even know what is available	Mention frustration rather than anxiety about crash Overwhelm	tech

Why do you think these changes are occurring?

239: Complexity worse because going too fast, need to slow down on updates, occusional urge worse: too many functions	Reflects time- occasional vs. full time prod. means I don't have time to devote to strictly use	tech

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

239: Complex new releases negative 270: Projection/ colors 274: manual use better than on line help 279: Windows... 281: On screen margin lost.	Time issue to learn not use because not do good job. Linear better than Hyper. Key strokes easier	Neg Neg Neg Neg Neg

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Tape 1A: 270 Projection want not reflect colors well, so do small demo around comp. 274: Text books easy to go back and find mat. so use more than demo	Need color reproduction. Time Easier to find material.	Tech Resp

Why do you respond this way?

287: On screen find confusing to jump back; once learn okay but prefer manual	Neg to onscreen help, maybe our way we have learned, or preferences	Tech

Interviewer: In what ways do you think conditions are changing at our university related to instructional technologies in the last five years?

Tape 1A: 341 Provost interest as result of student		Tech

Elaborate on why you think these changes are occurring.

Stduent complaint about situation in particular area		Tech

Elaborate on your perception of how you think university attitude toward technology in instruction is changing? Why do you think this is changing?

Tape 1A: 325 Provost collaboration committee driven by seeking to share	Seems motivation is to save money or find more use for existing equipment	Tech

software & hardware		

Have these perceptions of change influenced your use of instructional technology in any way?

Environment:

Interviewer: In what ways have your working conditions at the university changed over the past five years?

Focus on the following areas:

faculty motivation (requesting support, training, etc.)

faculty desire to stay current

administrative pressure

technical support

training

material resources

other faculty doing similar work

funding for projects

recognition or similar support

nature of students

colleagues in the department

resource allocation

administrative policies

Tape 1A:209 support from admin. same ways but not others, on own to learn Dept. can't but higher admin.	Can get, but not help learning	Env
222: New direct. of comp. verbalize trying sup.	Director (new) verbalize training sys but wait and see attitude.	
260: Sec support down	Do it ourself	
262: Class size larger but accreditation limits so last 5yr.	Work station limit are plus here	
292: tech support network okay	refers to own short fall (gaps in knowledge)	

Why do you think these changes are occurring?

262: class size due to accreditation 300: training; trying to do more as univ.	not strong support of univ. classes	Env

How do you feel about these changes (or what do you think...)? Is this positive? Negative?

260: Sect support 262: Accreditation size limit + 300: Comp. classes too brief 323: Univ. support, provost	More to do Short term or me(learning style) again implies blame self provost result of student	Env neg pos neg pos

How does this relate to what you do (in regards to teaching)? Have you responded to these changes in any way?

Tape 1A:226 Use student knowledge 298: find a book excellent feedback positive	Student positive feedback encourage furthur book use	Env Resp

Why do you respond this way?

Tape 1A: 295 Tech support mediocracy in netwroking may be due to lack of knowledge; don't understand answers Tech support not explain how solve	Implies "I don't know as much as I should" Lack technical confidence; self taught as opposed to train again doubts or blames self	Env

Describe the most significant positive change to your working environment in the last five years that has affected your teaching. Also describe the most significant negative change.

Tape 1A:334 Software	ease prob of scheduling a community lab; academi	Env

update and new dept. comp.lab	computing funding	

Elaborate on why you think these changes are occurring?

Tape 1A 341: Chairperson works toward of training; Rappestance? Student letter to provost be seen trying for four years; don't understand channels	Don't know if should mention implies thinks better if not known; puts provost in light that only provide if student, when fac. been requesting for years; blame self again	Env

In what ways do you communicate or socialize with your colleagues at the department, college, and university level?

Tape 1A: 303 Collegiate not d similar work "Lone Ranger" if more in dept., would help 310: On-line list serves: Time consuming (for but..) 329: Collaboration can be useful; Theatre use similar software.	Implies all aloneLike, to get help in learning software Intent fun- time to learn problem again brings up lack of time Teacher isolated; trap in time in internet	Env Tech

Indicate how the use of instructional technologies have changed over the past five years in the context of home, office and classroom use.

Tape 1A: 251 home use not consider because of close proximity to campus; no reason to invest at home; go I to office at all sorts of dorms 339: Delivery effort to keep up with MTV, cable; Technology everywhere, more used by public as tool. Just Here!!	Like to leave at office Does this imply generation more used to video than text? If in public, shouldn't teacher use it	Env

Have these perceptions of change influenced your use of instructional technology in any way?

Final summary questions:

How have the component areas discussed influenced you in use of technology?

Tape 1A: 24 Computers avaiability (pos) Env issue Software Purchasability Univ (+) 34: Learner better prepared, eager motivated explore ways to implement more efficiently 51 time may be inhibitor, many things to do to use	Can't use without support Mention "can't learn fast enough" Put energies which had indicated need for time	Env Env

How so you think this affects your use of instructional technology? (refer to specific elements and change of elements from interview)

Tape 1Aa: 31 Enable me to use in ways couldn't earlier,	This is more of tool of professor than ind tech.	Gen

financial support +, before was show and tell because of lack of statiion 51: Time to locate, get learn etc, inhibitor where ind. would send you to time 69: not want to whie, but spread thing.. have a life!	Personal Time Thinks university wants things but not want to support	

Which of the element areas is the most influential?

Tape 1Aa: 73 Learner; Technology; is exciting, want to lear; Accessible for use; global view maybe env. instead of tech.; Subject area should be included, not only attendants, whold field	Mentions "I want to learn, I'm just a slow learner." This implies lower self esteem, in that pattern of reg statements about self or her part is evident. Tools in profession as opposed to inst. tech.	Neg

What really influenced you, encouraged you, or made you actively use or not use instructional technologies?

Tape 1Aa: Environment primarily availability. Preface with fact that technology is tool of profession so subject require use of	Tough call, as env. includes field or subject area;	

Tape 1A:359 Don't know if really helped....
Statements like this seem to reflect a lack of confidence or self doubt. Patter Emerging...?

Pat appear to me as a typical educator, with little free time, as self professed, to work extensively with technology tools. Environment of course improves use of such tools.

APPENDIX G

EXAMPLE OF CONTACT SUMMARY SHEET

Contact Summary Sheet

Contact: In-depth interview | Use Level: S-L, P-L | Validation: Yes

Discipline/Dept.: Consumer Resources, Interior Design | Years at University: 15

Main issues or themes that surfaced during contact:

Concern over lack of time to do things they want, must spend time learning; Some statements reflected self-doubt in technical abilities; Need to use technology because is part of your culture; On-Line best serves are time consuming; Underlying theme of overwhelming; Is this a resistance to change because it requires effort?

Summary of information gained or not gained in primary areas:

Learn: Department standards have been raised so quality of student has changed, i.e. improved; Students are more seniors which is positive; More computer sophisticated.

Fact: Teaching style has changed in that she is getting away from teacher based institutions; classes are studio type, little lecture; has changed in that uses technology more; Mostly negative on discussion group classes or constructivist theory; abundant information is stressful to some degree; In lecture try to involve st. more.

Tech: Software is more complex; on screen help is awkward, prefers manual; Overwhelming at times; Has some anxiety about systems crash etc. and not so fast to keep up; Occurs vs. Full time user highlighted

Env: Took student complaint to Provost to find new software; Provost collaboration commitment motivations seems to be money saving or way to use existing resources more. Arlmin help is off and on. Class size change due to accredidation. New in a variety of issues; Delivery needs are trying to keep up with MTV generation.

Additional interesting information:

Secondary teacher prior to coming to University; Most important factor seems to be combination of keeping up with Ind. (Env) for students to get jobs, want to learn technology (tech), and availability (Env).

Concerns: Pat has been an assistant professor ever since she was hired in 15 years ago. Classes are primarily studio and require technology use a tool in the profession.

APPENDIX H

EXAMPLES OF SPREAD SHEET WITH CODED DATA

General Demographic statements

	time	survival	students	past exp	motivate interest	effective	hassel	dev. stud. skills	availability
respondent									
371			1		1			1	
371									
371									
371									
371									
371									
371									
371									
371									
371									
371									
Sum of values(371)	0	0	1	0	1	0	0	1	0
Avg. (371)	####	#DIV/0!	1	#DIV/0!	1	#DIV/0!	#####	1	#DIV/0!
Std(371)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
703	1		1		1		-1		1
703					1				1
703					1				1
703					1				1
703									1
703									
Sum of values(703)	1	0	1	0	4	0	-1	0	5
Avg. (703)	1	#DIV/0!	1	#DIV/0!	1	#DIV/0!	-1	#DIV/0!	1
Std (703)	####	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#####	#DIV/0!	0
74				1	1	1	-1		
74						1			
74									
74									
74									
74									
74									
Sum of values(74)	0	0	0	1	1	2	-1	0	0
Avg. (74)	####	#DIV/0!	#DIV/0!	1	1	1	-1	#DIV/0!	#DIV/0!
Std (74)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#####	#DIV/0!	#DIV/0!
340	1				1	1		1	
340								1	
340									
340									
340									
340									
340									
340									

Sum of values(340)	1	0	0	0	1	1	0		2	0
Avg. (340)	1	#DIV/0!	#DIV/0!	#DIV/0!	1	1	#####		1	#DIV/0!
Std (340)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####		0	#DIV/0!
740			0			1	1		1	1
740			1						1	
740			-1							
740										
740										
Sum of values(740)	0	0	0	0	0	1	1		2	1
Avg. (740)	####	#DIV/0!	0	#DIV/0!	#DIV/0!	1	1		1	1
Std (740)	####	#DIV/0!	1	#DIV/0!	#DIV/0!	#DIV/0!	#####		0	#DIV/0!
432					1	1				
432					1					
432					1					
432										
432										
Sum of values(432)	0	0	0	0	3	1	0		0	0
Avg. (432)	####	#DIV/0!	#DIV/0!	#DIV/0!	1	1	#####	#DIV/0!		#DIV/0!
Std (432)	####	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#####	#DIV/0!		#DIV/0!
201	0		1	-1	1		-1			1
201			1		1		-1			1
201					1		-1			
201							-1			
201										
Sum of values(201)	0	0	2	-1	3	0	-4		0	2
Avg. (201)	0	#DIV/0!	1	-1	1	#DIV/0!	-1	#DIV/0!		1
Std (201)	####	#DIV/0!	0	#DIV/0!	0	#DIV/0!	0	#DIV/0!		0
Sum of HU values	2	0	4	0	13	5	-5		5	8
385	-1		1		1					1
385	-1				1					
385	-1									
385										
385										
385										
385										
385										
385										
Sum of values(385)	-3	0	1	0	2	0	0		0	1
Avg. (385)	-1	#DIV/0!	1	#DIV/0!	1	#DIV/0!	#####	#DIV/0!		1
Std (385)	0	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#####	#DIV/0!		#DIV/0!

446	-1	-1	1						
446			1						
446			1						
446			1						
446			1						
446									
446									
446									
446									
Sum of values(446)	-1	-1	5	0	0	0	0	0	0
Avg. (446)	-1	-1	1	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Std (446)	####	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
596			-1	1	1				
596			1	1	1				
596									
596									
596									
596									
596									
596									
Sum of values(596)	0	0	0	2	2	0	0	0	0
Avg. (596)	####	#DIV/0!	0	1	1	#DIV/0!	#####	#DIV/0!	#DIV/0!
Std (596)	####	#DIV/0!	1.41421	0	0	#DIV/0!	#####	#DIV/0!	#DIV/0!
616	-1				1	1	-1		-1
616	-1						-1		-1
616									
616									
616									
616									
616									
616									
Sum of values(616)	-2	0	0	0	1	1	-2	0	-2
Avg. (616)	-1	#DIV/0!	#DIV/0!	#DIV/0!	1	1	-1	#DIV/0!	-1
Std (616)	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	0
98	-1	1	1	1	1		-1	1	
98	-1		0					1	
98									
98									
98									
98									
98									
Sum of values(98)	-2	1	1	1	1	0	-1	2	0
Avg. (98)	-1	1	0.5	1	1	#DIV/0!	-1	1	#DIV/0!

Std (98)	0	#DIV/0!	0.70711	#DIV/0!	#DIV/0!	#DIV/0!	#####		0	#DIV/0!
103			1	1	1	1			1	1
103			0	1	1	1			1	-1
103			1	1	1				1	
103			1							
103			1							
103			1							
Sum of values(103)	0	0	5	3	3	2	0		3	0
Avg. (103)	####	#DIV/0!	0.83333	1	1	1	#####		1	0
Std (103)	####	#DIV/0!	0.40825	0	0	0	#####		0	1.414214
638			1	1	1					-1
638			1	1	1					
638				1						
638										
638										
638										
Sum of values(638)	0	0	2	3	2	0	0		0	-1
Avg. (638)	####	#DIV/0!	1	1	1	#DIV/0!	#####	#DIV/0!		-1
Std (638)	####	#DIV/0!	0	0	0	#DIV/0!	#####	#DIV/0!		#DIV/0!
Sum of MU values	-8	0	14	9	11	3	-3		5	-2
188	-1	1	1						1	-1
188	-1		1						1	
188			1							
188			1							
188										
188										
Sum of values(188)	-2	1	4	0	0	0	0		2	-1
Avg. (188)	-1	1	1	#DIV/0!	#DIV/0!	#DIV/0!	#####		1	-1
Std (188)	0	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#####		0	#DIV/0!
587					1					1
587										-1
587										-1
587										
587										
587										
587										
587										
587										
587										
Sum of values(587)	0	0	0	0	1	0	0		0	-1
Avg. (587)	####	#DIV/0!	#DIV/0!	#DIV/0!	1	#DIV/0!	#####	#DIV/0!		-0.333333

Std (587)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!		1.154701
180		1	1	1						
180		1								
180										
180										
180										
180										
180										
Sum of values(180)	0	2	1	1	0	0	0		0	0
Avg. (180)	####	1	1	1	#DIV/0!	#DIV/0!	#####	#DIV/0!		#DIV/0!
Std (180)	####	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!		#DIV/0!
308		-1	1							-1
308										-1
308										
308										
308										
Sum of values(308)	0	-1	1	0	0	0	0		0	-2
Avg. (308)	####	-1	1	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!		-1
Std (308)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!		0
525			0			1				1
525										
525										
525										
525										
Sum of values(525)	0	0	0	0	0	1	0		0	1
Avg. (525)	####	#DIV/0!	0	#DIV/0!	#DIV/0!	1	#####	#DIV/0!		1
Std (525)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!		#DIV/0!
499	-1	0	1	1	1	0	-1		1	0
499			1		1	1			1	-1
499									1	
499									1	
Sum of values(499)	-1	0	2	1	2	1	-1		4	-1
Avg. (499)	-1	0	1	1	1	0.5	-1		1	-0.5
Std (499)	####	#DIV/0!	0	#DIV/0!	0	0.70711	#####		0	0.707107
643	-1	1	1		1		1		1	1
643		1	1				-1			1
643		-1								
643										
643										
643										
Sum of values(643)	-1	1	2	0	1	0	0		1	2

Avg. (643)	-1	0.3333	1	#DIV/0!	1	#DIV/0!	0		1	1
Std (643)	####	1.1547	0	#DIV/0!	#DIV/0!	#DIV/0!	1.414	#DIV/0!		0
Sum of LU values	-4	3	10	2	4	2	-1		7	-2

APPENDIX I

EXAMPLES OF TABLES USED IN DATA REDUCTION

respondent	time	survival	students	past exp	interest	effective	hassel	dev. stud. skills	availability
Sum of values(371)	0	0	1	0	1	0	0	1	0
count(371)	0	0	1	0	1	0	0	1	0
Avg. (371)	####	#DIV/0!	1	#DIV/0!	1	#DIV/0!	#####	1	#DIV/0!
Std(371)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(703)	1	0	1	0	4	0	-1	0	5
count(703)	1	0	1	0	4	0	1	0	5
Avg. (703)	1	#DIV/0!	1	#DIV/0!	1	#DIV/0!	-1	#DIV/0!	1
Std (703)	####	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#####	#DIV/0!	0
Sum of values(74)	0	0	0	1	1	2	-1	0	0
count(74)	0	0	0	1	1	2	1	0	0
Avg. (74)	####	#DIV/0!	#DIV/0!	1	1	1	-1	#DIV/0!	#DIV/0!
Std (74)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#####	#DIV/0!	#DIV/0!
Sum of values(340)	1	0	0	0	1	1	0	2	0
count(340)	1	0	0	0	1	1	0	2	0
Avg. (340)	1	#DIV/0!	#DIV/0!	#DIV/0!	1	1	#####	1	#DIV/0!
Std (340)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	0	#DIV/0!
Sum of values(740)	0	0	0	0	0	1	1	2	1
count(740)	0	0	3	0	0	1	1	2	1
Avg. (740)	####	#DIV/0!	0	#DIV/0!	#DIV/0!	1	1	1	1
Std (740)	####	#DIV/0!	1	#DIV/0!	#DIV/0!	#DIV/0!	#####	0	#DIV/0!
Sum of values(432)	0	0	0	0	3	1	0	0	0
count(432)	0	0	0	0	3	1	0	0	0
Avg. (432)	####	#DIV/0!	#DIV/0!	#DIV/0!	1	1	#####	#DIV/0!	#DIV/0!
Std (432)	####	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(201)	0	0	2	-1	3	0	-4	0	2
count(201)	1	0	2	1	3	0	4	0	2
Avg. (201)	0	#DIV/0!	1	-1	1	#DIV/0!	-1	#DIV/0!	1
Std (201)	####	#DIV/0!	0	#DIV/0!	0	#DIV/0!	0	#DIV/0!	0
Sum of HU values	2	0	4	0	13	5	-5	5	8
Sum of HU counts	3	0	7	2	13	5	7	5	8
Sum of values(385)	-3	0	1	0	2	0	0	0	1
count(385)	3	0	1	0	2	0	0	0	1
Avg. (385)	-1	#DIV/0!	1	#DIV/0!	1	#DIV/0!	#####	#DIV/0!	1
Std (385)	0	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(446)	-1	-1	5	0	0	0	0	0	0
count(446)	1	1	5	0	0	0	0	0	0
Avg. (446)	-1	-1	1	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Std (446)	####	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(596)	0	0	0	2	2	0	0	0	0
count(596)	0	0	2	2	2	0	0	0	0
Avg. (596)	####	#DIV/0!	0	1	1	#DIV/0!	#####	#DIV/0!	#DIV/0!
Std (596)	####	#DIV/0!	1.41421	0	0	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(616)	-2	0	0	0	1	1	-2	0	-2
count(616)	2	0	0	0	1	1	2	0	2
Avg. (616)	-1	#DIV/0!	#DIV/0!	#DIV/0!	1	1	-1	#DIV/0!	-1
Std (616)	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	#DIV/0!	0
Sum of values(98)	-2	1	1	1	1	0	-1	2	0
count(98)	2	1	2	1	1	0	1	2	0
Avg. (98)	-1	1	0.5	1	1	#DIV/0!	-1	1	#DIV/0!
Std (98)	0	#DIV/0!	0.70711	#DIV/0!	#DIV/0!	#DIV/0!	#####	0	#DIV/0!

Sum of values(103)	0	0	5	3	3	2	0	3	0
count(103)	0	0	6	3	3	2	0	3	2
Avg. (103)	####	#DIV/0!	0.83333	1	1	1	#####	1	0
Std (103)	####	#DIV/0!	0.40825	0	0	0	#####	0	1.414214
Sum of values(638)	0	0	2	3	2	0	0	0	-1
count(638)	0	0	2	3	2	0	0	0	1
Avg. (638)	####	#DIV/0!	1	1	1	#DIV/0!	#####	#DIV/0!	-1
Std (638)	####	#DIV/0!	0	0	0	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of MU values	-8	0	14	9	11	3	-3	5	-2
Sum of MU counts	8	2	18	9	11	3	3	5	6
Sum of values(188)	-2	1	4	0	0	0	0	2	-1
count(188)	2	1	4	0	0	0	0	2	1
Avg. (188)	-1	1	1	#DIV/0!	#DIV/0!	#DIV/0!	#####	1	-1
Std (188)	0	#DIV/0!	0	#DIV/0!	#DIV/0!	#DIV/0!	#####	0	#DIV/0!
Sum of values(587)	0	0	0	0	1	0	0	0	-1
count(587)	0	0	0	0	1	0	0	0	3
Avg. (587)	####	#DIV/0!	#DIV/0!	#DIV/0!	1	#DIV/0!	#####	#DIV/0!	-0.333333
Std (587)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	1.154701
Sum of values(180)	0	2	1	1	0	0	0	0	0
count(180)	0	2	1	1	0	0	0	0	0
Avg. (180)	####	1	1	1	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Std (180)	####	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(308)	0	-1	1	0	0	0	0	0	-2
count(308)	0	1	1	0	0	0	0	0	2
Avg. (308)	####	-1	1	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	-1
Std (308)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	0
Sum of values(525)	0	0	0	0	0	1	0	0	1
count(525)	0	0	1	0	0	1	0	0	1
Avg. (525)	####	#DIV/0!	0	#DIV/0!	#DIV/0!	1	#####	#DIV/0!	1
Std (525)	####	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#####	#DIV/0!	#DIV/0!
Sum of values(499)	-1	0	2	1	2	1	-1	4	-1
count(499)	1	1	2	1	2	2	1	4	2
Avg. (499)	-1	0	1	1	1	0.5	-1	1	-0.5
Std (499)	####	#DIV/0!	0	#DIV/0!	0	0.70711	#####	0	0.707107
Sum of values(643)	-1	1	2	0	1	0	0	1	2
count(643)	1	3	2	0	1	0	2	1	2
Avg. (643)	-1	0.3333	1	#DIV/0!	1	#DIV/0!	0	1	1
Std (643)	####	1.1547	0	#DIV/0!	#DIV/0!	#DIV/0!	1.414	#DIV/0!	0
Sum of LU values	-4	3	10	2	4	2	-1	7	-2
Sum of LU counts	4	8	11	2	4	3	3	7	11

APPENDIX J

GENERAL CATEGORY:
SUMMARY OF TOPICS MENTIONED 15 OR MORE TIMES,
BY LEVEL

respondent	time	students	interest	General dev. stud. skills	availability	Total
Sum of HU values	2	4	13	5	8	32
Sum of HU counts	3	7	13	5	8	36
HU pos. count	2	5	13	5	8	33
HU neg. count	0	1	0	0	0	1
0 count	1	1	0	0	0	2
Sum of MU values	-8	14	11	5	-2	20
Sum of MU counts	8	18	11	5	6	48
MU pos. count	0	15	11	5	2	33
MU neg. count	8	1	0	0	4	13
0 count	0	2	0	0	0	2
Sum of LU values	-4	10	4	7	-2	15
Sum of LU counts	4	11	4	7	11	37
LU pos. count	0	10	4	7	4	25
LU neg. count	4	0	0	0	6	10
0 count	0	1	0	0	1	2
Total count	15	36	28	17	25	121
Total value	-10	28	28	17	4	67

APPENDIX K

GENERAL CATEGORY:
SUMMARY OF FREQUENCY COUNTS AND VALUES
FOR TOPICS MENTIONED 15 TIMES OR MORE,
BY LEVEL OF USE.
INCLUDES NUMBER OF FACULTY SPEAKING OUT
LISTED IN ORDER OF HIGHEST TO LOWEST FREQUENCY COUNT.

Sheet10

	General										
	High			Medium			Low				
Topics	**Freq.**	**Value**	**# of Fac.**	**Freq.**	**Value**	**# of Fac.**	**Freq.**	**Valu**	**# of Fac.**	**Total count**	**Total value**
Students	7	4	4	18	14	6	11	10	7	36	28
Interest	13	13	6	11	11	6	4	4	3	28	28
Avail.	8	8	3	6	-2	4	11	-2	6	25	4
Dev. St. Skills	5	5	3	5	5	2	7	7	3	17	17
Time	3	2	3	8	-8	4	4	-4	3	15	-10
Totals	36	32	19	48	20	22	37	15	22	121	67

APPENDIX L

EXAMPLES OF TABLES COMPARING VALUE (+ OR -) OF TOPICS MENTIONED

General (high)

Topics	cases with pos. first mention	cases with neg first mention	value overall	value high	+ freq.	0 freq.	- freq.	Sum freq.	comments
students	371, 703, 201		+	+	5	1	1	7	371-interst in student, req e-mail use (104-109) 703-see student grow, e-mail use ofr lrg. class (48,102) 740-student growth(38); grad. st. use to build files(44); grad. St. not as tuned to technology. 201-st. impressions(27); st. questions that show learning(27)
interest	371, 703, 74, 340, 740, 432, 201		+	+	13	0	0	13	371-use e-mail to learn more(105) 703-win in ucc training(62); large class/seminar(66); Apple grant, winning(54); interst and ucc(79) 74-interest to see if make difference(77, 98) 340-need to use, dev. st skills, spd. sheets(60, 35, 64) 432-love computer(12); classroom and communicate(24); love of computers, what I teach(30) 201-want to use in labor econ(45); use current events(39); OH collection, videos, CD(34,84,42)
develop student skills	371, 340, 201		+	+	5	0	0	5	371-req. E-mail helps student learn(105) 340-give comp. assgn.(44); dev. st. skill is motivation(64) 740-use through career (44); grad. St. need familiar(66)
availability	703, 740, 201		+	+	8	0	0	8	703-winning(62); Apple grant(55); availability(79); home comp.(54); e-mail(102) 740-site lisc. inexp.(66) 201-OH available(34); videos(84)
time	703, 340, 201		-	+	2	1	0	3	703-lrg. class (62, 102) 340-time savings in preparation(39) 201-time and hassel of equip. set up waste of time(39)

General (med.)

Topics	cases with pos. first mention	cases with neg first mention	value overall	value med.	+ freq.	0 freq.	- freq.	Sum freq.	comments
students	385, 446, 98, 103, 638	596	+	+	15	2	1	18	385- students make me aware(59) 446-encourage st. use(38); st. use of pwr. Pt., st use of video intv.(65); responsibility to studnts(101); st. use tech(38) 596-st. fail to learn(79); student not like service courses(32) 98-OH puts st. to sleep(92);see student progree(45) 103-student dev.(84); students like(141); student record access(152); intro students to lang.(141); e-mail student(115); pleasure helping students(84) 638-student lack ability(19); student involvement, presentations(25)
interest	385, 596, 616, 98, 103, 638		+	+	11	0	0	11	385-want to use more(46,61) 596-image of ideal(46); vision(79) 616-doing it for years(60) 98-computers here to stay (81) 103-do as much as possible(115), like computers(141); love lang. Lab(161) 638-like to have more(42); previous use(46)
develop student skills	98, 103		+	+	5	0	0	5	98-all work comp. prepared(81); computers in use more(81) 103-dev. lang skills(115, 155, 169)
availability	385, 103	616, 638	+	-	2	0	4	6	385-mat. avail(59) 616-univ. not set up(40); no infrastructure(60) 103-use cast offs(152); access labs(119); lang. lab(152) 638-like to have more(42)
time		365, 446, 616, 98	-	-	0	0	8	8	385-need time(38); time to organize(61); time limiting(75) 446-time to learn(83, 38) 616-time, energy(40); fools if do(60) 98-not have time(92); not worth time(92)

General (low)

Topics	cases with pos. first mention	cases with neg first mention	value overall	value low	+ freq.	0 freq.	- freq.	Sum freq.	comments
students	188, 180, 308, 499, 643,		+	+	10	1	0	11	188-encourage student list serve(57); students to be connected(71)need connections(75); challenge students(79); 180-student demands knowledge(95) 308-senior project(34) 525-student req. to use(23) 499-pair students(31); higher order thinking(53) 643-e-mail students(100); encourage students to use e-mail(100) 596-
interest	587, 499, 643		+	+	4	0	0	4	587-start to use pp and like(45) 499-interest in applications(48); know as much as anybody(240) 643-internet sources(91)
develop student skills	188, 499, 643		+	+	7	0	0	7	188-dev st network(71); dev contact for profession(75) 499-solve prob(45); how to apply(40); poses quest. (48); how to apply clac.(89) 643-syllabus suggest e-mail(100,330)
availability	587, 525, 643,	188, 308, 499	+	-	4	1	6	11	188-equip avail, buy videos out of own(65,40) 587-not have equip(35); project instead of OH(47); pp on comp(86) 308-have none(44); have nothing(73) 525-student use lib(123) 499-no avsail(102); lack of equip(102); discouraging(240); 643-lab for curric(114); office(90)
time		188, 499, 643	-	-	0	0	4	4	188-time/equip(65); more to do(86) 499-borrow equip hassel of time(102) 643-typing(114)

APPENDIX M

TABLE 1
TOTAL COUNT OF ALL TOPIC STATEMENTS BY CATEGORY

Sheet2

Total counts of topics

	General	Learner	Faculty	Technology	Environment	Summary
Topics unique to the category		293	451	301	676	
Topics that fit other categories	168	86	261	321	71	500
Totals	168	379	712	622	747	500

APPENDIX N

TABLE 2
TOTAL COUNT OF TOPIC STATEMENTS FOR TOPICS
MENTIONED 15 OR MORE TIMES ONLY

Sheet3

Total counts of topics mentioned 15 or more times

	General	Learner	Faculty	Technology	Environment	Summary
Topics unique to the category		245	391	285	574	
Topics that fit other categories	121	78	250	265	31	391
Totals	121	323	641	550	605	391

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