

## COLLEGE OF AGRICULTURE FACULTY PERCEPTIONS OF ELECTRONIC TECHNOLOGIES IN TEACHING

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### Abstract

*The changing student population, rapid technological advances, and the economic issues facing higher education are creating an accelerated demand for learning anytime, anyplace. The ability of an organization to adapt to these changes will be influenced by at least three factors, a) the knowledge, skills, and abilities of its faculty/staff, b) the amount of importance placed on distance learning technologies to accomplish teaching and learning, and c) the availability of high quality facilities, equipment, technical support, and training. The purpose of this study was to provide baseline data for College of Agriculture faculty perceptions of electronic technologies used in teaching. Faculty agreed that electronic technologies could make a valuable contribution to the learning process, that they should be used in all classes, and that technology will change how we teach in the next five years. About one-half of the respondents reported having a course website, but most lacked experience in teaching learners at a distance, and were much more confident in their technical competence than in their methodological ability to use modern technologies. All respondents perceived training and assistance in the use of instructional technologies to be less available than equipment and facilities.*

### Introduction

In the 1997-98 academic year, just over one third of the approximately 5,000 postsecondary institutions in the U.S. offered distance education courses, while another fifth planned to do so (U. S. Department of Education, National Center for Education Statistics, 1999). “Major organizational changes and new developments in higher education are being accelerated by dynamic advances in global digital communications and increasingly sophisticated learning technologies... Barriers to accessing higher education learning opportunities are being reduced globally because of improved learning technologies” (Hanna, 1999, p. 19).

To prepare students successfully in Colleges of Agriculture, educators must incorporate the use of digital information technologies. “Educators must help all students become adept at distanced interaction, for skills of information gathering from remote sources and of collaboration with dispersed team members are as central to the future American workplace as learning to perform structured

tasks quickly was to the industrial revolution” (Dede, 1996, p. 30). In consideration of this incredible growth, what will be the impact of teaching using technology on faculty responsibility? Is teaching students through any or all distance education methods really nothing more than adapting traditional classroom approaches? What are the attitudes and barriers to using technologies often associated with distance education?

### Theoretical Framework

Research in the field of distance education has recognized the need for a change and modification of the faculty role in teaching at a distance (Wedemeyer, 1981; Beaudoin, 1990; Dillion & Walsh, 1992; Prudy & Wright, 1992). “It is not that the technology underpinning distance education drives the system but rather that fundamental changes in teaching style, technique, and motivation must take place to make the new ‘classrooms’ of the present and future function effectively” (Prudy & Wright, 1992, p. 4).

Many studies cite faculty resistance to instructional technology as a primary barrier to the continued growth of distance education programs (Gunawardena, 1990; McNeil, 1990). "Attitudinal issues—how people perceive and react to these technologies—are far more important now than structural and technical obstacles in influencing the use of technology in higher education" (McNeil, 1990, p. 2). Other barriers stem from the lack of perceived institutional support (faculty rewards, incentives, training, etc.) for course conversion to distance education formats (Dillon & Walsh, 1992; McNeil, 1990; Wolcott, 1997; Olcott & Wright, 1995). "The accelerated development of distance education programs across American higher education will require a renewed commitment to its most important resource....faculty" (Olcott & Wright, 1995, p. 5).

Despite the fact that much of the literature in distance education discusses the importance of faculty, this group has been largely neglected by the research (Dillon & Walsh, 1992; Beaudoin, 1990). Beaudoin (1990) observed that:

[t]he emergence of increasingly student-centered learning activities in the 1970s facilitated by new instructional technology introduced in the 1980s is contributing to a dramatic evolution in faculty roles, and raises fundamental questions within the professoriate about how it will contribute to the teaching-learning process in the 1990s and beyond. (p. 21).

In the Dillon and Walsh (1992) metaanalysis of studies examining faculty attitudes toward distance teaching, only one examined issues of faculty members who did not offer one or more courses via distance education. The researchers wanted to capture the perceptions of the entire teaching faculty of the College of Agriculture regarding the instructional use of the technologies often associated with distance education.

### **Purpose and Objectives**

The purpose of this study was to provide baseline data and focus for the improvement

of instruction in a college of agriculture through the utilization of digital technologies used in teaching. The objectives were to:

1. Describe demographic variables of the teaching faculty.
2. Describe the level of competence among faculty using technology in teaching.
3. Describe the faculty members' perceptions of the value of these technologies to teaching and learning.
4. Determine the perceived quality of the infrastructure: that is the availability of equipment, facilities, and training related to the use of these technologies and the level of institutional support faculty members believe surrounds the use of these technologies.

### **Methods and Procedures**

#### *Population*

The population for this study was all teaching faculty in the college of agriculture at a land grant university. A census of the population was surveyed. Department Heads were asked to provide a complete listing of faculty members in their department who held teaching appointments. With all departments reporting, a total of 331 faculty members with teaching appointments were identified. There were sixteen of these faculty members who subsequently provided documentation that they did not possess teaching appointments. The population of teaching faculty numbered 315.

#### *Instrumentation*

The instrument used to collect data was a three-part questionnaire designed by the researchers. The instrument was four pages long and designed to be automatically scanned into a digital file by an optical character recognition (OCR) scanner. Part I of the questionnaire was designed to identify the selected personal and professional characteristics of the respondents and describe their current level of involvement in technology-mediated instruction. Six questions were devoted to demographic variables. Those included were gender, age, the number of courses the faculty member

taught per year, the number of years the faculty member had been teaching, the tenure status of the faculty member (Non-Tenure Track, Tenure Track, Tenured), and their academic rank or title (Instructor, Lecturer, Assistant Professor, Associate Professor, Professor). An additional six questions were used to describe the respondents' current level of participation in technology-mediated instructional delivery strategies.

Part II consisted of 30 statements designed to measure objectives two through four. A five-point Likert-type response scale was employed. The response choices were: 1 = "Strongly Disagree," 2 = "Disagree," 3 = "Neither Agree nor Disagree," 4 = "Agree," 5 = "Strongly Agree." The researchers considered the possibility that many of the faculty would not hold strong opinions on some statements due to a lack of information about, and or exposure to, these relatively new technologies. Reliability was established by calculating Cronbach's Alpha. The alpha for the 30 items in Part II of the questionnaire was .82.

Part III consisted of a three open-ended questions designed to provide an opportunity for the respondents to add their comments concerning the improvement of their use of distance education technologies.

A panel of five experts made up of faculty members from the Department of Agricultural Education, the Department of Educational Human Resource Development, and the Center for Distance Learning Research established content validity of the instrument. Selected faculty members from the colleges of Education and Liberal Arts completed a pilot test of the instrument. Minor changes in the instrument were made based upon evaluation of the pilot test and suggestions from the panel of experts.

#### *Collection of Data*

All teaching faculty in the college were sent a copy of the questionnaire along with a cover letter describing the project on November 5, 1999. The Associate Dean for Academic Programs signed the cover letter. Campus mail was used to reach those faculty members residing on-campus, and the U.S. Postal mail was used for those located off-campus. The researchers chose

to use a traditional paper instrument so as not to exclude those who would have difficulty responding with an online survey instrument.

Of the 315 survey instruments mailed, 196 were returned within two weeks, for an effective initial response rate of 62.2%. After three weeks, a reminder letter was sent to non-respondents along with a second copy of the survey instrument. A follow up e-mail reminder was sent to non-respondents four weeks after the initial mail out. Those non-responding teaching faculty without valid e-mail addresses were contacted via telephone. All non-respondents were contacted via telephone six weeks after the initial mailing, in some cases at home. In each case, they were encouraged to complete the survey and additional instruments were supplied upon request. In all, 263 survey instruments were returned for a final response rate of 83.5%. Survey and follow-up procedures were in accordance with those outlined by Dillman (1978).

#### *Analysis of Data*

Quantitative data were analyzed using SPSS<sup>®</sup> software version 9.0 for Windows. Descriptive statistics were calculated for each variable. Frequencies and percentages were used to summarize agreement or disagreement with each of the statements related to competence, value, and quality of infrastructure. An attempt to control non-respondent error was made by comparing the data from early and late respondents as suggested by Miller and Smith (1983). No significant differences were found between the groups.

The constant comparative method was used for the open-ended, qualitative data analysis (Lincoln & Guba, 1985). This method describes four stages: 1) comparing incidents applicable to each category, 2) integrating categories and their properties, 3) delimiting the construction, and 4) writing the construction. For the first stage, the researchers studied the open-ended responses to determine trends in the data. Each idea (unit) was initially listed, without placement into categories. The investigators drew upon tacit knowledge in making these initial judgments for early category

formulation. Colored markers were used to differentiate respondent themes so that the data would remain in context and provide visual indications of emerging categories.

### Findings

#### *Part I: Characteristics and Level of Involvement*

For reasons unknown to the researchers, one faculty member failed to report gender. Of the 262 respondents reporting, 228, or 86.7%, were male. Slightly more than one-third (33.9%) of the faculty members were less than 40 years old, while 38.8% were between 51 and 65 years of age and 5.3% were over 65. The average faculty member reported teaching 2.4 classes per year, was tenured (66.9%), and held the rank of full professor (58.2%).

Over one-half the faculty members (52.9%) reported having a website related to their course. Of these, 84.3% were described as simply enhancing the course, 15.0% were described as a required component of the course, and .7% (1 course) was described as being completely delivered via the website.

Almost exactly half the faculty with a course website (49.6%), administer that site themselves. Less than one-quarter (23.0%) assigned a graduate assistant to the task. Almost as many (20.9%) use professional support staff. Most of these course websites reside administratively near the faculty member on their departmental servers (62.1%), and on university servers (21.4%). Faculty were almost evenly split on the software used to edit these websites with 32.2% using a text editor, and 28.1% using Microsoft Word. Only 4.8% use Microsoft FrontPage while 23.2% report using "other" software.

While many of the teaching faculty had websites, few had experience teaching at a distance. Only 1.1% had taught a course at a distance more than 10 times. Another 10.2% had taught at a distance between 2 and 10 times, while 9.1% had taught at a distance once. Almost eighty percent (79.5%) of the faculty members responding to the survey indicated that they had never taught a class to learners at a distance.

#### *Part II: Competence, Value, Quality of Infrastructure*

In Part II of the survey, competence, value, and quality of infrastructure were determined using 30 survey questions (competence – 11 questions, value – 9 questions, and infrastructure, 10 questions). The researchers have included a Figure to assist the reader in visualizing patterns and trends of agreement or disagreement among selected questions in each of these three areas. Because they were obviously different, questions relating technical and methodological (pedagogical/andragogical) competence are presented separately (See Figure 1).

*Competence.* Eleven items on the questionnaire were used to measure the perceived level of competence that respondents possessed in the use of electronic technologies often associated with distance education.

The faculty indicated that they were able to use many of these technologies. Almost two-thirds (62.7%) of the faculty indicated they agreed or strongly agreed that they could create their own presentation graphics, while less than a quarter (22.7%) disagreed or strongly disagreed. A clear majority of the faculty members (84.2%) agreed or strongly agreed that they used e-mail for "almost all of my correspondence," while 29.2% agreed or strongly agreed that they would send their "most important or confidential documents through e-mail." A majority of the faculty members (58.7%) agreed or strongly agreed that they could "scan photographs into digital files," while 28.6% disagreed or strongly disagreed. Nearly one-half (48.1%) agree or strongly agree that they are able to "connect a computer to the various output devices available (LCD projector, TV, etc.)." By a narrow margin, the faculty members agree that they could "manipulate digital images" (45.6% agree or strongly agree vs. 42.9% disagree or strongly disagree). Slightly over one-half (54.6%) agree or strongly agree that they could "confidently deliver my course over the videoconferencing equipment."

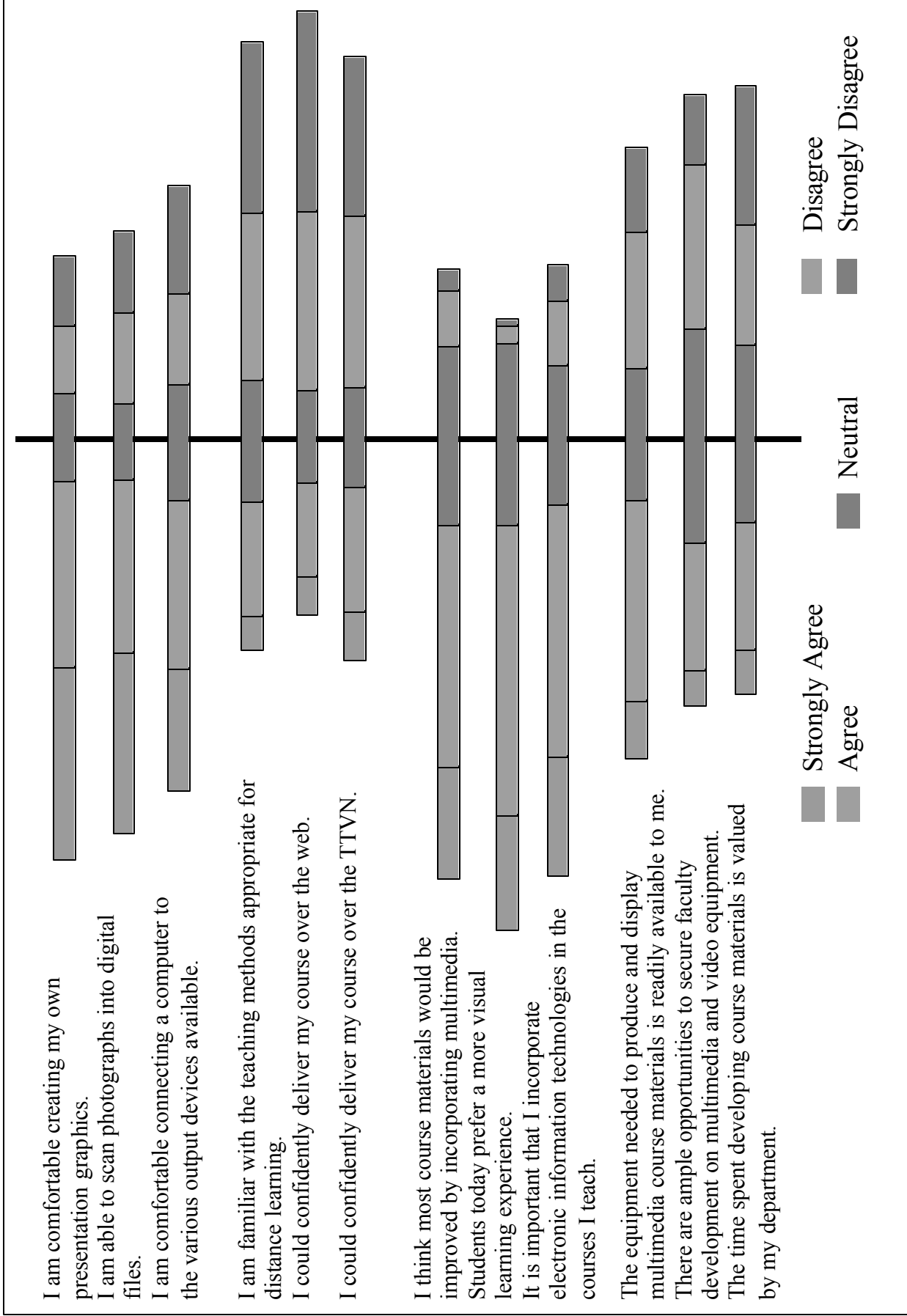


Figure 1. Patterns in competence, importance, and quality of infrastructure.

While many of the faculty members were fairly confident in their ability to use presentation software, e-mail, and digital images in their teaching, they also identified areas in which they were not as confident. Over one-half of the faculty members (56.2%) disagreed or strongly disagreed that they could create their own web page. Only a handful would agree (6.6%) or strongly agree (3.1%) with the statement, "I am able to record and use digital sound in my presentations." Nearly two-thirds (62.7%) disagreed or strongly disagreed with the statement, "I could confidently deliver my course on the web."

Faculty members had much more confidence in their technical competence than they did in their methodological ability to use these technologies in their teaching. Over one-half (55.6%) of the respondents disagreed or strongly disagreed with the statement, "I am familiar with the teaching methods appropriate for distance learning."

*Value.* Nine items were used to measure value--that is--the importance of the role respondents believed these technologies have or will have to teaching agriculture.

An overwhelming majority of the faculty members strongly agreed (55.1%) and agreed (37.6%) with the statement, "The Internet/WWW are convenient ways to access information." Nearly half agreed or strongly agreed (48.3%) with the statement, "Participation in listservs, threaded discussion groups, chats and other electronic communications offers great benefits." The respondents agreed (39.7%) and strongly agreed (18.3%) that most course materials could be improved by incorporating multimedia. They agreed (40.3%) and strongly agreed (17.5%) that, "Animated graphics increase student interest and retention." Almost exactly two-thirds (66.1%) of the respondents agreed or strongly agreed that, "Students today prefer a more visual learning experience." Over three-quarters of those responding (80.3%) agreed or strongly agreed that, "Electronic information technologies provide students with instantly available supplemental course and research materials." Over one-half (60.8%) agreed or strongly agreed that, "It is important that I incorporate electronic

information technologies in the courses I teach."

Faculty opinions were mixed concerning the effect of these technologies. While they clearly agree (38.0%) or strongly agree (31.9%) with the statement, "Electronic communications and information drastically alter how we teach in the next five years," they do not support the statement, "Electronic communications and information drastically alter what we teach in the next five years" (46.0% disagree or strongly disagree).

*Quality of Infrastructure.* Ten items were used to measure the perceived availability of equipment, facilities, and training to determine the extent to which the campus environment supported the use of technologically mediated instruction on- and off-campus.

Concerning the availability of equipment, 91.6% of the teaching faculty members indicated they were connected to electronic mail in their office and 71.9% indicated they were connected at home. More than one-third (42.2%) agreed or strongly agreed that, "The equipment needed to produce and display multimedia course materials is readily available to me." More than one-half (54.0%) agreed or strongly agreed that they were aware of "the necessary procedure to secure electronic presentation equipment for classroom use within the university." Over half of the faculty members (52.2%) agreed or strongly agreed that that they "have access to a classroom designed to support the use of multimedia teaching aids."

Teaching faculty members perceived training and assistance in the use of instructional technologies to be less available than equipment. More than one-third (38.4%) disagreed or strongly disagreed that "there are ample opportunities to secure faculty development on using multimedia and videoconferencing equipment" while 26.6% agreed or strongly agreed. While 44.3% indicated they were neutral on the question, 10.7% strongly disagreed with the statement, "There are enough faculty development workshops regarding videoconferencing" while 6.9% strongly agreed. Over half the faculty members (57.4%) disagreed or strongly

disagreed that they were “Aware of the procedures, office, and personnel responsible for scheduling videoconference classes/sessions for the college.”

The respondents did not believe that the climate was supportive of the use of these technologies. Almost one-half of the respondents (42.7%) disagreed or strongly disagreed that, “The time spent developing course materials is valued by my department.”

It was interesting to the researchers that the faculty members who had not participated in distance education perceived the level of support as lower than those who had taught classes at a distance. When all 263 faculty were included, only 29.5% agreed or strongly agreed that they “Had access to technical assistance when teaching at a distance.” Of the 54 faculty members who had taught at a distance, 51.9% agreed or strongly agreed with the statement, while 27.7% disagreed or strongly disagreed.

#### *Open-ended Data Collection*

There were three open-ended questions on the survey: 1) What would significantly improve your use of the electronic technologies often associated with distance education? 2) What components should be present in an effective course delivered using electronic technologies? 3) Please provide any other comments and/or suggestions you believe are relevant to teaching and learning with technology.

For the first open-ended question, “What would significantly improve your use of the electronic technologies often associated with distance education?” respondent themes were compiled into six categories: 1) *Support Resources* (technical and course conversion personnel, including funding student workers/graduate students, 2) *Faculty Rewards/Recognition* (release time/faculty development to learn to use technologies, recognition for tenure & promotion, etc., 3) *Training* (to improve comfort and familiarity with equipment), 4) *Access to State-of-the-Art Equipment*, 5) *Quality Assurance* (through research, success at other peer institutions, and continuity in format and procedures), and 6) *Availability of an Audience Base*, (to sustain and make the effort worthwhile).

Supporting quotes ranged from philosophical components about quality assurance to the lack of any rewards to participate. One lengthy quote incorporated several dimensions. “I must be convinced that distance education does not create an inferior product. I am very concerned that the teaching style necessary for electronic delivery would compromise the learning experience for off-site as well as on-site students. It seems that the present climate emphasizes accessibility over excellence. In addition to these philosophical questions, there is of course the major issue of appropriately equipped classrooms and other facilities.” Another goes on to note, “seeing solid evidence that peer institutions are successfully adopting similar approaches and are maintaining the academic reputations” indicated that teaching faculty want to “watch and wait” to see if distance education technology will “stand the test of time.” Many faculty members perceived a lack of “Real SUPPORT from the department and university, including recognition that its development in my program is as important and valued as developments in my research. This recognition would need to be accompanied by time for necessary TRAINING and the ready access to equipment (respondent emphasis).” Additional time was most frequently mentioned as a factor to improve use. “Having enough time to develop the materials needed, and to practice developing and using the materials. One-shot training programs....leave me frustrated....” Others mentioned the need for an audience base to justify the additional time and effort: “An audience that expresses a need and is willing to provide financial resources to justify allocation of faculty time to course and materials development.” Overall, there is a perception that these six areas must be addressed prior to faculty adoption of distance education technologies.

In describing faculty perception of teaching and learning at a distance, as well as their level of competence and confidence, a second open-ended question was used: “What components should be present in an effective course delivered using electronic technologies?” There were five primary categories: 1) *Interactions/Feedback*, 2)

*Systematic Instructional Design*, 3) *Multimedia Components*, 4) *Simple and Reliable Delivery System* (that is supported and easily accessible), and 5) *Strong Content/Supplemental Materials*. Faculty again mentioned the importance of time and money to create and fully utilize computer technology. There was a strong view that the components of effective instruction for distance learning are the same as “traditional” courses. “The same components are needed for effective course delivery in any learning/teaching environment: Good preparation, thoughtful planning, updated materials, enthusiasm, and empathy for the students.” Many mentioned fundamental components like “purpose of exercise, objectives, clear and visible materials, critical messages, interaction, feedback, testing, integrity, high quality graphics.” Most emphasized the importance of interaction (mentioned 60 times). “The professor must be able to ‘connect’ with each and every student during the lecture and students must have unhindered access to the professor.” Others noted the importance of suitable technology. “We need a simpler delivery system that also gives quality projection for the site audience here.”

The last open-ended response allowed faculty to provide any additional comments and/or suggestions relevant to teaching and learning with technology. Many of the same themes were reiterated. “Technology is a tool similar to a chalkboard or overhead---all tools have advantages and disadvantages over all other tools available. There is no ‘perfect’ teaching philosophy or tool, only varying degrees of effectiveness with various audiences.” “If we are to expect our students to be technologically savvy, we (the instructor) should role-model this for them...The primary hurdle...is access (and maintenance) of equipment.” “Development of high quality courses for distance education requires significant investments of time and resources which our program is not well-equipped to accommodate at present.”

### **Conclusions and Recommendations**

The average teaching faculty member was a male, between 51-65 years of age, with more than 15 years of teaching

experience, tenured at the rank of professor, and who had never taught students at a distance. This population is significantly different than those described in Dillon and Walsh’s (1992) metaanalysis of distance education research that focused on faculty members who had previously taught one or more distance courses. The faculty members in this study were employed at a land grant institution and perceived a lack of institutional support for teaching in general, specifically the time and support necessary for the innovative application and development of educational technologies.

The teaching faculty agreed that these technologies can make a valuable contribution to the learning process, that they should be used in all classes, those taught on- and off-campus, and that they will change how we teach in the next five years.

The majority of faculty reported having a website, primarily for course enhancement. They administered that site themselves on departmental servers. Twice as many faculty members maintained their own webpages as those who employ graduate students or support staff for that purpose. It would seem that even in the face of multiple demands on their time, many faculty members choose to use their time in support of course websites, although few actually have experience teaching a course at a distance.

As an indication of competence, the respondents indicated that they were able to use many of these digital teaching technologies. A notable exception was their lack of ability to use digital audio. Digital audio can often contribute as much or more than digital images to an instructional delivery strategy, and digital audio can be a less demanding media type—to create, edit, and use—than digital photography. Many of the most modern digital communications technologies, Internet videoconferencing (H.323), and Streaming Media require—or at least benefit from—the use of properly created digital audio files. Yet, the faculty members were much more confident in their ability to create, edit, and use digital images. We therefore recommend that the basic creation and use of digital audio files be

included among the faculty development opportunities made available.

Faculty members had more confidence in their technical than their methodological ability to use these technologies in their teaching. A majority of the respondents indicated that they did not understand how to incorporate these technologies into their teaching. We therefore recommend that specific methods of using these technologies to enhance and extend teaching be included in each of the technical faculty development opportunities. Training opportunities should consider the combination of technological skill level with pedagogical/andragogical applications as a *technology cluster*. "Some change agencies promote a package of innovations because they find that the innovations are thus adopted more rapidly" (Rogers, 1995, p. 15).

The agricultural teaching faculty members valued these technologies and recognized in general that they are—and will be—an important part of the instructional process. They supported the notion that these technologies will change the way teaching and learning occurs within the next five years. They alluded to the ways in which the process might be altered through their support for items that describe learners as more central to the instructional design process. The faculty members perceive that students today prefer a more visual learning environment, and that the Internet can provide instantly available supplemental course and research materials. Over 90% of the faculty perceived the Internet as a convenient way to access information, and over half believed that the use of rich media (multimedia, animations) enhanced instruction. Over 60% of the faculty believed that, "It is important that I incorporate electronic information technologies in the courses I teach." Still, slightly over one-half did not have a course website of any kind. The apparent discrepancy between espoused and actual commitment to the use of these technologies was interesting and worthy of additional research. Perception of the need for faculty rewards including release time/work load reconfigurations, credit toward tenure/promotion efforts, and availability of resources (personnel and fiscal) would be

necessary for faculty to adopt the use of instructional technology in teaching. It is therefore recommended that additional research be conducted to identify the barriers to adoption as perceived by both adopters and non-adopters.

Infrastructure was perceived as multifaceted and in general lacking in this institution. The teaching faculty members perceived that support and training were less available than equipment. During the past five years the college has devoted significant resources to enhancing faculty members' access to equipment. The availability, or lack thereof, of technical support personnel, has been left to departments. The researchers recognize that budgeting is a complex task, and that 'one-time' expenditures for equipment are often easier than on-going salary lines for technical support personnel. We recommend, however, that resources be directed to create an adequate level of support and training such that these expensive pieces of equipment are used for the benefit of students.

All 262 respondents were generally neutral regarding the statement, "Faculty have access to technical assistance when teaching at a distance." Those 54 respondents who had offered courses via distance education in the past responded more positively to the statement. The researchers concluded that support for the use of these technologies was actually more available than was generally perceived. We therefore recommend that the unit tasked to provide support services and faculty development communicate their role more effectively throughout the college. According to Olcott and Wright (1995),

"The accelerated development of distance education programs across American higher education will require a renewed commitment to its most important resource . . . faculty. Advances in technology afford institutions unique opportunities to deliver education.... However, responsibility for instructional quality and control, the improvement of learning, and the aggregate effectiveness of distance education still rests with the faculty."

This study identified the faculty members' perceived competence, value, and quality of the infrastructure available to facilitate instructional use of digital technologies. It is indeed true that faculty roles and responsibilities must change to accommodate the use of these technologies, and that teaching at a distance does require a different set of competencies. Yet faculty members' attitudes, and the barriers created by the lack of institutional support, must be addressed to integrate more fully these technologies into the teaching and learning process.

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