AN ABSTRACT OF THE DISSERTATION OF

Susanne J. Nelson for the degree of Doctor of Philosophy in Education presented on April 30, 2003.
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The purpose of this study was to identify if differences existed in perceived barrier factors and perceived attitude factors toward distance education between faculty and administrators in the decision stage and those in the implementation stage of distance education technology adoption. Information was gathered from teaching faculty and program leaders involved in agricultural education teacher preparation programs across the United States during the 1999-2000 academic year.

The barrier statements were reduced to nine barrier factors and the attitude statements were reduced to five attitude factors through Principal Components Analysis. Respondents were grouped into the decision stage or the implementation stage of distance education technology adoption according to Rogers' (1995) innovation-decision process. Statistically significant differences existed for various technology types between the groups for both barrier factor scores and attitude factor scores.

The following conclusions were formulated from this study: (a) a majority of the participants were in the decision stage of the innovation-decision process for distance education technology adoption; (b) on-line delivery of courses was the distance education

technology most respondents were currently using or planning to use; (c) distance education was not a major factor helping to meet program level goals; (d) training opportunities were available for faculty who teach using distance education; (e) the majority of the population indicated they were not adequately supported by the department to teach using distance education technologies; (f) participants were planning to have resources available for students taking courses via distance education technologies, yet were noticeably indecisive for some resources; (g) cost barriers, course quality, student contact, and equipment concerns were considered barriers for a majority of the respondents; (h) each type of distance education technology had barrier factors that showed significant differences between participants in the decision stage and those in the implementation stage (i) overall the respondents' attitudes were favorable to distance education, but significant differences in attitude factor scores were evident between deciders and implementers when viewed by type of distance education technology; (j) all but one of the barrier factor scores were considered reliable, and (k) all of the attitude factor scores were considered reliable.

Perceptions of Agricultural Education Teacher Preparation Programs Toward Distance Education

by
Susanne J. Nelson

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

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Susanne J. Nelson, Author

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Perceptions of Agricultural Education Teacher Preparation Programs Toward Distance Education

Chapter 1

Introduction

Historically distance education has meant correspondence study. In the United States during the late Nineteenth Century, Pennsylvania and Chicago Universities created correspondence courses and the ability to offer education in remote areas to diverse populations as the U.S. Post Office started a free delivery service (Prewitt, 1998). These course offerings were short-lived and extremely controversial. Then in the 1920's, Wisconsin's School of the Air utilized broadcast radio to deliver lectures to the masses. The 1970's witnessed the development of educational television. All of these forms of distance education tried to mimic the experience in the classroom, and all were tied to the traditional institution. Movement away from the university structure did not happen until developments in international distance education began taking shape. In the United Kingdom, during 1972, Open University was the first university not associated with a traditional institution. Open University was also noted for offering student-centered learning, viewing the students as independent learners and thus increasing the quality of distance education. Two primary objectives drove this first surge of development in distance education: first, extending the traditional university and overcoming the historical scarcity and exclusivity of higher education, and second, allowing the university structure to grow larger (Matthews, 1999).

The definition of distance education (DE) used in the 1990's incorporated the use of a great array of technologies. Porter (1997) gave a general yet complete definition of

distance education when she stated, "It is education or training information, including the instruction and experience that learners gain, although they are physically distant from the source of that information and instruction" (p. 01). She continued by indicating practical possibilities. "It can involve the use of new technologies, innovative materials, and interactive instructional methods. It can reach people of all ages and abilities who might otherwise find it difficult to further their education or get the training they need" (Porter, 1997, p.01).

Today, the term distributed learning is being used. Oblinger, Barone and Hawkins (2001) described the difference between distance education and distributed learning when they stated,

> "Distance learning is a subset of distributed learning, focusing on students who may be separated in time and space from their peers and the instructor. Distributed learning can occur either on or off campus, providing students with greater flexibility and eliminating time as a barrier to learning" (p.7).

Distributed learning describes the convergence of on-campus and distance education instruction with educational technologies to provide learning opportunities independent of time and location.

Although the term distributed learning is more encompassing, the term distance education will be used throughout this study, as distance education still signifies the learner is geographically distant from the instructor. Barron (2002) discussed the similarities of the terms distance education and distributed learning in the context of library services. She commented that distributed learning included everyone academically, but the true distance learner still had special information access requirements that students on or near campus did not have. Bishop & Spake (2003)

acknowledged that various definitions of distance education exist, but stated, "a common thread is the separation of the instructor and student and the focus on specialized methods of course delivery to address the unique needs of such students" (p.373). The American Association of University Professors (2002) continues to use a definition for distance education they adopted in June 1999. It states,

> "In distance education (or distance learning) the teacher and the student are separated geographically so that face-to-face communication is absent; communication is accomplished instead by one or more technological media, most often electronic (interactive television, satellite television, computers and the like" (Preamble, ¶1).

They followed-up this statement by clarifying that distance education can include learners from a considerable distance or learners in another building and can apply to both on and off campus learners. The term distance education denotes the context for this research; it portrays an incorporation of technology to assist in the education of students whom educators cannot assume will ever physically be on campus. O'Quinn and Corry (2002, Introduction, ¶ 3) stated, "Distance education requires not only that faculty learn how to use new technologies, it also requires a paradigm shift in how educators orchestrate the act of learning". As the incorporation and use of technology for distance learning is predominate in today's definition of distance education, we are not including correspondence courses or educators traveling to remote locations in our definition of distance education for the purpose of this study.

Distance education is not merely a fad that, when given enough time, will lose its appeal and simply go away. Valentine (2002) mentioned that the costs for the technology are decreasing, the delivery systems are improving, and students continue to enroll and

are relatively satisfied with their distance education experience. We have seen a rapid expansion of distance education at the community college, university level and mainstream public (Berge, 1998; Gellman-Danley & Fetzner, 1998; & Sherry, 1996). The U.S. Department of Education's distance education report (1997) determined that by fall of 1995, one third of the higher education institutions were offering distance courses and another 25% were planning to offer them in the following three years. In the 1997-1998 academic year, the number of higher education institutions offering distance education courses increased by one-third, but the number of distance education enrollments, course offerings, and number of distance education degrees and certificate programs almost doubled between the time of the two reports (U.S. Department of Education, 1999). The Campus Computing Project (2002) reported that over half of the United State's public and private universities offered courses and degree programs via distance education in 2001.

State level educational reform, reduced state fiscal revenues, teacher shortages, demographically diverse students and technological advances have pushed distance education as an alternative delivery methodology in the United States (Barker, Frisbie & Patrick, 1993; Bishop and Spake, 2003). In a national study, Dillman, Christenson, Salant, and Warner (1995) implied a need for instruction to be delivered in ways other than traditional college classrooms, as distance education strategies have a great potential to overcome barriers to lifelong learning. Oblinger, Barone, and Hawkins (2001) reported that today's driving force behind distributed learning typically falls into at least one of four categories: (a) expanding access to underserved populations, (b) alleviating

on-campus capacity constraints, (c) generating new revenue, and (d) serving as a catalyst to stimulate institutional transformation for market competition.

As the number of distance courses and programs continues to grow, concerns over the quality and effectiveness of distance education still overshadows this form of delivery. However, Willis (1995) suggested that the instructional format of distance delivered courses has little effect on student achievement. Miller and Clouse (1994) concluded that distance education is cost effective, and students learn as well, or better, than students involved in traditional instruction. Many others agree that distance learners do achieve as well as traditional on-campus learners (Dillon & Walsh, 1992; Main & Berry, 1993; Murphy, 2000; Olcott, 1997; Thompson, Simonson, & Hargrave, 1996). Probably the largest summative piece regarding achievement of on-campus students versus distance students was compiled by Russell (1999) entitled, *The No Significant Difference Phenomenon.* His collection of hundreds of research pieces concluded that there was not a significant difference between learning outcomes from students on-campus and students at a distance.

In a critical review of Russell's (1999) work, Phipps and Merisotis (1999) warned that distance education practices are advancing more rapidly than our understanding of their practical uses, and much of the research is still inconclusive regarding the effectiveness of distance courses. They added that technology is not the important factor; good teaching practices incorporated into the course make the difference in an effective distance course (Phipps & Merisotis, 1999). The National Education Association's (NEA) survey (2000) reported that instructors who teach distance education courses felt traditional courses did a better job than distance courses at

meeting the following goals: (a) addressing the variety of student learning styles, (b) strengthening students' group problem-solving skills, (c) developing student interactivity, (d) improving verbal skills, and (e) helping students deliver better oral presentations. The same group of instructors felt that distance courses and traditional courses were equal in meeting the following goals: (a) improving quantitative skills, (b) helping students master the subject matter, and (c) assessing the educational effectiveness of the course. Distance courses were considered better than traditional courses by faculty in the NEA (2000) poll at: (a) giving the students access to information, and (b) providing students with high quality course material.

Assessment of distance education quality beyond student achievement is also reported in the literature. Porter (1997) reported that distance learning programs can be designed to meet the needs of any group of learners as long as the needs of the learners are considered, the course or program is adequately structured, and the correct technologies are utilized. Oblinger, Barone, and Hawkins (2001) mentioned adequate academic and student services for distance learners are one measure of quality in distance education. A study conducted by the Institute for Higher Education Policy (2000) listed 24 measures of quality for Internet-based distance learning, which they broke down into the following benchmarks: (a) institutional support, (b) course development, (c) teaching/learning, (d) course structure, (e) student support, (f) faculty support, and (g) evaluation and assessment.

As distance education evolves to incorporate the use of a variety of technologies for delivery and the use of distance education continues to grow, it is important also to look at how many faculty are actually teaching courses via distance education and using

distance education technologies. For the fall of 1998, The National Center for Education Statistics (2002) reported that no more than 9% of the instructional faculty and staff surveyed had taught a distance education class. Spodark (2003) cites Sax (2000) who states that 36% of her national sample of faculty place or collect course assignments on the Internet and 22% use computers in undergraduate course instruction. The National Education Association's (NEA) survey (2002) estimated that one in 10 NEA members had taught a distance learning course in the last five years. More universities are offering distance education courses and programs, but there is no evidence in the literature stating that the majority of teaching faculty are teaching via distance education.

> "We clearly have a long way to go in the field of distance education before it becomes assimilated into the mainstream of higher education. On the other hand, technology is here to stay and will dominate the educational marketplace for the twenty-first century. The challenge is how do we improve the practice and process of distance education for the next generation of teachers and learners?" (Olcott, 1997, p. 2).

Theoretical Framework

As today's definition of distance education is tied to distance education technologies, it is important to first understand the adoption of distance education technologies as an innovation in order to better understand the adoption of distance education. The following is a review of literature based on innovation adoption. Larison (1995) used Lindquist's (1978) five issues to be addressed if faculty are to successfully adopt a technological innovation. Lindquist's five issues as stated by Larison (1995) are:

> (a) "There must be a sense of ownership by those the innovation affects. (b) There must be linkage to both informational and interpersonal resources. (c) Leadership must be present that is guiding, involving, and initiating rather than authoritarian, influential, and dogmatic. (d) There must be an actively open

> environment that seeks out and listens to disparate opinions about the innovation. (e) Material and psychic rewards must be present that will foster self-esteem and personal development dealing with access to information" (p. 141).

The faculty in Larison's study only met one of the five, linkage to both informational and interpersonal resources. Larison also asked if Lindquist's structure could be used to predict innovation persistence and concluded that facultys' decisions to continue using an innovation may be more complicated than meeting the five issues in Lindquist's framework; external circumstances may ensure the continuance of the technology despite the five issues mentioned above.

Many studies have been conducted that utilize Rogers' (1995) theory of diffusion of innovations (Anderson & Harris, 1997; Dooley & Murphy, 2000; Jacobsen, 1998; Knutel, 1998; and Ndahi, 1998) as the framework to study the adoption of distance education technologies. Knutel (1998) incorporated Rogers' work and constructed his own four-stage process framework after an extensive review of adoption models, yet the final model was very similar to Rogers' five-step model of the innovation-decision process.

Rogers' (1995) model of the innovation-decision process was used as the theoretical framework for this study to search for differences between faculty in the different stages of the innovation-decision process. Rogers' innovation attributes also guided the search for barriers and attitudes toward the concept of distance education. Rogers (1995) defines an innovation as, "... an idea, practice, or object perceived as new by an individual" (p. 11). He continued by adding,

> "It matters little, as far as human behavior is concerned, whether or not an idea, object, or practice is 'objectively' new in the sense of

> the time lapse since its first use or discovery. It is the perceived newness of the idea for the individual that determines his reaction to it. If the idea seems new to the individual, it is an innovation" (p.11).

As fewer than 10% of faculty are teaching distance education courses (The National Center for Education Statistics, 2002; & National Education Association, 2000) and the definition of distance education incorporates technology for delivery (The American Association of University Professors, 2002), the use of distance education technologies to teach distance education courses can be viewed as an innovation.

Rogers stated that the decision about an innovation is not an instantaneous act but a process that consists of a series of actions and decisions and describes this process in terms of a five-step model (Rogers, 1995).

> "1. *Knowledge* occurs when an individual (or other decision-making unit) is exposed to an innovation's existence and gains some understanding of how it functions.
>
> 2. *Persuasion* occurs when an individual (or some other decision-making unit) forms a favorable or unfavorable attitude toward the innovation.
>
> 3. *Decision* occurs when an individual (or some other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.
>
> 4. *Implementation* occurs when an individual (or some other decision-making unit) puts an innovation into use.
>
> 5. *Confirmation* occurs when an individual (or some other decision-making unit) seeks reinforcement of an innovation-decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation" (p. 162).

Within the knowledge stage, the cognitive level of the decision model, the first and most basic type of knowledge is awareness-knowledge, knowing that the innovation actually exists. Awareness-knowledge itself can be a motivator for further, more in-depth types of knowledge. How-to knowledge, knowing how to use the information properly,

and principles-knowledge, knowing underlying concepts of the innovation, are the other two more in-depth types of knowledge that, when lacking before trial or adoption, often lead to rejection or discontinuance. Rogers posits that the acquisition of how-to knowledge may be the most important level needed for individual acceptance of the innovation during the trial phase.

The persuasion stage, affective level of the decision model, is where an individual's attitudes toward the innovation are formed. Although an individual may form favorable attitudes toward the innovation, the behavior of adoption should not be assumed. Rogers defined an attitude as, "a relatively enduring organization of an individual's beliefs about an object that predisposes his or her actions"(p.168). During this stage an individual is seeking information and evaluating perceived attributes of the innovation.

Rogers has come up with five main attributes of an innovation that will help explain the rate of adoption: relative advantage, compatibility, complexity, trialability, and observability. Attitudes about the innovation will be formed based on the information or lack of information that is conveyed regarding the innovation's attributes. Rogers (1995) defined these attributes as follows:

> 1. "Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes (p.212).
> 2. "Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (p. 224).
> 3. "Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use (p. 242).
> 4. "Trialability is the degree to which an innovation may be experimented with on a limited basis (p. 243).
> 5. "Observability is the degree to which the results of an innovation are visible to others" (p. 244).

The third stage of the model is the decision stage. At this stage the decision to adopt or reject the innovation is made. Adoption is the decision to make full use of an innovation, while rejection is simply deciding not to adopt. During the decision stage, a trial or demonstration can speed up the adoption process, but this stage is the crucial point where an individual decides to use or not use the innovation.

A change in behavior accompanies the next stage of the model, the implementation stage. This is the where the idea is actually put into practice. The end of the implementation stage is usually signified when the innovation loses its "distinctive quality as the separate identity of the new idea disappears" (Rogers, 1995, p.173) and becomes part of the daily operations.

The final stage of Roger's model is the confirmation stage. During this stage, the individual seeks reinforcement for or reverses a previous decision. Confirmation does not always mean continuance; it could mean discontinuance if the individual feels the innovation should be replaced with something else or is simply not satisfied.

For the purposes of this study, the innovation is the use of distance education technology to teach distance education courses and the diffusion is the extent that faculty and administrators of agricultural education teacher preparation programs have adopted this technology. The stages of Rogers' model that were examined in this study were the decision and implementation stages. This study did not try to place participants into the knowledge and persuasion stages as knowledge and attitudes are continuously present and measurement of a participant in one stage exclusive of the others would be impossible. It was also determined that it would be confusing for participants to self select into the implementation stage versus the confirmation stage. Participants were

grouped into the decision and implementation stages based on their current state of planning for distance education technologies or using distance education technologies.

Rational and Statement of the Problem

Distance education is evolving and growing across the United States. Why does it appear that faculty are not adopting this form of education and its related technologies? Olcott (1997) presented a challenge to improve the practice and process of distance education. Distance education technologies are involved in both the practice and process of today's distance education. Miller and Clouse (1994) stated,

> "The primary key to making this educational system [an educational system that can transmit through time, space, culture, age, and diverse value systems] operational is not technology but the establishment of an infrastructure which will encourage entrepreneurs to take the lead and take risks in pursuing these new methodologies in education" (p.193).

We can better understand practice and process and further investigate infrastructure of distance education by analyzing perceptions of those involved with the delivery methods for distance education, the distance education technologies.

Olcott (1996) posits that adoption of distance education by postsecondary institutions may be aided through utilization of a framework that combines attributes of organizational culture and innovation diffusion theories. He continued by identifying three inherent assumptions. (a) Faculty are central to the adoption of distance education. (b) The institution and its subunits must accept distance education, or distance education must adopt the institution's principles and practices, or both must change to accept the practices of the other. (c) Faculty must see distance education's positive innovation attribute characteristics.

Olcott's (1996) framework has helped to guide and focus this research in the following ways:

1. Faculty are central to the adoption of distance education. An in-depth look at faculty's perceptions of attitudes and barriers will help define factors that may inhibit the use of distance education. Once barrier and attitude factors have been identified, an examination of factor differences between faculty in the decision stage and faculty in the implementation stage of the innovation-decision process will help create a holistic representation of the significant inhibiting factors for faculty of agricultural education teacher preparation programs.

2. Mutual acceptance of practices between distance education and the institution must occur. Comparing the adoption levels of distance education technology to faculty's perceived barriers will provide insight on the areas of conflict, indicating mutual acceptance in conflicting practices has not occurred.

3. Faculty must see distance education's positive innovation attribute characteristics. Significant differences in attitudes and barriers between the deciders and implementers may be similar to Rogers'(1995) innovation attributes.

Purpose of the Study

The purpose of this study was to identify if differences existed in perceived barrier factors and perceived attitude factors toward distance education between faculty and administrators in the decision stage and those in the implementation stage of distance education technology adoption. Information was gathered from teaching faculty and program leaders involved in agricultural education teacher preparation programs across the U.S. during the 1999- 2000 academic year.

The research questions that were addressed in this study were the following:

1. What are the demographics and characteristics for the respondents, the teacher education programs and the universities for the population?
2. What are the current practices and processes of distance education in agricultural education teacher preparation programs across the United States during the academic year of 1999-2000?
3. What do faculty and program leaders of agricultural education teacher preparation programs perceive as the major barriers inhibiting the start and/or expansion of distance education?
4. What are the attitudes of faculty and program leaders in agricultural education teacher preparation programs toward distance education?
5. Is there a difference in how participants responded to barrier factors for distance education when grouped by stage of adoption?
6. Is there a difference in how participants responded to attitude factors for distance education when grouped by stage of adoption?
7. Is there a difference in the perceived barrier factors for distance education between faculty and administrators?
8. Is there a difference in the perceived attitude factors for distance education between faculty and administrators?

Significance of the Study

Available research dealing with issues of faculty and distance education can be separated into a variety of topic areas centered around faculty's successful implementation of distance education and/ or distance education technologies. These

areas of research include: barriers to successful implementation of distance education, attitudes toward distance education, incentives that motivate faculty to use distance education, necessary components for successful adoption of distance education, and university and departmental policies needed for successful implementation of distance education. While studies have summarized factors inhibiting faculty adoption of distance education, research was not found that both identified perceived barrier and attitude factors and tested for significant differences between those who use distance education technologies and those who have not used DE technologies on the same group of responders.

Research addressing barriers to successful implementation of distance education has included the following audiences: (a) faculty who have taught distance education courses (Berge, 1998; & Olcott, 1996), (b) comparisons between faculty who have and have not taught distance education (Muilenburg & Berge, 2001; & Schifter, 2002), (c) frameworks to categorize barriers for faculty (Berge 1998; Betts 1988; Gellman-Danley & Fetzner, 1998; & Olcott, 1996), and (d) differences between administrators and faculty regarding barriers to distance education (O'Quinn & Corry, 2002; & Schifter, 2002) . The research has been helpful, but a holistic picture of faculty barriers toward distance education has not been presented (Muilenburg & Berge, 2001). Research was not available that indicated which barriers inhibit teaching faculty's and administrators' involvement with distance education based on the faculty members relative stage of distance education technology adoption. Research is needed to develop a standard barrier framework that can be utilized by numerous populations to better understand what types of barriers faculty face given their stage of distance education technology adoption.

Muilenburg & Berge (2001) constructed a list of barriers through factor analysis during the same time frame as this study and recommended further research to validate the factors and identify constructs that would account for greater than 52% of the variance in the data.

Faculty attitudes toward distance education have been addressed in the literature with studies acknowledging positive attitudes and identifying a correlation between faculty attitudes and adoption of distance education (Born and Miller, 1999; Challis, 1998; &Ross, 1997). What has not been studied are the attitudes of faculty and administrators toward distance education based on their stage of distance education technology usage. A comparison of attitudes based on faculty's use of distance education technologies would help create a more complete picture of whether or not attitudes should be considered barriers to distance education.

Clark (1992) recommended developing a closed-answer instrument to obtain the attitudes of faculty and administrators. He used open ended questions to solicit attitudes from faculty but suggested that was not very efficient to do on a large scale. An attitudinal questionnaire is needed that can be utilized in repeated studies and can gather faculty attitude data based on stage of distance education adoption.

University policies have been reviewed in the literature both as policies that need implementation for the successful accomplishment of distance education and as possible barriers to distance education. Though these policies have been based on faculty needs, no research was found to identify which policies were seen as barriers by a population of faculty and administrators based on usage of distance education technologies.

Definitions of Terms

Agricultural education teacher preparation programs - Programs in higher education that prepare students to become agriculture instructors at the high school or secondary level.

Adoption - "A decision to make full use of an innovation as the best course of action available" (Rogers, 1995, p. 21).

Attitude - Rogers (1995) defined an attitude as, "a relatively enduring organization of an individual's beliefs about an object that predisposes his or her actions" (p.168).

Barrier - or obstacle, something that inhibits the adoption or use of distance education technologies.

Audio conferencing - instructional dialogue via telephone.

Diffusion - "The process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas" (Rogers, 1995, p. 5).

Digital (desktop) conferencing - instructional dialogue via computer.

Distance education - Any method that utilizes technology to deliver instruction to individuals who are separated either by time or location from the source of the instruction. For purposes of this research, we did not include correspondence study in this definition.

Faculty - Teaching faculty would be any person involved in the delivery of pedagogical courses in the process of preparing secondary agriculture teachers.

Innovation - Rogers (1995) defined an innovation as, "an idea, practice, or object perceived as new by an individual" (p.11).

Internet or on-line courses - Courses that have been developed so that most or all of the content and instruction is available over the Internet.

Organizational culture - "The shared values of the institution that guide organizational and individual behaviors, provide meaning to faculty, staff, students, the public and administrators, and communicate the basic philosophy of the institution through traditions, rituals, language, and formal an informal communication channels" (Olcott & Dunham, 1991, p. 5) as cited in Olcott (1996).

Program leader - Program leader is the person with direct responsibility for providing the leadership for the agricultural teacher preparation program.

Telecourses - Video programs combined with print media, using one of many TV delivery methods, including videocassettes, to carry video content.

Videoconferencing - instructional dialogue via live TV.

Limitations of the Study

This research was conducted with the following limitations:

1. The study's participants were a relatively small population of program leaders and teaching faculty at all institutions across the U.S. that had agricultural teacher education preparation programs during the 1999-2000 academic year.

2. The study was limited to only the program leader and faculty teaching courses related to pedagogy. Other administrators and other teaching faculty that may have been associated with the teacher education department were not included.

3. The universities having agricultural teacher preparation programs were found in the *American Association for Agriculture Education Directory* (1999). Any other

universities that may have had programs were not known and were therefore not part of the sample.

4. Because this study focused on agricultural teacher education, the findings may not be generalizable to other teacher education programs or other administration and faculty in general.

5. The researcher designed the questionnaire, and although the questionnaire was reviewed for content validity, some questions may not have accurately measured the perceptions of the respondents

6. The researcher's own opinions and expectations may result in bias.

7. The use of a questionnaire limits the type of data collected and prohibits a richer understanding of respondents' opinions and feelings. It is also a very inflexible instrument that may not articulate the questions in a clear format (Gall, Borg & Gall, 1996).

Assumptions of the Study

The following assumptions were made for the purpose of this study:

1. Perceptions of barriers and attitudes could be measured by the instrument developed for this study.

2. The entirety of the population was surveyed.

3. The respondents answered honestly and thoughtfully when answering the items on the questionnaire.

Chapter 2

Review of Literature

The purpose of this chapter is to present a review of the literature related to adoption, use, barriers, and attitudes toward distance education. The following areas were examined: : (a) Academic culture and innovation adoption (b) policies needed for adoption of distance education, (c) barriers related to adoption of distance education, (d) barriers related to adoption of distance education technologies (e) attitudes toward distance education, (f) distance education research involving teachers, and (g) research in distance education related directly to agriculture educators.

Academic Culture and Innovation Adoption

Rogers (1995) defined an organization as,

> "... a stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labor. Individual behavior in an organization is relatively stable and predictable because organizational structure is characterized by predetermined goals, prescribed roles, an authority structure, rules and regulations, and informal patterns" (p. 403).

Olcott (1996) cites Olcott & Dunham (1991) to define organizational culture for a university as,

> "... the shared values of the institution that guide organizational and individual behaviors, provide meaning to faculty, staff, students, the public and administrators, and communicate the basic philosophy of the institution through traditions, rituals, language, and formal an informal communication channels" (p. 31).

He continued by saying, "the theoretical tenets of organizational culture suggest that postsecondary institutions are characterized by a set of basic practices, principles, and values that are embraced by the faculty and usually the institution" (p. 31). Faculty's

commitment to these practices, principles and values are demonstrated and encouraged by engaging in activities that are promoted, supported and rewarded through institutional policies and missions (Wolcott, 1997).

For successful innovation adoption to occur within an organization, it is important to align both the policies and practices of the institution and the polices and practices of the innovation (Rogers 1995). Johnson (2000) listed three factors that must be present within the organization for the successful implementation of distance education technologies: (a) framing, the defined need for the technology in terms of the university's political and strategic imperatives; (b) innovation environment, the internal environment and support structures for faculty, and (c) innovation attributes, the characteristics of the innovation as described by Rogers (1995). Rogers (1995) mentioned that lack of technical knowledge is a barrier to technology innovation implementation that can cause delayed adoption until sufficient knowledge allows successful innovation implementation. "The more 'radical' an innovation, indexed by the amount of knowledge that organization members must acquire in order to adopt, the more uncertainty it creates and the more difficult its implementation" (Rogers, 1995, p. 397). More (1994) stated that the major barrier for innovation adoption is organizational change, changing faculty roles and administrative structures. Olcott's (1996) visual representation of distance education concluded,

> "If faculty are given a position in the balcony rather than center stage; if administrative support is rhetoric rather that reality; and if academic units view distance teaching as a peripheral academic endeavor, the systematic adoption of distance education as an essential component of instructional mission will be seriously impeded" (p.30).

Policies for Distance Education Adoption

The success of distance education truly depends on the adoption of distance technologies by the faculty (Willis, 1994) as well as incorporation into the organizational culture, which may result in changing the university's familiar practices and policies.

> "A change in institutional culture within the university can happen only when shared values and vision about distance education exist among the faculty, including a commonly held set of standards and assumptions about how to achieve effective teaching and learning at a distance. The policy structure of the university -including faculty reward and tenure policies- is critical to helping create and sustain such an environment"(Innovation in Distance Education [IDE], 1995, p.16).

The report also mentioned that institutional policy shapes the academic behavior by controlling resources, establishing rules and regulations, and creating reporting systems that establish accountability. The institution's policies guide faculty actions related to teaching and research, and when these polices do not incorporate distance education, faculty have a more difficult time aligning their work with distance education to the polices and practices of the university. Faculty have to feel secure that their work in distance education is aligned with policies and valued as part of the institution's mission and goals as faculty are one of the most important forces in a university's culture (Stenerson, 1998).

Various frameworks have been developed for encouraging and aiding institutional and faculty adoption of distance education. Smith (1998) recognized the importance of clearly defining the goals of distance education, so faculty could match the underlying goals to their own educational goals. He viewed distance education as a strategy with the potential to meet educational goals, not as the primary objective. Smith (1998) identified

access, reach, quality, efficiency, and customer service as goals for educational objectives such as increasing enrollment, economies of scale, enhancing flexibility, involving outside experts, and providing real-world case studies. If the educational objectives of distance education are incorporated within the education goals of the university, this method of strategic planning will encourage the adoption of distance education more than presenting distance education as the objective.

The report provided by the Innovation in Distance Education group (1995) categorized policy issues supporting faculty into groups of resource allocation, rules and regulations, and accountability, while policies supporting learners were learner participation, curriculum development, and support services. Within each category, polices were listed that were important for consideration. Resource allocation addressed the issues of faculty support systems, rewards, development, and expectations. Intellectual property rights and promotion and tenure were included in the rules and regulation category, and relevance or fit of distance education was the focus of the accountability group. Policy issues relative to learner participation included technical support services, access to resources, evaluation of experience, and evaluation of performance. Incentives, marketing and program development were the issues listed under curriculum, and various levels of support were the focus for the student services category. The idea behind developing a set of policy issues was to create a structure for planning for successful incorporation of distance education into institutional policies and practices.

Betts (1998) concluded that faculty are more likely to increase their participation in distance education if inhibiting factors are eliminated by the administration and

intrinsic motivation factors are stressed. She recommended that institutions identify the factors that motivate their faculty and the factors that inhibit their faculty from participating in distance education in order to implement or expand their DE offerings.

Olcott (1991) listed several policies that must be evaluated at the institutional level for faculty to be successful at implementing distance education. These policies included:

> "residency; academic standards; evaluation (faculty, students, and program); faculty compensation; articulation; copyright; royalties; release time; allocation of instructional resources, collective bargaining and related legal issues; promotion and tenure; student and faculty support services; and inload vs. overload teaching assignments" (p. 50).

Berge (1998) added two additional issues from his questionnaire of online educators to the work of Gellman-Danley and Fetzner (1998), who grouped policy issues into seven operational areas for distance learning. The newly formed nine areas included: academic, fiscal, geographic service area, governance, labor-management, legal, student support services, technical and cultural. If policy areas are changed to address the necessary logistics and processes of distance education, adoption of distance education into the university's culture will have a higher likelihood of success and appear relatively seamless.

Although the research addresses slightly different policy issues, researchers are building a framework to guide the decisions of policy makers for successful adoption of distance education. If these policies are not evaluated and changed to include distance education, then they become barriers for faculty toward the implementation of distance education.

Barriers to Distance Education

Since so much emphasis is placed on faculty as the main stimulus for institutional change, it is imperative to determine what factors inhibit faculty from including distance education in their teaching and research. Educational research provides us with a comprehensive description about the types of barriers that are prohibiting the implementation of distance education for both educators that have used distance technologies and those who have not taught distance education courses. While research provides us with a thorough list of barriers, what is missing is a holistic approach to barrier research based on the participant's stage of distance technology adoption.

O'Quinn and Corry (2002) utilized Betts' (1998) list of inhibiting factors and surveyed community college faculty. They found that the participants did not reply with agreement or strong agreement to any of the factors that had inhibited or could inhibit their participation in distance education. The factors that respondents felt did not inhibit their participation in distance education included: "lack of professional prestige, delivery method used, change in faculty role, and lack of monetary support" (O'Quinn & Corry, Comparisons of Responses, ¶ 6).

Muilenburg and Berge (2001) collected data for a factor analytic study of barriers at the same time data was collected for this survey (1999-2000). Their target population was not clearly identified, but the respondents were from a variety of educational settings, businesses, non-profit organization, and governmental agencies. They identified 10 barriers to distance education and named them as follows: (a) administrative structure, (b) organizational change, (c) technical expertise, support, and infrastructure,

(d) faculty compensation and time, (e) threat of technology, (f) legal issues, (g) evaluation/effectiveness, (h) access, and (i) student-support services.

Olcott (1996) broke his own list of determinate institutional policies, mentioned earlier, into barriers that discourage faculty from participating in distance education and provided questions for determining if an institution's culture favors or dissuades the adoption of distance education. The barriers are as follows: (a) lack of support for release time, training, and instructional resources, (b) lack of applicability toward promotion and tenure, (c) concerns about inload vs. overload, (d) lack of incorporating distance education in the institutional mission, (e) uncertainty about compromising classroom autonomy, curricular control, intellectual property rights and academic quality, (f) lack of quality instructional and student support services, (g) concerns regarding residency status of distance education courses, intellectual property rights and royalties.

With the addition of Berge's (1998) two barriers to the work of Gellman-Danley and Fetzner (1998), nine operational areas of academic policy (academic, fiscal, geographic service area, governance, labor-management, legal, student support services, technical and cultural) were formed to consider distance education's fit into the institutional mission. These nine were combined with Olcott's barriers (1996) to construct the barrier framework that guided the search for barriers to distance education. This framework was used to identify a robust listing of barrier variables and define barriers for the construction of the questionnaire instrument. Further research was evaluated to give additional support to the newly constructed barrier framework. The resulting framework, a list of barrier categories, is as follows: (a) lack of support for release time, training, and instructional resources; (b) lack of applicability toward

promotion and tenure, and incorporation in the institutional mission; (c) concerns about inload vs. overload; (d) concerns for technology difficulties and lack of support; (e) uncertainty about compromising classroom autonomy, curricular control, intellectual property rights and royalties, and academic quality; (f) lack of quality instructional and student support services; (g) concerns regarding residency status of distance education courses, accreditation, legal concerns; (h) lack of equivalence to on-campus courses; and (i) costs for development and maintenance.

Olcott (1996), Berge (1998) and Gellman-Danley and Fetzner (1998) had developed their framework based on their review of the literature, and that research base continues to support the newly combined framework. A further review of additional research was completed to provide added support for the framework. Studies that supported as well as research that directly contradicted each of the barrier categories follow.

Lack of Support for Release Time, Training, and Instructional Resources.

One study that confirmed the faculty support barrier was completed by Miller and Carr (1997). They surveyed all colleges and departments of agriculture in the United States and its territories that were interested in distance education training to determine the needs of agricultural faculty related to distance teaching and learning. The researchers concluded that teaching techniques for distance education and models of effective distance teaching were rated in the top five faculty needs, for each of the three groups in the population. Enhancing interaction, learner-centered teaching, instruction for credit courses and principles of teaching were ranked in the top five for at least two of the three groups. Since these items were ranked in the top five as needs from the faculty,

a lack of this type of training could be regarded as inhibitors to faculty's use of distance education.

Another agricultural related survey supporting the time and training element of the barrier framework was conducted by Rockwell, Schauer, Fritz and Marx (1999). They surveyed faculty and administrators in the College of Agricultural Sciences and Natural Resources and found that the time requirement needed, the time away from research, the training needs, and the lack of technology skills and support were perceived as barriers to distance education. The work of Gunawardena (1990), Betts (1998), Gellman-Danley & Fetzner, (1998), and Moskal, Martin and Foshee (1997) recognized the lack of support for time, training and resources as barriers to distance education. Berge and Muilenburg (2001) indicated that faculty's lack of time was the most consistently reported barrier from respondents replying to their survey.

Lack of Applicability Toward Promotion and Tenure and Incorporation in the Institutional Mission.

Literature related to the barrier category that includes lack of support for promotion and tenure and lack of incorporating distance education into the institution's mission ranged from studies claiming this type of support is necessary (Olcott, 1997a; Gunawardena, 1990; & Sedlak & Cartwright, 1997) to studies concluding lack of this type of support have been barriers, (Dillon & Walsh, 1992; & Wolcott, 1997; & Mezach & Cardot, 1988) to a major national study (U. S. Department of Education, 1997) claiming these ideas are not seen as barriers.

Olcott, (1997a), Gunawardena, (1990), and Sedlak and Cartwright, (1997) all reported that support from administrators is imperative to the successful adoption and

continued used of distance education. Moskal, Martin and Foshee (1997) stressed the importance of distance education being compatible with the instructor's discipline in order to be adopted successfully.

Dillon and Walsh (1992) reported that distance teaching is not rewarded by academic departments or considered a scholarly activity. They continued by saying that leadership is lacking for the successful diffusion of distance education. In an analysis of institutional reward systems relative to distance education, Wolcott (1997) claimed that distance teaching was not valued thus not rewarded, not considered as valuable to the promotion and tenure process, and was not a high priority or an institutional commitment. Mezach and Cardot (1988) concluded that continuing education (CE) did not count in promotion and tenure decisions, but presidents and chief academic officers responding to the questionnaire felt that continuing education should count for more with regard to salary decisions.

The national study concluding that lack of institutional and administrative support was not a barrier for distance education was the U. S. Department of Education's (1997) study. The study's questionnaire was administered to the person most knowledgeable about distance education course offerings at 1,276 two-year and four-year higher education institutions. The report concluded that respondents (60% and 58% respectively) felt lack of administrators' support and lack of fit with the institutions' missions were not barriers prohibiting the expansion or start up of distance education offerings. Barrier statements related to lack of administrative support and lack of fit with the institutions mission were included in the questionnaire due to the contradiction in findings.

Concerns About Inload vs. Overload.

The barrier category dealing with the educator's workload goes beyond the time needed for distance course preparation and includes time required to administer, maintain and upgrade the course. In Kambutu's doctoral dissertation (1998), data was collected from one academic administrator and one university extension administrator from each of the 67 land-grant institutions. He concluded that the administrators felt distance teaching was extra to a faculty member's normal workload. Betts (1998) also reported from her study that both faculty and deans indicated that concern about faculty workload was rated as one of the top five inhibitors keeping them from participating in distance education. Barrier statements dealing with faculty workload were included in the research instrument.

Concerns for Technology Difficulties and Lack of Support.

Concerns for technology seem to range from lack of technical support to lack of access to updated equipment. Moskal, Martin and Foshee (1997) claim the equipment should be easy to use and readily available. The U. S. Department of Education (1997) reported 31% of respondents felt limited access to technology was a major barrier and 23% felt equipment failure and maintaining equipment was a major barrier.

Ndahi (1998) surveyed faculty from 20 universities that utilized distance education in their industrial and technical teacher education programs. The findings for this study indicated that equipment failure, non-adjustment of workload, lack of interaction and lack of technical support were the most common problems from those educators who used distance education. Faculty in this study also gave reasons why they did not want to use distance education. These reasons included limited teaching skills;

lack of institutional encouragement, support and incentives; vague institutional policies; and lack of time to plan.

Perreault, Waldman, Alexander, and Zhao (2002) collected data from business professors who taught distance learning courses. These professors reported problems with the reliability of technology, lack of student technology competence, lack of technical support from the institution, lack of student access to course materials, and communication issues between the instructor and students and among students.

Uncertainty About Compromising Classroom Autonomy, Intellectual Property Rights and Academic Quality.

Quality of the course was mentioned the most for the barriers in the autonomy, intellectual rights, and academic quality category (Betts 1998; Ndahi, 1998; & Wolcott, 1993). Faculty at the University of Nebraska-Lincoln indicated the following were very important to develop educational materials for distance delivery: developing interaction, developing instructional materials, applying selected technologies, and marketing courses (Schauer, Rockewll, Fritz, & Marx, 1998).

In a qualitative study by Dooley and Murphy (2000), faculty articulated a fear that capturing their intellectual property through distance courses could eliminate faculty positions. Barnard (1997) also mentioned intellectual ownership issues would inhibit the expansion of access to digital information. Larison (1995) found that the faculty he surveyed felt there was some threat to intellectual property rights, but it was not excessive.

Lack of Quality Instructional and Student Support Services.

Instructional and support services deal with logistics and the processes involved with the physical delivery of the course and services need by students. Dillon and Walsh (1992) cite Dillon (1989) as identifying areas of support that faculty considered beneficial. These areas included: "assistance with the preparation of course materials, clerical services, coordination of communication with the distance students, marketing services, and distribution of materials" (p.11).

Specific student services were recognized as important to the success of a distance delivered graduate program in Montana. The student services listed by Foster (1997) were distance registration, library access, e-mail accounts, and delivery of course materials. Barnard (1997) also emphasizes the need for online libraries and seamless access to library resources as online learner needs. Barriers in this category include a lack of those services necessary to support delivery of the instruction, support student registration for courses, and ability to access resources for success.

Concerns Regarding Residency Status of Distance Education Courses, Accreditation, and Legal Concerns.

The U. S. Department of Education (1997) reported that 79% of respondents indicated that inability to obtain state authorization was not a barrier prohibiting the use, expansion or start up of distance education offerings. Other statements that respondents did not consider as barriers were restrictive federal, state or local policies (58%) and legal concerns (57%).

Lack of Equivalence to On-Campus Courses.

Specifics relating to course equivalency were harder to pinpoint. Repman and Logan (1996) discussed the differences in interaction and how lack of interaction can be barriers if distance education courses are not structured with these inherent problems in mind. Kelsey and Sutphin (2000) described barriers to student interactions using interactive compressed video that were based on limited interactions due to limitations in technology and social concerns.

Moskal, Martin and Foshee (1997) reported courses offered via distance education need to have a clear advantage over traditional delivery. Born and Miller (1999) stated that the faculty they surveyed agreed that distance education could be as challenging as on-campus, but were still concerned about lack of effective interaction and overall quality of a web-based degree.

Costs for Development and Maintenance.

In her commentary, Carter (1996) included costs in her framework of questions that institutions should consider before beginning distance education programs. The U. S. Department of Education's (1997) report on distance education indicated that 43% of respondents specified program development costs were a major factor keeping the respondents' institutions from starting or expanding their distance education course offerings. Gunawardena (1990) lists issues related to costs for hardware and system costs as well as personnel cost to keep the systems functioning for videoconference-based distance education.

Barrier's Alignment to Characteristics of Innovations.

The barrier framework used in this study aligned with Rogers (1995) characteristics of innovations that when lacking, lead to slow adoption. Lack of support for release time and training would be considered high complexity. Lack of incorporating distance education in the institutional mission, concern over quality and apprehension regarding loss of intellectual property would be viewed as low compatibility. No observability could be seen as lack of applicability toward promotion and tenure, and lack of support services could be construed as little relative advantage. The literature points to many barriers inhibiting the adoption of distance education. The barrier framework used in this research helped to create a robust list of barrier statements to be used the this study's survey instrument.

Barriers to Distance Education Technologies

Although the incorporation of distance education technologies has become part of distance education, some studies have focused on barriers to the incorporation of distance education technologies. Baldwin (1998) lists a number of reasons why faculty do not incorporate technology into their work. These include,

> "...insufficient or obsolete hardware and software, inadequate facilities and support services, lack of time and money, an appropriate reward system, lack of information about good practice, and underestimation of the difficulty in adopting new technologies" (p. 13).

Moskal, Martin, and Foshee (1997) identified three factors that encourage the adoption of educational technologies: 1) the technology must improve student learning 2) it must offer a clear advantage over traditional delivery, and 3) the technology must be readily available for use. They also listed nine factors important to the adoption of

educational technologies and incorporated Rogers' (1995) attributes of an innovation into each factor: (a) easy to use (complexity), (b) advantages over traditional deliver (compatibility), (c) compatible with instructor's discipline (relative advantage and compatibility), (d) increased student motivation (relative advantage), (e) increased student learning (relative advantage), (f) available time to learn to use (relative advantage and compatibility), (g) equipment available to use in the classroom (relative advantage and complexity), (h) funds available for necessary materials (relative advantage), and (i) training provided for faculty (complexity). If these factors are important to the adoption of distance education, then the lack of these factors could be construed as barriers. Barrier statements reflecting these possible barriers were included in the survey instrument.

Attitudes Toward Distance Education

The barriers discussed in the barrier framework may not be the only factors that inhibit the adoption of distance education. Numerous studies have attempt to solicit the attitudes of primary stakeholders in distance education, but limited research was found that provided a framework for categorizing the types of attitudes faculty may hold toward distance education. Research on attitudes toward distance education was reviewed and evaluated to create a list of attitude statements that would solicit the attitudes towards distance education from the study's participants.

Culnan's (1984) study of perceived accessibility as an attitudinal variable playing an important role in the use of online information systems suggests that users require support and training until they feel comfortable using a system and then require the system to be accessible for continual use. This study broke accessibility into three terms: reliability, convenience, and ease of use. Access to the hardware or software of the

system was not sufficient to guarantee use. The technological barrier statements included in this research were: equipment failures/cost of maintaining, lack of access to technology, technological failures limiting teaching, and lack of technology support.

Miller and Clouse (1994) reported that instructors' attitudes are important for successful adoption of distance education. Taylor and White (1991) surveyed faculty in Australia who were familiar with both on-campus and off-campus teaching. Attitudes were assessed according to statements dealing with job satisfaction and how attainable these statements would be for both on-campus and off-campus teaching. The following five items were the most important in achieving job satisfaction: "quality of interaction with students; working with motivated students; satisfaction from the act of teaching; feeling of personal achievement; and high level of student outcomes" (p. 8). These statements seem to indicate attitudes based on personal satisfaction and student achievement.

Clark (1992) addressed faculty receptivity in a framework that looks at attitudes toward distance education in general, toward personal involvement in distance education, toward distance education in both general and specific academic settings, and toward the use of specific media in distance education delivery. He found that although faculty attitudes were for the most part positive toward distance education, they were skeptical and indicated slightly negative attitudes when responding to personal use of distance technologies for their own classes. This signifies that personal use may be an important type of attitude for the adoption of distance education. He also concluded that faculty with the greatest amount of experience had positive attitudes and those with little or no experience had negative attitudes.

Ross (1997) administered a national questionnaire to business teachers and administrators to identify their attitudes, factors that influenced their attitudes, and the impact of these factors toward participation in distance education. Through regression analysis, he found some characteristics that were the most influential for predicting receptivity and support for distance education. Characteristics that were common at both the baccalaureate level and master's level of instruction were as follows: (a) attitudes about non-traditional students, the feasibility of DE, and the role DE should take on campus; (b) Carnegie classification of the university; (c) age of the respondent; (d) concerns about objectives; (e) concerns about rewards; (f) tenure status; and (g) type of accreditation. His study combined demographic and cognitive factors to explain faculty's perceived attitudes.

Ross and Klug (1999) later used five demographic variables: years of experience in distance education, age, years in position, rank, and Carnegie classification of the institution to forecast the attitude variables of fit, difficulties, objectivity and accreditation impact. The attitude variables were then used to predict the composite variables of receptivity and support through a simultaneous equations design. This methodology indicated the relative importance to categorize attitude variables into: fit, difficulties, objectivity and accreditation impact.

Challis (1998) found that faculty were slightly positive for using distance education in their academic areas, but were slightly negative when considering DE for their own courses. The study surveyed the public higher education faculty in Utah. Conclusions were drawn about attitudes toward faculty's personal use, willingness to

teach, general effectiveness of distance education, and appropriateness toward academic programs.

Born and Miller (1999) built their attitudinal research based on the premise that adoption of distance education depended heavily on the perception and attitudes of faculty. They created an attitude-based instrument to assess overall perceptions of web-based courses and used demographic characteristics to interpret their results. The conclusions that related directly to web-based distance education included: (a) participants were undecided about web-based distance education; (b) there was no correlation between faculty rank and perceptions of web-based DE; and (c) perceptions of web-based distance education were significantly higher for faculty who were involved in distance education.

Attitude research has been directed toward specific types of technology, targeted toward specific groups of respondents, interpreted using demographic and cognitive variables, and addressed as open-ended questions. This review of literature was unable to find a stable framework for eliciting attitudes toward distance education. However, the literature did provide evidence that attitudes can prohibit the use of distance education, and attitude statements were developed for the study's instrument to solicit the attitudes of agricultural teacher education preparation program participants toward distance education.

Teacher Education

Although research has focused on distance education as an effective method of learning (Billon & Walsh, 1992; Main & Berry, 1993; Olcott, 1997a; & Russell, 1999), it is important to the scope of this study to identify research related to the use of distance

education for pre-service education. A review of literature related to using distance education for pre-service and in-service educators revealed that distance delivered courses for teacher education are practical and beneficial for this group of learners. Beare (1989) found no differences in course achievement or course evaluation between distant learners and traditional learners. After examining a doctoral cohort distance education program at Purdue University, Lehman, Newby and Ahn (1998) concluded, "with careful selection, effective distance learning experiences can be constructed for both in-service and pre-service teachers" (p. 135).

The students in Montana's distance delivered graduate degree program in education appreciated being able to study in a time and place that was conducive to family, professional, and work obligations. They realized the limitless possibilities for their own learning as well as their students. They increased their understandings and competencies for using technology and became advocates for distance learning as a result of their participation in distance education (Foster, 1997).

The teacher education program at Bradley University had been enhanced through distance technologies by enabling connections with the K-12 community, providing professional development opportunities, encouraging collaboration, and developing additional mentoring opportunities (McMullen, Goldbaum, Wolffe, & Sattler, 1998)."Shortages in certain licensure fields, new certification requirements, and salary incentives have all contributed to a growing need for alternative methods of continuing teacher education." (Beare, 1989).

Kotrlik, Redmann, Harrison and Handley (2000) recommended that teacher preparation programs strengthen their emphasis on preparing teachers to be self-directed

learners to enhance their knowledge and skills using information technology. They also cautioned that training about information technology must remain part of the pre-service curriculum in order to enhance the knowledge and skill levels of the students.

The studies that directly asked questions concerning the value of distance education for pre-service teachers found distance education to be very positive and beneficial for pre-service as well as in-service training. The review of literature did not find any evidence suggesting that distance education would be inappropriate for training pre-service teachers or pre-service agriculture teachers.

Agricultural Educators

In addition to views on the effectiveness of distance education in general, research specifically on distance education in agriculture is also important to the scope of this study. Bowen and Thompson (1995) surveyed the department heads from colleges of agricultural sciences across the U.S. and found that the department heads would be willing to utilize distance education, supported their faculty who were involved in delivering and receiving instruction via distance education, and realized their faculty would need training in DE. Murphy and Terry (1998b) enlisted agricultural educators in a Delphi panel and found that the use of electronic communication, information, and imaging technologies would improve teaching, but the lack of training time, commitment, support, and funding were all obstacles for the adoption of the technologies. They also indicated computer-based telecommunications technologies held the most promise for instruction.

Murphy and Terry (1998a) also surveyed all teaching faculty in the College of Agriculture at a land grant university and noted that substantial support would be needed

in order for faculty to adopt electronic technologies for teaching purposes. The faculty members in their study did not feel that the time and effort needed to develop distance education courses was valued. Murphy and Terry (1998a) recommended further clarification of obstacles was needed for faculty to adopt distance education technologies.

Born and Miller (1999) studied Assistant, Associate and Full Professors in the Agronomy Department at Iowa State University and found they thought web-based distance education could be as challenging as on-campus courses, and their department needed to continue developing DE courses. Student/professor interactions and the quality of the web-based degree were the faculty's greatest concerns.

Miller and Shih (1999) found that College of Agriculture teaching faculty at Iowa State University perceived off-campus courses to be less rigorous than on-campus courses. The three factors identified in the study that explained perceptions of rigor were: active learning, effort, and operating at high cognitive levels. They recommended further research to determine if off-campus courses actually do require less student effort, have less opportunity for active learning and allow lower cognitive thought processes.

Miller and Pilcher (2000) then surveyed both faculty and students regarding their perceptions of academic rigor for both off-campus and on-campus courses. Both faculty and students agreed that on-campus courses were rigorous, while agreement toward off-campus was not as equal. Students felt that off-campus courses required more effort than did the faculty. Both groups felt that interaction is very limited with off-campus courses, and off-campus students contribute less to class discussion than their on-campus counterparts do.

The review of distance education in agriculture courses and programs suggests that for the most part faculty and administrators are generally positive toward distance education, although thought off-campus courses were less rigorous than on-campus. Barriers to distance education in agriculture (lack of training time, lack of commitment, lack of support, and lack of funding) were similar to other disciplines.

Summary

This review of the literature examined the following areas: (a) Academic culture and innovation adoption (b) policies needed for adoption of distance education, (c) barriers related to adoption of distance education, (d) barriers related to adoption of distance education technologies (e) attitudes toward distance education, (f) distance education research involving teachers, and (g) research in distance education related directly to agriculture educators.

A review of the literature concluded that faculty are very important to implementing a change in the university's culture. In order for the adoption of distance education to be successful, policy makers must be aware of the barriers that inhibit the use of distance education as well as the attitudes that faculty hold toward distance education.

Barrier frameworks have been developed to solicit faculty's perceptions of barriers, and attitudes have been solicited but not within a developed framework. Some research has reported a difference in perceptions between those faculty who have used distance education and those who have not taught distance education courses. These differences will be explored further in this research.

Chapter 3

Methodology and Procedures

The purpose of this study was to identify if differences existed in perceived barrier factors and perceived attitude factors toward distance education between faculty and administrators in the decision stage and those in the implementation stage of distance education technology adoption. Administrators and teaching faculty from agriculture education teacher preparation programs across the United States during the 1999–2000 academic year were surveyed. The participants were asked to respond to questions in the areas of program goals, awareness of technology types, ability to use technology types, level of technology adoption, availability of faculty training, perceived faculty support, future distance education goals, perceived barriers to implementing distance education and attitudes toward distance education.

A survey instrument (Appendix A) sent via mail was used to identify and assess the perceptions, attitudes and demographic information from both teaching faculty and program administrators in agricultural education teacher preparation programs. The questionnaire was chosen as the instrument for data collection due to the advantages of keeping the costs low, receiving information from a wide geographical area and receiving the data in a relatively short amount of time (Gall, Borg & Gall, 1996).

The purpose of this chapter is to describe the research procedures used to conduct this study. Subheadings included in the chapter are: (a) Design of the Study, (b) Research Questions and Hypotheses, (c) Description of the Population, (d) Description of the Survey Instrument, (e) Construction of the Instrument, (f) Pilot Test Procedures, (g)

Reliability of the Instrument, (h) Validity of the Instrument, (i) Data Collection Procedures, (j) Data Analysis and (h) Summary.

Design of the Study

Because of the complexity of this research, two different research methods were used. Descriptive research was used for gathering demographic information, assessing levels of technology adoption, and gathering perceived barriers and attitudes. Comparisons of the two groups (defined by level of distance education technology adoption) determined if significant differences existed. Since the independent variable, group affiliation, could not be manipulated, this type of research was a causal-comparative design (Gay, 1992), also referred to as ex post facto research because the causes have exerted their effect on the dependent variable and/ or the personal characteristics were already present (Gall, Borg & Gall, 1996).

Research Questions and Hypothesis

The eight major research questions that serve as the guide for this study are as follows:

1. What are the demographics and characteristics for the respondents, the teacher education programs and the universities for the population?
2. What are the current practices and processes of distance education in agricultural education teacher preparation programs across the United States during the academic year of 1999-2000?
3. What do faculty and program leaders of agricultural education teacher preparation programs perceive as the major barriers inhibiting the start and/or expansion of distance education?

4. What are the attitudes of faculty and program leaders in agricultural education teacher preparation programs toward distance education?
5. Is there a difference in how participants responded to barrier factors for distance education when grouped by stage of adoption?
    a. *H*o: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on perceived barrier factor scores for distance education.
6. Is there a difference in how participant responded to attitude factors for distance education when grouped by stage of adoption?
    a. *H*o: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on attitude factor scores for distance education.
7. Is there a difference in the perceived barrier factors for distance education between faculty and administrators?
    a. *H*o: There is no significant difference between the faculty and administrators based on perceived barrier factor scores for distance education.
8. Is there a difference in the perceived attitude factors for distance education between faculty and administrators?
    a. *H*o: There is no significant difference between the faculty and administrators based on perceived attitude factor scores for distance education.

Description of the Population

The target population for this study was identified as current program leaders and current teaching faculty from all agricultural education teacher preparation programs across the United States during the 1999-2000 school year. Program leaders were defined as the individuals with direct leadership and responsibility for the agricultural education teacher preparation programs at each university. Teaching faculty were those individuals who taught agricultural education pedagogy courses for the agricultural education teacher preparation programs at each university. The entirety of this population was selected instead of a sample, due to the relatively small population size and ease of accessibility.

Initial contacts were made (Appendix B) to all individuals presumed to be the department head for each university's agricultural teacher education program. Names and contact information were found in the *American Association for Agriculture Education (AAAE) Directory* (1999). The AAAE is the primary professional organization for individuals involved with postsecondary agricultural education. The individuals receiving the initial contact were asked to identify the program leader and all teaching faculty, as defined earlier, in their respective teacher education preparation programs. They were also asked to forward the message on to an individual in the university who could identify members of the population if they were unable to do so. Follow-up communication was continued to all nonrespondents until contact was made, and the names of teaching faculty and program leaders were gathered from each university declaring an agricultural education teacher preparation program.

Description of the Survey Instrument

The survey instrument (Appendix A) used was developed specifically for this study to identify if differences existed between the group of respondents in the decision stage for distance education technology adoption and the group in the implementation stage of distance education technology adoption. The survey instrument was constructed from related literature that contributed to various sections of the current instrument. A panel of experts (Appendix C) examined the instrument for content validity and readability. The panel of experts consisted of five members as follows: a program leader from a teacher education program in agriculture education, a program leader from a teacher education program in professional technical education, two teaching faculty from a teacher education program in agriculture education and one teaching faculty from a general teacher education program.

Construction of the Instrument

The related literature revealed no survey instruments directed toward agricultural education teacher preparation programs that attempted to identify if differences existed between the group of respondents in the decision stage for distance education technology adoption and the group in the implementation stage of distance education technology adoption. Ideas, concepts and questions were used from questionnaires with a related focus to construct the questionnaire for this research. Ross (1997) reported the attitudes and levels of support for business college faculty and administrators toward distance education at the baccalaureate, master's and doctorate levels. Larison (1995) assessed if faculty at Eastern Oregon University perceived barriers to technology implementation. Layfield (1998) utilized yet another questionnaire with high school agriculture teachers at

the national level to define the perception and use of the Internet. Clark (1993) incorporated specific media types into a national attitude questionnaire. The United States Department of Education's 1997 report entitled *Distance Education in Higher Education Institutions* was a national study examining areas that pertained directly to this study. These areas included: types of technology, availability of resources, opportunities for training, importance of goals to the program and extent the goal is met using distance education, and barriers to distance education.

Due to the lack of an existing instrument's ability to address all the goals for this study, it was necessary to develop a new instrument. Four sections of the survey instrument were either duplicated or partially duplicated from the instrument used in the United States Department of Education and the National Center for Education Statistics' (NCES) 1997 questionnaire; these will be identified in each applicable section. The instrument was developed after an extensive review of related literature. There were ten sections to the questionnaire (Appendix A).

Section 1 measured the importance level of various goals to the teacher education program and the extent to which each goal had been met through the use of distance education in a two-part question. Possible responses included: 1 = *Not important*, 2 = *Somewhat important*, and 3 = *Very important* in Section 1a, and 1 = *Not at all* (no extent), 2 = *Minor extent*, 3 = *Moderate extent* and 4 = *Major extent* in Section 1b. This section was duplicated exactly from the NCES 1997 questionnaire.

Section 2 measured participants' awareness to technology types. Participant responses included: 1 = *Very aware*, 2 = *Somewhat aware*, and 3 = *Not aware*. The data for this section was recoded to 1 = *Not aware*, 2 = *Somewhat awa*re, and 3 = *Very aware*

for the purposes of data analysis. NCES 1997 and Stewart (1995) were used to identify names and definitions for the distance education technology types.

Section 3 measured participants' ability to use various technology types. In a review of distance education technology, Stewart (1995) reviewed and defined some of the more common types of DE technology in use. Response categories for Section 3 included: 1 = *Very capable*, 2 = *Somewhat capable*, and 3 = *Not capable*. These were also recoded during data entry for analysis to 1 = *Not capable*, 2 = *Somewhat capable*, and 3 = *Very capable*.

Section 4 measured the level of technology adoption, and possible responses were as follows: 1 = *Use and continue*, 2 = *Use and discontinue*, 3 = *Plan to use*, and 4 = *No plan to use*. These measures were extrapolated from Roger's (1995) innovation-decision process.

Section 5 measured the faculty training opportunities available to participants. The respondents, choices included: 1 = *Available* and 2 = *Not available*. Variable statements were duplicated from the NCES 1997 questionnaire.

Section 6 measured the extent the department provided faculty with support for using distance education technologies. Possible responses were: 1 = *Not at all*, 2 = *Minor extent*, 3 = *Moderate extent*, and 4 = *Major extent*.

Section 7 measured which resources the agricultural education teacher preparation programs would have available for students in the next three years. Participants selected from the following choices: 1 = *Not available*, 2 = *Available for some courses*, 3 = *Available for all courses* and 4 = *Don't know*. Variable statements from the NCES 1997 questionnaire were duplicated as well as the structure for measurement.

Section 8 measured the extent the given barrier was keeping the department from starting or expanding the distance education offerings, 1 = *Not at all*, 2 = *Minor factor*, 3 = *Moderate factor*, and 4 = *Major factor*. Barrier statements were duplicated from the NCES 1997 questionnaire, and the researcher added additional statements.

Section 9 measured the attitudes toward distance education using a 5-point Likert-type scale (Gall, Borg & Gall, 1996) with 1 = *Strongly agree*, 2 = *Agree*, 3 = *Undecided*, 4 = *Disagree*, and 5 = *Strongly disagree*. The data were recoded to 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Undecided*, 4 = *Agree* and 5 = *Strongly agree*. Many of the attitude statements were taken from Born & Miller (1999) and made into generic statements instead of using the original web-based statements and statements that focused on the Master of Science in Agronomy distance education program.

Section 10 included questions to collect demographic information regarding personal characteristics, professional characteristics and departmental and university characteristics.

Pilot Test Procedures

The instrument was piloted with a group ($N = 7$, Appendix D) similar to the population. Because the entirety of the population was utilized for the study, the most closely related group consisted of former program leaders and teaching faculty. These educators had at one time met the criteria to be involved in the study, but were now retired, or had been promoted and no longer met the criteria for either group. The feedback from the pilot test resulted in wording changes for clarification and formatting purposes, but no major changes were made to the instrument.

Reliability of the Instrument

Gall, Borg & Gall (1996) stated that ..."the reliability of a test refers to how much measurement error is present in the scores yielded by the test,...the difference between an individual's true score on a test and the scores that she actually obtains on it over a variety of conditions" (p. 254). Since one cannot directly measure true scores or measurement error, we have to estimate them. Internal consistency estimates test score reliability by examining the individual items through a procedure called Cronbach's coefficient alpha (α). Cronbach's is used on non dichotomous data where 1.00 indicates perfect reliability. An alpha of .80 or higher is sufficient for most research (Gall, Borg & Gall, 1996). The Cronbach's alpha coefficient for the pilot test data was $\alpha = .80$.

Validity of the Instrument

A common view of validity is that the item or test is valid if it measures what it purports to measure. Gall, Borg and Gall (1996) stated that test scores cannot be valid or invalid. The validity lies in inferences that we make from the test scores. Gall, Borg and Gall (1996) list four types of evidence that will demonstrate validity: construct-related evidence, content-related evidence, predictive evidence and concurrent evidence. This evidence is relevant for questionnaires and tests. Krathwhol (1998) maintained that construct validity is the unifying framework for all types of validity evidence forming the basis for intended score interpretation. He continued, by clarifying that this view of validity broadens the definition from the test to any score and focuses the measure of validity in the interpretation of the intended scores.

Content-related evidence was used to demonstrate the validity of this instrument by verifying that the instrument's scores actually reflect the conceptual domain that these

scores claim to measure. Evidence of content validity was gathered by soliciting the comments and suggestion from the panel of experts and members of the pilot test group. The two groups provided input regarding the content and direction of the instrument, which added to the clarity and appropriate wording of the questions.

Data Collection Procedures

The survey instrument and cover letter (Appendix E) were mailed to the participants with a self-addressed, stamped return envelope. Participants were asked to return the completed questionnaires by a given date, two weeks after the questionnaire was mailed (Dillman, 1978). One hundred and five questionnaires were collected from the initial letter. A second copy of the questionnaire, along with a self-addressed, stamped return envelope and alternate cover letter (Appendix F) was mailed two weeks after the first to those individuals who had not responded. This time participates were given two and one-half weeks to return the questionnaire (Dillman, 1978). Thirty-six questionnaires were collected following the second mailing. A reminder e-mail (Appendix G) was sent four weeks following the second mailing to participants who had not yet returned their questionnaire. The e-mail requested that the participants return their completed questionnaires in one week. An additional 10 completed questionnaires were collected. These 10 questionnaires were coded as the late responders.

Data Analysis

The data were analyzed using SPSS 11.0. Specifically, analyses were reported using the following methods for each question.

1. Data related to research questions one and two were analyzed using descriptive and cross tabulation statistics. Frequencies, percentages, means

and standard deviation were calculated for the demographic variables and questions related to perceptions of distance education in general.

2. Data associated with research question three were analyzed using descriptive statistics. Frequencies, percentages, means, and standard deviations were calculated for the variables that measured perceived barriers.
3. Data relative to research question four were analyzed using descriptive statistics. Frequencies, percentages, means, and standard deviations were calculated for the variables that measured attitudes.
4. Principal component analysis with varimax rotation was used to group 35 variables into nine factors for research questions number 5 and 7. Tabachnick and Fidell (2001) stated that, "[Principal component analysis] PCA is the solution of choice for the researcher who is primarily interested in reducing a large number of variables down to a smaller number of components" (p. 612). The regression factor scores were calculated and saved as new variables to compare means between the two groups. Independent samples T- tests were run on the factor scores, comparing factor scores for participants in the decision group (those who indicated they planned to use distance education technologies and those who did not plan to use distance education technologies) to factor scores for participants in the implementation group (participants who indicated they used distance education technologies and would continue and those who had used and would discontinue using distance education technologies). Differences between the faculty and the administrators were also explored. Groups were assigned based on

participants' answers for each type of technology, i.e. audio conferencing, digital conferencing, telecourses, videoconferencing and Internet. The alpha level of .05 was set a priori as the level of significance for research questions five and seven.

5. Principal component analysis was also used to reduce the number of variables in research questions 6 and 8. For the 22 attitude variables, an oblimin rotation was used, as the factor correlation matrix showed correlations greater than .32 (Tabachnick & Fidell, 2001). Independent T-tests were run to analyze the mean differences on the five attitude factor scores between the decision group and the implementation group as well as the faculty and the administrators for each type of distance education technology. The alpha level of .05 was set a priori as the level of significance for research questions six and eight.

Summary

Both descriptive and causal comparative research methods were utilized to answer the eight research questions in this study. The primary research objective was to determine if there were differences in the attitudes and perceived barriers of those participants who had used distance education technologies and those who were still in the decision stage. Because of how the data were collected, it was also possible to compare the faculty and administrators' attitudes and barriers and collect various demographic characteristics from the participants.

The population included all teaching faculty and all program leaders in the agricultural education teacher preparation programs across the U.S during the 1999-2000

academic year. (N = 193). Usable responses were received from 148 faculty and program leaders for an overall response rate of 76.68 %.

The survey instrument used was created specifically for this study. The instrument was first reviewed by a panel of experts and then mailed, with cover letter, to a group of former teaching faculty and program administrators to pilot test the questionnaire. Internal consistency, (reliability) was measured using Cronbach's alpha, and content validity was established upon review by the panel of experts and pilot testing group. All data related to this study was analyzed using SPSS 11.0. Univariate statistics (frequencies and t tests) were used as well as the principal component analysis.

Chapter 4

Data Analysis and Results

Descriptions of this study's purpose, design, population, data collection, and statistical methodologies were provided in chapter 3. Chapter 4 focuses on statistical implementation, reasoning and results.

The purpose of this exploratory quantitative study was to determine if differences existed in perceptions of barriers and attitudes between groups of respondents at two different stages of distance education technology adoption. Respondents for this study were faculty and administrators in agricultural education teacher preparation programs across the United States during the 1999-2000 academic year. The following questions guided the study:

1. What are the demographics and characteristics for the respondents, the teacher education programs and the universities for the population?
2. What are the current practices and processes of distance education in agricultural education teacher preparation programs across the United States during the academic year of 1999-2000?
3. What do faculty and program leaders of agricultural education teacher preparation programs perceive as the major barriers inhibiting the start and/or expansion of distance education?
4. What are the attitudes of faculty and program leaders in agricultural education teacher preparation programs toward distance education?
5. Is there a difference in how participants responded to barrier factors for distance education when grouped by stage of adoption?

a. *Ho*: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on perceived barrier factor scores for distance education.

6. Is there a difference in how participants responded to attitude factors for distance education when grouped by stage of adoption?

   a. *Ho*: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on attitude factor scores for distance education.

7. Is there a difference in the perceived barrier factors for distance education between faculty and administrators?

   a. *Ho*: There is no significant difference between the faculty and administrators based on perceived barrier factor scores for distance education.

8. Is there a difference in the perceived attitude factors for distance education between faculty and administrators?

   a. *Ho*: There is no significant difference between the faculty and administrators based on perceived attitude factor scores for distance education.

Response Rate

The total population for the study consisted of program leaders and faculty teaching pedagogy classes in agricultural education teacher preparation programs, N=193 (79 program leaders and 114 faculty). Questionnaires were mailed out to all program leaders and faculty teaching pedagogy classes in agricultural education teacher

preparation programs. Returned questionnaires yielded a total response rate of 78% from all participants, with a useable response rate of 76.68%. These percentages are broken down into the frequencies and percentages of program leaders and teaching faculty who received the questionnaire and those who returned the questionnaire (Table 1). Three questionnaires had one or more incomplete sections and were omitted. The statistical analysis of this study was based on data obtained from 148 usable questionnaires.

Table 1

Number of Questionnaires Mailed and Return Rates for the Study

Questionnaires	Program Leaders	Percentage of Total	Teaching Faculty	Percentage of Total	Total
Questionnaires mailed	79	41.0	114	59.0	193
Questionnaires returned	66	43.7	85	56.3	151
Usable returns	65	43.9	83	56.1	148

The first mailing resulted in 105 returned questionnaires. The 2-week follow up mailing to nonrespondents yielded an additional 36 completed questionnaires. The third and final reminder added 10 more useable questionnaires. The follow-up procedures were the first step in controlling for nonresponse error, attempting to get back as many responses as possible (Dillman, 1978; & Miller & Smith, 1983). To provide further evidence that results from this study can be applied to the 1999-2000 population of teaching faculty and program leaders in agricultural education teacher preparation programs, the early respondents were compared to the late respondents. Miller & Smith

(1983) stated that, "late respondents are statistically compared to early respondents using the evaluation data to justify generalizing from the respondents to the sample" (p. 48). Early and late respondents were compared using the regression factor scores for barriers and the regression factor scores for attitudes. The independent sample *t* test indicated no significant differences between early and late responders at the .05 alpha level on a 2-tailed *t* test.

Demographic Information

The first research question was designed to identify the characteristics of the population. Questions included in the demographic section of the questionnaire (Section 10) focused on the respondent characteristics of: gender, age, years as an administrator, years in higher education, years in secondary education, academic rank, tenure, and number of courses taught at a distance. Demographic questions related to the agricultural education teacher education program included: the year distance education technologies were first incorporated into the program, full time equivalent (FTE) allocation percentages for the departments between colleges of agriculture and colleges of education, existence of a departmental distance education specialist, ability for students to complete the teacher education program via distance education, number of faculty in the agricultural education teacher education program, and number of students in the agricultural education teacher education program. Respondents were also asked to estimate their university's total student enrollment.

The first demographic question asked the participant's gender. Respondents indicated that 88.5% were male and 10.8 % were female. One individual decided not to

answer the gender question. Figure 1 represents the percentages of male and female respondents in the study.

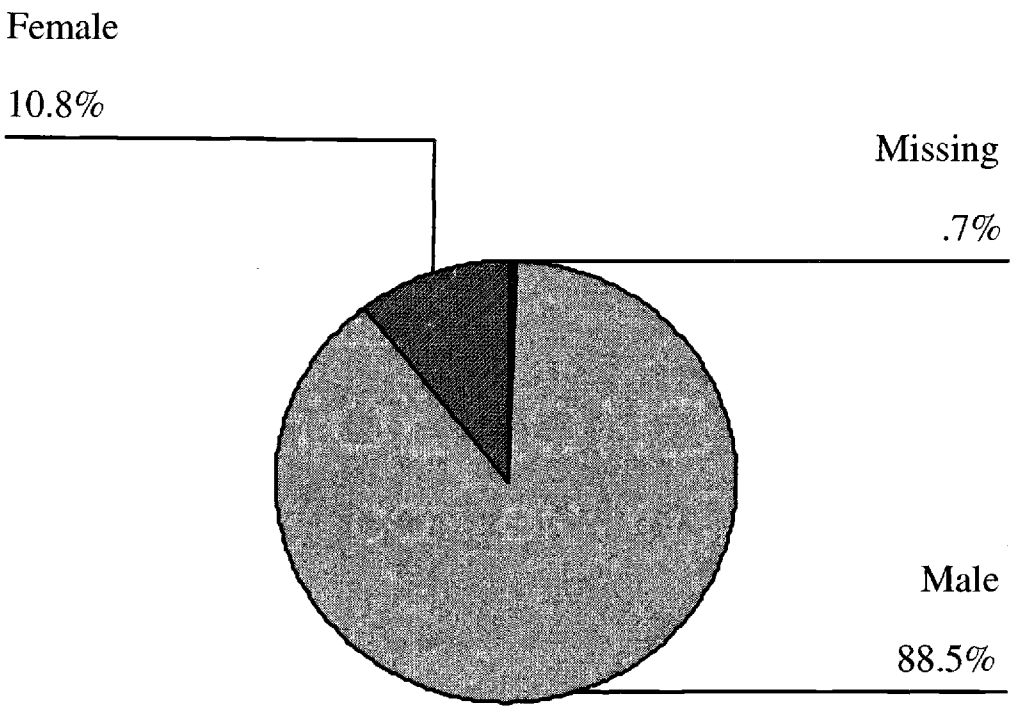

Figure 1. Gender of Agricultural Education Teacher Preparation Program Respondents (N = 148).

Participant ages ranged from 29 to 69 years old. These ages were grouped into 10-year intervals for ease of reporting. Table 2 identifies the breakdown of participants into the age groups. The mean age was 47.99 with a standard deviation of 8.96.

Table 2

Distribution of Ages for Respondents in Agricultural Education Teacher Preparation Programs ($N = 148$)

Age	Frequency	Percentage
29 - 39	32	21.1
40 - 49	47	31.7
50 - 59	54	36.5
60 - 69	15	10.1
Missing	1	.60
Total	148	100.0

Question number three of the demographic section asked if the individual had been in an administrative position and if so, how long. The analysis revealed that 31.8% of the sample had never been in an administrative position. For the 55.4% (12.8% of respondents left the question blank) who indicated they had served in an administrative position, the number of years in administration ranged from 0 (n= 66) to 37 years (n=1). The mean for this question was 5.05 years with a standard deviation of 7.43 due to the relatively high number of individuals with 0 years in administration and large spread (0 to 37 years) for number of years that participants had held administrative positions. The data were grouped in five-year increments for ease of reporting. Table 3 indicates number of years respondents had been in administrative positions.

Table 3

Number of Years in an Administrative Position for Respondents in Agricultural Education Teacher Preparation Programs (N = 148)

Years in administration	Frequency	Percentage
0	47	31.8
1 - 5	41	27.7
6 - 10	18	12.2
11 – 15	6	4.1
16 – 20	10	6.7
21 - 37	7	4.7
Unanswered	19	12.8
Total	148	100.0

The number of years respondents were in higher education ranged from 1 year (n=4) to 35 years (n=2). The mean for the number of years in higher education was 15.97 years with a standard deviation of 9.48. The number of years participants were involved in higher education were grouped into five-year intervals for ease of reporting. Table 4 summarized the data for the number of years respondents taught in higher education.

Table 4

Number of Years in Higher Education for Respondents in Agricultural Education Teacher Preparation Programs (N = 148)

Years in higher education	Frequency	Percentage
1 - 5	28	18.9
6 - 10	21	14.2
11 - 15	26	17.6
16 - 20	25	16.9
21- 25	18	12.1
26 - 30	20	13.5
31 - 35	10	06.8
Total	148	100.0

The number of years teaching at the secondary education level was the fifth question in the demographics section. The statistics indicated that 10% of the population had never taught at the secondary level, while the greatest number of years served was 29 (n=1) years as a high school teacher. The average number of years teaching high school was 5.47 years with the standard deviation of 4.03. Table 5 reveals the breakdown of years the respondents taught at the secondary level. The number of years in secondary education was grouped into 3-year intervals for reporting purposes.

Table 5

Number of Years in Secondary Education for Respondents in Agricultural Education Teacher Preparation Programs (N = 148)

Years in secondary education	Frequency	Percentage
0	15	10.3
1 - 3	34	23.0
4 - 6	51	34.4
7 - 9	24	16.2
10 - 29	22	14.7
Unanswered	2	01.4
Total	148	100.0

Figure 2 depicts the percentages of professors, associate professors, assistant professors, and those respondents categorized as "other". The majority of the participants were professors (n=66). Those respondents who marked the "other" option (n=16) and filled in the blank with their current title (n=14) held the positions of director (n=2), graduate instructor (n=1), instructor (n=8), lecturer (n=1), supervisor of teacher education (n=1), and senior extension associate (n=1).

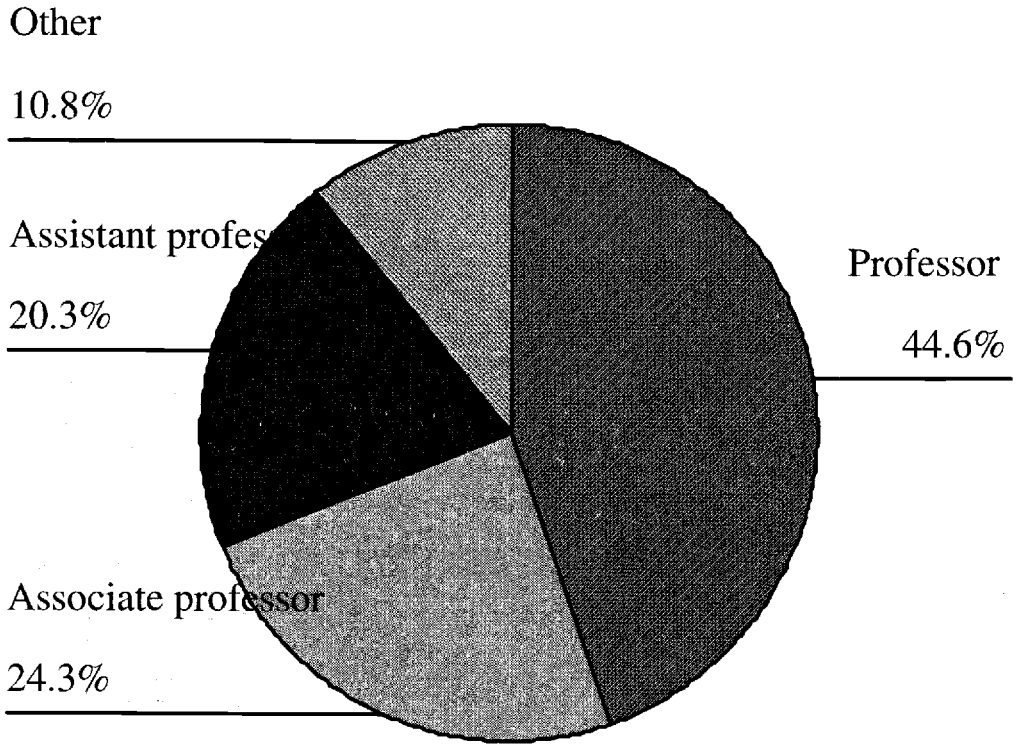

Figure 2. Percentage by Academic Rank of Respondents in Agricultural Education Teacher Preparation Programs (N = 148).

Question number seven in the demographic section asked respondents whether or not they had tenure. The respondents indicated that 68.9% did have tenure (n=102) while the remaining 31.1% did not (n=46). Figure 3 depicts the graph for the percentages of respondents involved in agricultural education teacher preparation programs with tenure and those without.

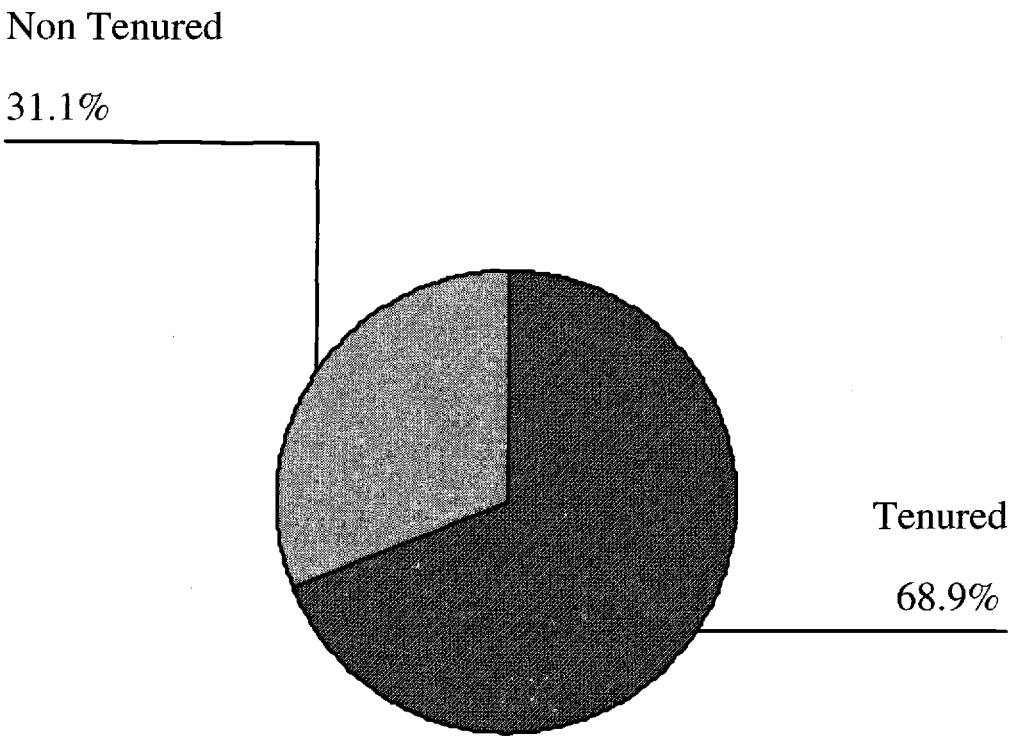

Figure 3. Percentage of Respondents in Agricultural Education Teacher Preparation Programs That are Tenured and Non Tenured (N = 148).

The final question relating directly to individual demographics asked how many distance education courses the respondents taught. The data revealed that 41.9% indicated they had never taught a course using distance education technologies (n=62), while 15.5% of the respondents indicated they had taught 5 or more distance courses (n=23). The mean number of courses taught by the respondents was 2.41 courses with a standard deviation of 1.49. Table 6 shows the number of distance courses taught by frequency and percentages for individuals involved in agricultural education teacher preparation programs.

Table 6

Number of Distance Education Courses Taught by Respondents in Agricultural Education Teacher Preparation Programs (N = 148)

Number of courses taught using DE	Frequency	Percentage
0	62	41.9
1	23	15.5
2	25	16.9
3	14	9.5
5 or more	23	15.5
Missing	1	0.7
Total	148	100.0

The first question addressing the demographics of the department asked which year did each department first incorporate distance education technologies into their program. Only the data from each program leader or one faculty member (if the program leader did not respond) from each university were analyzed to report departmental and university statistics (n=77). Table 7 shows the year of incorporation grouped into two-year intervals along with the frequencies and percentages of departments who incorporated distance education into their teacher education programs during that time period. Fifteen percent of the departments had not incorporated distance technology.

Table 7

First Year of Incorporating Distance Education Technologies for Each Department Involved with Agricultural Education Teacher Preparation Programs (n = 77)

Year of DE Incorporation	Frequency	Percentage
Never incorporated	51	15.4
1994 and prior	27	15.4
1995 -1996	24	16.6
1997 -1998	32	19.3
1999 -2000	14	10.2
Unanswered	18	23.1
Total	148	100.0

Question number 10 in the demographics section asked what percentage of the agricultural education teacher preparation programs 's full time equivalency (FTE) allocation was in their college of agriculture and what percentage was in their college of education at their respective universities. Sixty-four percent (n=49) of agricultural education teacher preparation programs have 100% of their FTE allocated in the college of agricultural sciences while 13% (n=10) have 100% of their FTE allocated in the college of education. Table 8 represents the frequencies and percentages of agricultural education teacher preparation programs by percentage of FTE college allocation for the college of agriculture and the college of education.

Table 8

Percentage FTE Allocation to College of Agriculture and College of Education for Agricultural Education Teacher Preparation Programs (n = 77)

Percentage FTE Allocation			
Agriculture	Education	Frequency	Percentage
100	0	49	64
90	10	1	1.3
90	0	1	1.3
75	25	1	1.3
50	50	7	9.1
30	70	1	1.3
20	80	1	1.3
2	0	1	1.3
0	100	10	13
0	0	3	3.9
missing	missing	2	2.5
Total		77	100.0

Figure 4 depicts the percentage of respondents that indicated their departments had a distance education specialist and the percentage of respondents that indicated their departments did not have a distance education specialist. The data revealed that 71.4% of respondents said their department did not have a DE specialist.

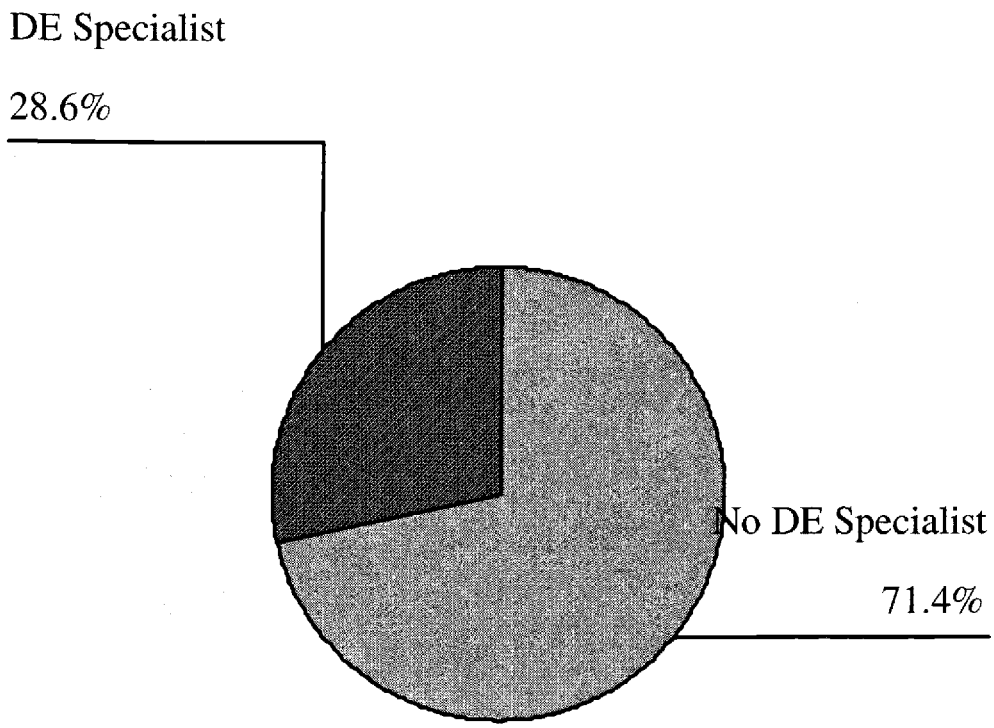

Figure 4. Percentage of Agricultural Education Teacher Preparation Programs That Had and Did Not Have a Distance Education Specialist (n = 77).

Only one program indicated that students at their university could complete their agricultural education teacher preparation program by exclusively taking distance education courses. The remaining respondents (n=75) indicated that students could not obtain agricultural education certification entirely at a distance. One participant did not answer this question. Figure 5 shows a graphical presentation of the percentage of agricultural education teacher preparation programs that could be completed exclusively through distance education.

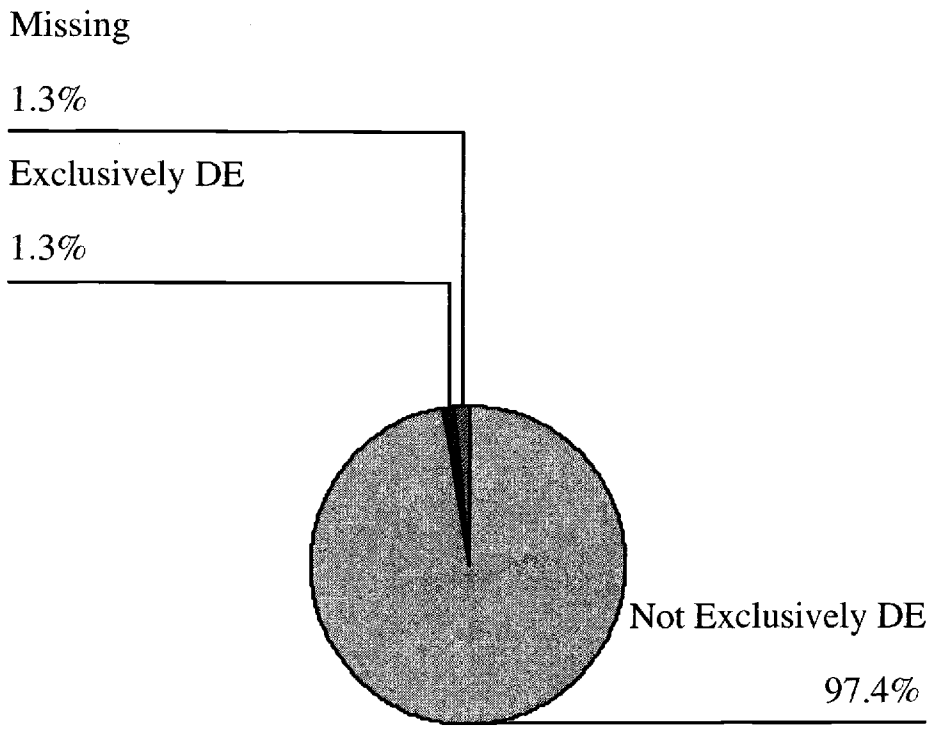

Figure 5. Percentage of Respondents Indicating Agriculture Teacher Certification Could be Completed Entirely Through Distance Education (n = 77).

Question number 13 asked how many faculty were in each agricultural teacher preparation program. The average number of faculty in each agricultural education teacher education program was 2.28 faculty members with a standard deviation of 1.91 (Table 9).

Table 9

Number of Faculty in Agricultural Education Teacher Preparation Programs ($N = 77$)

Number of faculty by FTE	Frequency	Percentage
.50	2	2.6
1	25	32.5
2	22	28.6
3	12	15.6
4	7	9.0
5	4	5.2
6	3	3.9
7	1	1.3
13	1	1.3
Total	148	100.0

Question number 14 asked for the total student enrollment at each university. The totals provided by the participants are summarized in Table 10 by groups of 10,000. The mean enrollment was 18,906 students with a standard deviation of 14,422 due to wide range of enrollment (less than 10,000 to 81,000 students).

Table 10

University Enrollment as Reported by Respondents in Teacher Education Programs in Agricultural Education (N = 148)

Number of students	Frequency	Percentage
Less Than 10,000	20	26.0
10,000 – 19,999	20	26.0
20,000 – 29,999	14	18.3
30,000 – 39,999	7	9.1
40,000 – 49,999	3	3.9
50,000 or Greater	3	6.5
Missing	10	13.1
Total	77	100.0

The final demographic question asked for the average number of student teachers in each agricultural education teacher preparation program. The number and percentages of student teachers for teacher education programs are grouped into intervals of 10 student teachers and summarized in Table 11. The mean number of student teachers was 14.26 with a standard deviation of 12.98. The rage for the number of student teachers was two students (n=2) to 85 students (n=1).

Table 11

Average Number of Student Teachers as Reported in Agricultural Education Teacher Preparation Programs (n = 77)

Number of student teachers	Frequency	Percentage
1 - 10	38	49.4
11 - 20	25	32.5
21 - 30	8	10.4
31 or Greater	6	7.7
Total	148	100.0

Analysis of Instrument Reliability

The instrument created for this study consisted of ten sections. Each section attempted to measure different constructs and was first tested for reliability, or internal consistency, independent of the remaining sections. Then reliability was examined on all scaled items as a measure of the instrument's overall reliability. Reliability was ensured using Cronbach's alpha. In an examination of the theory and application for coefficient alpha, Cortina (1993) states the following:

> "The estimate of reliability that one uses must depend on the sources of variance that one considers relevant. If error factors associated with the use of different items are of interest, then internal consistency estimates, such as coefficient alpha (which takes into account variance attributable to subjects and variance attributable to the interaction between subjects and items), or single administrations of parallel tests may be used" (p. 98).

Table 12 reports the number of items, types of options available for response and coefficient alpha for each section of the questionnaire. When analyzing all scaled items for the instrument, the overall alpha score was .80.

Table 12

Coefficient Alpha for Each Questionnaire Section

Section number	Number of items	Title	Response option	Coefficient alpha
I a	8	Goals of DE	Not Important, Somewhat, Very	.75
I b	8	Extent Goal Met	Not at all, Minor Extent, Moderate, Major	.90
II	5	Awareness of Tech Types	Very Aware, Somewhat, Not	.83
III	5	Ability to Use Tech.	Very Capable, Somewhat, Not	.84
IV	5	Level of Tech. Adoption	Use and Continue, Use and Discontinue, Plan to Use, No Plan to Use	.71
V	4	Faculty Training	Available, Not Available	.77
VI	6	Extent Dept. is Providing Faculty Support	Not at All, Minor Extent, Moderate , Major	.74
VII	16	Future Goals	Not Available, Available for Some Courses Available for All, Don't Know	.87
VIII	35	Barriers	Not at All, Minor Factor, Moderate, Major	.91
IX	22	Attitudes Toward DE	Strongly Disagree, Agree, Undecided Disagree, Strongly Disagree	.93

Screening of Data

Before any data analysis was performed, all data was carefully screened for accuracy, missing values, outliers, normal distributions, linearity and homoscedasticity, using SPSS for Windows version 11. Accuracy was checked by looking at the minimum

and maximum values as well as frequencies, stem plots and histograms. Missing value analysis showed that no more than 5% of any one variable was missing, but because of the large number of variables (129), many cases had one missing value. These missing values appeared to be randomly distributed. Univariate outliers were checked by observation of means, minimum and maximum values and histograms. Mahalanobis distance at $p < .001$ was used to test for multivariate outliers. This test measures how much a case differs from the average of all other cases when considering the independent variables (Tabachnick & Fidell, 2001). No outliers were detected at the given level. The distributions of data were analyzed with histograms and descriptive statistics, and all variables were adequately distributed. Normality was assessed visually using histograms with normal curves for data, and the data fell within the normal range.

Practices and Processes of Distance Education in Agricultural Education Teacher Preparation Programs Across the U.S. During the Academic Year of 1999-2000

Research question number two was designed to describe and summarize how distance education technologies were incorporated into agricultural education teacher preparation programs during the 1999-2000 academic year. In Section 1, part A of the questionnaire, the respondents were first asked to rate how important the eight goal statements were toward their agriculture teacher education programs. The participants provided their answers on an importance scale consisting of three choices: not important, somewhat important and very important. The opportunity for participants to write in additional comments was also provided in this section of the questionnaire.

Three participants wrote in and ranked the following additional goals for this section: reduce road time for faculty was considered very important (n=1); meeting adult

learner's needs was considered very important (n=1), and uniform programs between two campuses of the university was considered very important (n=1).

Part B in Section 1 asked participants to rate the extent that distance education technologies were meeting each goal statement they indicated was either important or very important to their agricultural education teacher preparation program. The participants who wrote in the new goal statements indicated that distance education was a major extent in meeting those three goals (reduce road time for faculty, meeting adult learner's needs, and uniform programs between two campuses of the university).

Data from part A and part B in Section 1 of the questionnaire were summarized on Table 13. Ninety-nine percent of the participants indicated that increasing student access by making courses available at convenient locations was either somewhat important or very important, and 86% of those participants indicated this goal was being met at either a minor, moderate or major extent though distance education technologies. Twenty-three percent of respondents indicated that reducing their institution's per-student cost was very important to their program, while 54% rated increasing their institution's enrollment as very important. Table 13 shows each goal statement, the number of participants responding to the statement, the total percentage of participants that rated the goal as either somewhat or very important, and the extent distance education technologies were meeting the goal by those participants who rated the goal as important.

Table 13

Percentage of Respondents Indicating the Extent DE Technologies Have Met Various Goals by Importance of Goal to Agricultural Education Teacher Preparation Programs

	Extent goal is met via DE				
Importance of goal	Not met	Minor	Moderate	Major	*%N*
Reducing your institution's per-student cost (*n*=85)					
Somewhat important	14.1	30.6	9.4	0.0	54.1
Very Important	4.7	12.9	4.7	1.2	23.5
Making educational opportunities more affordable for students (*n*=96)					
Somewhat important	8.3	33.3	11.5	0.0	53.1
Very important	7.3	9.4	17.7	3.1	37.5
Increasing institution's enrollments (*n*=96)					
Somewhat important	6.3	13.5	13.5	1.0	34.4
Very important	3.1	22.9	20.8	7.3	54.1
Increasing student access to courses by reducing course time constraints (*n*=99)					
Somewhat important	5.1	29.3	10.0	0.0	44.4
Very important	4.0	17.1	21.1	9.0	51.2
Increasing student access by making courses more available at convenient locations (*n*=100)					
Somewhat important	8.0	20.0	13.0	2.0	43.0
Very important	5.0	15.0	22.0	14.0	56.0
Increasing institution's access to new audiences (*n*=100)					
Somewhat important	8.0	29.0	10.0	0.0	47.0
Very important	6.0	19.0	19.0	4.0	48.0
Improving the quality of course offerings (*n*= 92)					
Somewhat important	8.7	30.4	2.2	0.0	41.3
Very important	7.6	22.8	20.7	2.2	53.3
Meeting the needs of local employers (*n*=81)					
Somewhat important	12.3	23.5	6.2	1.2	43.2
Very important	4.9	12.3	9.9	1.2	28.3

Section 2 asked the participants how aware they were of the following types of technology for distance delivery of courses: audio conferencing, digital conferencing, telecourses, videoconferencing, and on-line courses. The options were written as 1 = *Very aware*, 2 = *Somewhat aware*, and 3 = *Not aware*. These options were recoded to indicated 1 = *Not aware*, 2 = *Somewhat aware*, and 3 = *Very aware*.

The option to write in additional types of distance education technology was also provided in this section of the questionnaire. Six participants indicated they were aware of five additional technology types. These technologies were interactive television (n=2), compact disc (CD)/ multimedia (n=1), fiber optics (video and audio; n=1), radio delivered courses (n=1) and ICN (which was not defined by the participant; n=1).

Table 14 summarizes the data and shows that 66.2% of the participants indicated they were very aware of videoconferencing while 37.8% were very aware of digital conferencing.

Table 14

Awareness of DE Technology by Respondents in Agricultural Education Teacher Preparation Programs (N = 148)

Distance education technology	Not aware		Somewhat aware		Very aware	
	f	%	*f*	%	*f*	%
Audio Conferencing	5	3.4	53	35.8	90	60.8
Digital Conferencing	10	6.8	82	55.4	56	37.8
Telecourses	6	4.1	51	34.5	91	61.5
Videoconferencing	4	2.7	46	34.1	98	66.0
Internet	4	2.7	48	32.4	96	64.0

After participants had indicated their awareness level of different technology types, they were asked to indicate how capable they were at using these same technologies. The answer choices for this section, Section 3, were written as 1 = *Very capable*, 2 = *Somewhat capable*, and 3 = *Not capable*. Again, the data were recoded as 1 = *Not capable*, 2 = *Somewhat capable*, and 3 = *Very capable*.

Participants who included the technologies of interactive television, CD/multimedia and ICN indicated they were very capable of using these technologies. Participants who included radio and fiber optics did not indicate their ability to use these technologies.

Table 15 describes how capable the agricultural education teacher preparation program respondents were of using the various technology types. The percentage of respondents that indicated their capability ranked in the very capable column ranged from 47.3% for audio conferencing to 24.3% for digital conferencing.

Table 15

Ability to Use DE Technology by Respondents in Agricultural Education Teacher Preparation Programs ($N = 148$)

Distance Education Technology	Not Capable		Somewhat Capable		Very Capable	
	f	%	*f*	%	*f*	%
Audio Conferencing	27	18.2	50	33.8	70	47.3
Digital Conferencing	39	26.4	73	49.3	36	24.3
Telecourses	23	15.5	58	39.2	66	44.6
Videoconferencing	23	15.5	59	39.9	65	43.0
Internet	28	18.9	62	41.9	55	37.0

Section 4's purpose was to group those participants who were in the decision stage of the innovation-decision process and those who were in the implementation stage. For each technology type, the respondents were asked to indicate one of the following: 1 = *Use continue*, 2 = *Use and discontinue*, 3 = *Plan to use*, and 4 = *No plan to use*. The participant groupings were used to answer research questions five and six later in this chapter. The three respondents who wrote in the additional technology types (interactive television, CD-multimedia and ICN) marked them as use and would continue to use.

Forty-seven percent of the participants planned to use the Internet for course delivery and another 33.1% already used the Internet and planned to continue. Forty-six percent of respondents had no plans to use the audio conferencing technology and 33.1% already used and planned to continue to use audio conferencing technology. The

percentages for how respondents used and planned to use each distance education technology type are outlined in Table 16.

Table 16

Percentage of Agricultural Education Teacher Education Program Respondent's Use or Plan for DE Technologies ($N = 148$)

Distance Education Technology	Use and Continue	Use and Discontinue	Plan To Use	No Plan To Use
Audio Conferencing	33.1	6.8	12.8	46.6
Digital Conferencing	21.6	2.7	46.6	29.1
Telecourses	33.8	9.5	32.4	24.3
Videoconferencing	40.5	3.4	33.1	23.0
Internet	33.1	0.7	47.3	18.9

Faculty training was the basis for section five of the questionnaire. This section focused on the training opportunities that were available to faculty who teach using distance education technologies. Respondents were asked to indicate if various types of training were either available or not available. Table 17 shows the results of which resources were available by frequency and percentage for respondents from agricultural education teacher preparation programs. At least 70% of participants had all four training opportunities available for them to use. One participant also wrote in that videoconference equipment training was available.

Table 17

Availability of Faculty Training by Agricultural Education Teacher Preparation Program Respondents ($N = 148$)

Training Opportunity	*f* Available	% Available
Training in the use and application of distance education technologies.	130	87.8
Training in the development of curricula for distance education courses.	112	75.7
Training in teaching methods for distance education courses.	105	70.9
Consultation with support center staff.	137	92.6
Total	148	100.0

Section 6 asked participants to identify the level of support and types of incentives for faculty who teach using distance education technologies. Respondents were asked to choose one of the four choices to rate the extent the department is providing support: 1 = *Not at all*, 2 = *Minor extent*, 3 = *Moderate extent*, and 4 = *Major extent*. In addition to the previously mentioned four choices, respondents were able to provide additional comments. One respondent wrote in that the incentive of hiring additional faculty was moderately supported, while two others included training workshops and financial incentives offered by the continuing education department for the development of web-based courses were major types of support. The last written comment indicated that paid training time beyond contract obligations was not supported at all.

Sixty-four percent of the respondents reported that reducing regular teaching load to allow more time for development and teaching using distance technologies was not

supported by their department. Sixty -four percent of the participants also said that providing extra monetary incentives for development and/or delivery of distance courses was not supported, and 56% indicated that considering distance courses extra or overload was not supported by their departments. Table 18 reports the data.

Table 18

Extent Department is Providing Support for Incentives by Agricultural Education Teacher Preparation Program Respondents (N = 148)

Incentive	None		Minor		Moderate		Major	
	f	%	*f*	%	*f*	%	*f*	%
Reduce regular teaching load to allow more time for development and teaching using distance technologies.	95	64.2	31	20.9	17	11.5	5	3.4
Consider distance courses extra or over load.	84	56.8	33	22.3	18	12.2	11	7.4
Provide extra monetary incentives for development and/or delivery of distance courses.	95	64.2	28	18.9	15	10.1	10	6.8
Consider course development and teaching as credit toward promotion and tenure.	39	26.4	43	29.1	50	33.8	16	10.8
Provide more flexibility in work schedules.	59	39.9	47	31.8	28	18.9	11	7.4
Bring courses taught using distance technologies into regular teaching load.	33	22.3	30	20.3	47	31.8	35	23.6

The purpose of seventh section of the questionnaire was to elicit the future goals of agricultural education teacher education programs for making resources available to students taking courses via distance education technologies. Respondents indicated which resources they planned to have available for distance education students over the next three years. Respondents were given the choices of: *Not available*, *Available for*

some course, *Available for all courses*, and *Don't know* for a list of resources that could be made available to DE students.

Online access to wide area networks was the resource that 85.1% of respondents indicated would be available for either some or all courses. Eighty-three percent of participants also indicated that toll-free telephone, e-mail, or other online access to the instructor would be available for either some or all courses.

The percentage of respondents indicating that resources would not be available to distance education students included: teaching assistant, tutor, or facilitator regularly available at remote sites (32.4%), delivery of courses using audio conferencing (27.0%), and ability to deposit collections at remote sites (24.3%). The data are summed in Table 19.

Table 19

Availability of DE Resources for Students in Agricultural Education Teacher Preparation Programs ($N = 148$)

	Not Available		Available for Some Courses		Available for All Courses		Don't Know	
Resource	*f*	%	*f*	%	*f*	%	*f*	%
Instructor visits remote site(s) on occasion	17	11.5	82	55.4	24	16.2	24	16.2
Toll-free telephone, E-mail, or other online access to instructor.	9	6.1	33	22.3	91	61.5	14	9.5
Teaching assistant, tutor, or facilitator regularly available at remote site(s).	48	32.4	50	33.8	18	12.2	31	20.9
Toll-free telephone, e-mail or other online access to teaching assistant, tutor or facilitator.	29	19.6	44	29.7	48	32.4	26	17.6
Access to an electronic link with institute's library.	24	16.2	50	33.8	47	31.8	23	15.5
Institution library staff assigned to assist distance education students.	33	22.3	30	20.3	31	20.9	52	35.1
Cooperative agreements for students to use other libraries.	20	13.5	36	24.3	43	29.1	47	31.8
Deposit collections at remote sites.	36	24.3	29	19.6	12	8.1	68	45.9
Online access to wide area networks (e.g. Internet)	8	5.4	44	29.7	82	55.4	11	7.4
Courses delivered using audio conferencing.	40	27.0	61	41.2	15	10.1	28	18.9
Courses delivered via digital conferencing.	23	15.5	81	54.7	17	11.5	26	17.6
Courses delivered via videoconferencing.	18	12.2	89	60.1	26	17.6	14	9.5
Courses delivered via telecourses.	27	18.2	84	56.8	15	10.1	20	13.5
Courses delivered via Internet or online.	11	7.4	94	63.5	28	18.9	14	9.5
Online (automated) help system.	25	16.9	56	37.8	20	13.5	46	31.1

The section with the greatest number of variables was Section 8. This section was a list of 35 barriers and asked participants to indicate the extent that the statement or barrier listed was keeping their department from starting or expanding distance education offerings. Respondents chose from the following responses to each barrier statement: 1 = *Not at all*, 2 = *Minor factor*, 3 = *Moderate factor*, and 4 = *Major factor*.

Three barrier statements were written in by participants and included the following: difficulty in teaching on-campus section of off-campus course simultaneously was a moderate factor inhibiting the department; proximity of other universities offering same courses was a moderate barrier factor, and philosophically opposed to the use of distance education to develop new teachers was a major factor prohibiting the department from starting or expanding distance education offerings.

Table 20 summarizes the frequency and percentage that participants rated their perceptions of inhibitive barriers. The barriers that the largest percentage of respondents indicated were either a moderate or major factor keeping their department from starting or expanding distance education offerings included the following: lack of adequate compensation for faculty's time, efforts, etc. (75.7%); lack of faculty rewards or incentives (70.3%); program development costs (68.3%); lack of ability to teach skills requiring "hands on" instruction (66.2%); concerns about faculty workload (64.9%); lack of administratively provided time/support to develop course and materials (64.2%); lack of personal contact (one on one) between instructor and student (59.4%); lack of face-to-face contact (58.1%), and concerns about course quality (58.1%).

Two barriers were rated as not being a barrier factor that prohibits starting or expanding distance education offerings by over 60% of respondents. These included lack

of fit with the institution mission (69.6%) and concern for faculty leaving due to increased use of technology (61.5%).

Table 20

Barriers Keeping Departments from Starting or Expanding DE Offerings in Agricultural Education Teacher Preparation Programs (N = 148)

	Not At All		Minor Factor		Moderate Factor		Major Factor	
Barrier	*f*	%	*f*	%	*f*	%	*f.*	%
Lack of adequate compensation for faculty's time, efforts, etc.	12	8.1	24	16.2	54	36.5	58	39.2
Lack of faculty rewards or incentives.	14	9.5	30	20.3	50	33.8	54	36.5
Program development costs.	10	6.8	37	25.0	51	34.5	50	33.8
Concerns about faculty workload.	15	10.1	35	23.6	49	33.1	47	31.8
Lack of administratively provided time/ support to develop course and materials.	14	9.5	39	46.4	49	33.1	46	31.1
Lack of ability to teach skills requiring "hands on" instruction.	13	8.8	37	25.0	56	37.8	42	28.4
Lack of face-to-face contact.	12	8.1	49	33.1	46	31.1	40	27.0
Lack of personal contact (one on one) between instructor and student.	15	10.1	43	29.1	48	32.4	40	27.0
Lack of administratively provided time/ support to learn technologies.	21	14.2	36	24.3	52	35.1	39	26.4
Equipment failures/costs of maintaining equipment.	22	14.9	45	30.4	46	31.1	34	23.0
Lack of nonverbal communication between instructor and student.	15	10.1	54	36.5	47	31.8	31	20.9
Lack of faculty commitment to spend the time to master the use of technologies.	2	14.9	45	30.4	53	35.8	28	18.9

Table 20

Barriers Keeping Departments from Starting or Expanding DE Offerings in Agricultural Education Teacher Preparation Programs (N = 148; continued)

	Not At All		Minor Factor		Moderate Factor		Major Factor	
Barrier	*f*	%	*f*	%	*f*	%	*f*	%
Concerns about course quality.	10	6.8	52	35.1	59	39.9	27	18.2
Lack of infrastructure to support use of technology in DE (tech. experts, system admin.).	37	25.0	50	33.8	37	25.0	24	16.2
Faculty comfort/discomfort level with the technology.	18	12.2	57	38.5	49	33.1	24	16.2
Lack of faculty interest.	25	16.9	56	37.8	44	29.7	23	15.5
Lack of training to use technology in teaching.	25	16.9	57	38.5	43	29.1	23	15.5
Lack of access to state-of-art hardware.	40	27.0	54	36.5	34	23.0	20	13.5
Lack of faculty competence developing instructional materials for distance teaching.	23	15.5	58	39.2	47	31.8	19	12.8
Lack of students' ability to receive a quality educational experience.	28	18.9	49	33.1	51	34.5	19	12.8
Faculty resistance to distance learning.	35	23.6	57	38.5	39	26.4	17	11.5
Lack of support from institution administrators.	64	43.2	39	26.4	29	19.6	16	10.8
Technological failures/limitations for effective teaching.	27	18.2	56	37.8	48	32.4	16	10.8
Students' ability to cooperatively form groups and problem solve.	27	18.2	70	47.3	34	23.0	15	10.1

Table 20

Barriers Keeping Departments from Starting or Expanding DE Offerings in Agricultural Education Teacher Preparation Programs (N = 148; continued)

	Not At All		Minor Factor		Moderate Factor		Major Factor	
Barrier	*f*	%	*f*	%	*f*	%	*f*	%
Lack of perceived need (e.g. limited student market).	65	43.9	38	25.7	32	21.6	13	8.8
Negative faculty attitudes/unwillingness to accept new technologies.	47	31.8	64	43.2	25	16.9	12	8.1
Lack of fit with institutions missions.	103	69.6	31	20.9	6	4.1	8	5
Loss if intellectual property.	53	35.8	56	37.8	31	20.9	8	5.4
Lack of student services (registration, financial aid, etc.)	50	33.8	62	41.9	27	18.2	8	5.4
Restrictive federal, state, or local policies (e.g. limitations on the number of distance education credits students may earn, student ineligibility for financial aid, residency requirements)	70	47.3	57	38.5	15	10.1	6	4.1
Lack of access to library or other resources For instructional support.	53	35.8	57	38.5	33	22.3	5	3.4
Legal concerns (e.g. intellectual property rights, copyright laws).	61	41.2	60	40.5	20	13.5	4	2.7
Lack of student services.	55	37.2	60	40.5	26	17.6	4	2.7
Concern for faculty leaving do to increased use of technology.	91	61.5	41	27.7	11	07.4	3	2.0
Lack of accreditation for distance courses.	71	48.0	57	38.5	16	10.8	2	1.4

The purpose was of the next section in the questionnaire was to identify the participants' personal attitudes toward distance education. A Likert type scale was the procedure used to measure attitudes (Gall, Borg & Gall, 1996). The original questionnaire used a five-point scale ranging from 1 = *Strongly agree*, 2 = *Agree*, 3 = *Undecided*, 4 = *Disagree*, and 5 = *Strongly disagree*. The data were recoded to reflect an increasing positive scale from 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Undecided*, 4 = *Agree*, and 5 = *Strongly agree*.

The attitude statements that received at least 80% of participants indicating either agreement or strong agreement included the following: distance education courses should be offered for college credit (95.9%); spending ample time developing DE courses is crucial to the success of the course (95.9%); DE courses can be an effective educational method at the graduate level (89.2%); teaching a distance class is a valuable educational contribution and should be considered during promotion, tenure and salary increases (87.1%); DE courses can be as academically rigorous as on-campus courses (83.7%); I would be willing to teach a course using distance education technologies (82.4%); distance education courses are appropriate in our academic area (82.4%); DE courses could be offered as substitutes for some on-campus courses (81.7%); distance education courses should become an integrated part of university curricula (81.1%); faculty should be encouraged to use distance learning technology for delivery of instruction (81.0%).

The statement with the highest percent of respondents indicating either disagreement or strong disagreement was, students taught using distance technology learn more or better than traditional face-to face taught students (54%). Table 21 summarizes the frequency and percentage of agreement for each attitude variable.

Table 21

Attitudes Toward Distance Education by Agricultural Education Teacher Preparation Programs (N = 148)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Spending ample time developing DE courses is crucial to the success of the course.	1	.7	1	.7	4	2.7	37	25.0	105	70.9
Distance education courses should be offered for college credit.	3	2.0	1	.7	2	1.4	69	46.6	73	49.3
I would be willing to teach a course using distance education technologies.	1	.7	8	5.4	16	10.8	49	33.1	73	49.3
DE courses can be as academically rigorous as on-campus courses.	2	1.4	14	9.5	8	5.4	56	37.8	68	45.9
Teaching a distance class is a valuable educational contribution and should be considered during promotion, tenure and salary increases.	3	2.0	6	4.1	10	6.8	64	43.2	65	43.9
DE courses can be an effective educational method at the graduate level.	4	2.7	2	1.4	10	6.8	75	50.7	57	38.5
Our department needs to develop more distance education courses.	5	3.4	12	8.1	17	11.5	64	43.2	50	33.8
Distance education courses are appropriate in our academic area.	3	2.0	10	6.8	13	8.8	72	48.6	50	33.8
I would like to use (or already use) distance education for my courses.	2	1.4	11	7.4	20	13.5	66	44.6	48	32.4
DE is **not** worth the effort because of technological difficulties.	4	2.7	7	4.7	25	16.9	66	44.6	46	31.1

Table 21

Attitudes Toward Distance Education by Agricultural Education Teacher Preparation Programs (N = 148; continued)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Distance education courses should become an integrated part of university curricula.	2	1.4	8	5.4	18	12.2	75	50.7	45	30.4
Distance education is an effective educational method.	4	2.7	6	4.1	20	13.5	72	48.6	45	30.4
DE courses could be offered as substitutes for some on-campus courses.	8	5.4	8	5.4	11	7.4	77	52.0	44	29.7
Faculty should be encouraged to use distance learning technology for delivery of instruction.	0	0.0	8	5.4	18	12.2	85	57.4	35	23.6
DE courses can be an effective educational method at the undergraduate level.	5	3.4	5	3.4	30	20.3	76	51.4	32	21.6
A course taught using distance learning technology does **not** use student's time as effectively as a traditional classroom course.	2	1.4	18	12.2	40	27.0	58	39.2	29	19.6
DE degrees should be valued as equivalent to on-campus degrees.	11	7.4	21	14.2	42	28.4	46	31.1	28	18.9
Students spend less time working on DE than on-campus courses.	5	3.4	19	12.8	52	35.1	50	33.8	21	14.2
Teaching a DE course would improve my on-campus teaching.	7	4.7	32	21.6	43	29.1	44	29.7	21	14.2
Effective student-professor interaction is possible in DE courses.	2	1.4	20	13.5	37	25.0	66	44.6	20	13.5

Table 21

Attitudes Toward Distance Education by Agricultural Education Teacher Preparation Programs (N = 148; continued)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Using distance learning technology to deliver instruction improves faculty teaching skills.	6	4.1	25	16.9	47	31.8	50	33.8	18	12.2
Students taught using distance tech. learn more or better than traditional face-to-face taught students.	27	18.2	53	35.8	59	39.9	7	4.7	2	1.4

Principal Component Analysis

Principal component analysis was conducted on the 35 barrier perception statements and the 22 attitude statements. The data were analyzed using SPSS for Windows, release 11.0. Principal components analysis was used as the extraction method and rotated using varimax rotation with Kaiser Normalization for the barrier statements, and rotated using oblimin rotation with Kaiser Normalization for the attitude statements due to correlations in the factor correlation matrix exceeding .32 (Tabachnick & Fidell, 2001).

Principal component analysis was performed twice. First by excluding cases pair wise and replacing missing values with the mean and then without replacing missing variables. In both tests the means were exactly the same. In order to get a complete set of variables for the new factor scores, missing values had to be replaced by the mean.

Stevens (1996) stated that rules indicating the appropriate sample size for component reliability vary from two subjects per variable to 20 subjects per variable. Tabachnick and Fidell (2001) indicated that four to five observations were needed for every variable. Hair, Anderson and Tatham (1987) indicated a preference for a sample size of 100 or larger. The sample size of the study was 148 with the 35 barrier variables, yielding an observation to variable ratio of 4.2:1. The value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was .812. The 22 attitude variables had an observation to variable ratio of 6.7:1 with the value of the KMO at .907. Tabachnick and Fidell (2001) claim that KMO values of .6 and above are required for good factor analysis.

Principal Components Analysis (PCA) was used as opposed to Factor Analysis (FA) as there was,

> "...no underlying theory about which variables should be associated with which factor... PCA is the solution of choice for the researcher who is primarily interested in reducing a large number of variables down to a smaller number of components" (Tabachnick and Fidell 2001, p.612).

Following variable extraction, rotation was used to improve the interpretability of both sets of variables. Both orthogonal and oblique rotations were performed.

> "Perhaps the best way to decide between orthogonal and oblique rotation is to request oblique rotation with the desired number of factors and look at the correlations among factors. Look at the factor correlation matrix for correlations around .32 and above. If correlations exceed .32, then there is 10% (or more) overlap in variance among factors, enough variance to warrant oblique rotation unless there are compelling reasons for orthogonal rotation" (Tabachnick & Fidell, 2001, p. 622).

The highest correlation in the barrier variables was .274 in the component correlation matrix, indicating no need for the oblique rotation (Appendix H). The attitude variables had three correlations over .32 (.398, .387 and .346) in the component correlation matrix, indicating a need for the oblique rotation (Appendix I). Variables loaded approximately the same on the same number of factors regardless of rotation with both data sets.

Orthogonal rotation was chosen for the barrier variables as the factors were not correlated, and orthogonal rotation offers ease of interpreting, describing and reporting results (Tabachnick & Fidell, 2001). Varimax, an orthogonal technique was chosen to maximize the variance of factor loadings. All variables loaded on one of nine factors. The factor loadings of the varimax rotation are found in Appendix H.

Oblique rotation was chosen for the attitude variables as the factors indicated greater correlations, and the procedure used within this rotation was oblimin. The pattern matrix was used to interpret the factors as this matrix shows the unique contributions of each factor and the set of variables they composed was easier to see.

Identifying the Factors for the Barrier Variables.

The four methods used to determine the number of factors to retain are as follows: (a) eigenvalues equal to or greater than one (Tabachnick & Fidell, 2001); (b) a scree plot of eigenvalues plotted against factors to visualize changes in the slope (Tabachnick & Fidell, 2001); (c) the combination of factors that accounted for at least 70% of the variance (Stevens, 1996), and (d) factor loadings greater than ± .3 (Hair, 1998).

Nine factors were extracted and named in this study: (a) Faculty Attitudes and Resistance to Distance Education, (b) Lack of Personal Contact, (c) Lack of Faculty Time/Support, (d) Technology Issues, (e) Lack of Student Services, (f) Institutional

Culture, (g) Legal Concerns, (h) Regulatory Restrictions, and (i) Expense. The eigenvalues and percentage of explained variances are summarized in Table 22.

Table 22

Statistics for Nine Extracted Barriers Factors

Factors	Eigenvalues	% of Variance	Cumulative %
Factor 1	9.07	25.92	25.92
Factor 2	3.11	8.89	34.81
Factor 3	2.91	8.31	43.12
Factor 4	2.37	6.76	49.88
Factor 5	2.06	5.90	55.78
Factor 6	1.75	4.98	60.76
Factor 7	1.31	3.75	64.51
Factor 8	1.14	3.25	67.76
Factor 9	1.04	2.96	70.72

Tabachnick & Fidell (2001) offered a rule of thumb for only interpreting variables with loadings of .32 and above. The higher the loading score, the more the variable accurately reflect the factor. They also cite Comrey and Lee (1992) who suggested that variable loadings greater than .71 are considered excellent, .63 very good, .55 good, .45 fair, and .32 poor. Stevens (1996) concluded from the 1988 Guadagnoli and Velicer study that components with at least four loadings equal to or greater than .6, or with at least three loadings equal to or greater than .8 are reliable regardless of sample size.

Factor 1, labeled Negative Faculty Attitudes and Resistance to Distance Education, had eight variables load at .32 or higher. Seven of the eight variables loaded with scores greater than .6 and the eighth variable loaded at .559. Table 23 presents the variable number from the questionnaire, the variable statement, the factor loading score, the mean and the standard deviation for each variable that loaded on Factor 1. The variable means ranged from 1.49 as the lowest and 2.59, the highest variable mean score.

Table 23

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 1: Faculty Attitudes and Resistance to Distance Education

Variable Number	Variable description	Factor Loading	*M*	*SD*
o	Lack of faculty interest.	.629	2.44	.949
p	Lack of faculty commitment to spend the time to master the use of technologies.	.798	2.59	.961
q	Faculty comfort/discomfort level with the technology.	.831	2.53	.901
r	Lack of training to use technology in teaching.	.615	2.43	.949
s	Faculty resistance to distance learning.	.852	2.26	.948
t	Negative faculty attitudes/unwillingness to accept new technologies.	.841	2.01	.903
u	Lack of faculty competence developing instructional materials for distance teaching.	.770	2.42	.906
v	Concern for faculty leaving do to increased use of technology.	.559	1.49	.729

Factor 2 was labeled "Lack of Personal Contact". This factor had seven variables with six of the seven loading at a .6 or above and the seventh loading at .426. Table 24 shows this data.

Table 24

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 2: Lack of Personal Contact

Variable Number	Variable description	Factor Loading	*M*	*SD*
w	Lack of face to face contact	.837	2.78	.942
x	Lack of nonverbal communication between instructor and student.	.811	2.64	.929
y	Lack of personal contact (one on one) between instructor and student.	.869	2.77	.967
z	Lack of ability to teach skills requiring "hands on" instruction.	.718	2.86	.933
aa	Concerns about course quality.	.689	2.7	.846
bb	Lack of students' ability to receive a quality educational experience.	.648	2.41	.942
ee	Students' ability to cooperatively form groups and problem solve.	.426	2.25	.877

Table 25 depicts the data related to Factor 3, named "Lack of Faculty Time/Support". All five statements loaded with factor loading scores of .67 or higher. The means for Factor 3's statements ranged from 2.74 to 3.07.

Table 25

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 3: Lack of Faculty Time/Support

Variable Number	Variable description	Factor Loading	*M*	*SD*
d	Lack of administratively provided time/support to to learn technologies.	.694	2.74	1.006
e	Lack of administratively provided time/support to develop course and materials.	.790	2.86	.969
f	Lack of faculty rewards or incentives.	.756	2.97	.976
l	Concerns about faculty workload.	.673	2.88	.982
m	Lack of adequate compensation for faculty's time, efforts, etc.	.732	3.07	.938

Factor 4 was named "Technology Issues". Only four variables loaded on Factor 4, but they all loaded with high scores, from .659 to .835. The means for the variables ranged from 2.23 to 2.63. Table 26 summarizes the data.

Table 26

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 4: Technology Issues

Variable Number	Variable description	Factor Loading	*M*	*SD*
h	Equipment failures/cost of maintaining equipment.	.714	2.63	1.001
i	Lack of access to state-of-the-art hardware.	.835	2.23	.997
j	Technological failures/limitations for effective Teaching.	.659	2.36	.906
k	Lack of infrastructure to support use of technology in distance education (tech. experts, system administrators).	.752	2.32	1.025

Factor 5, Lack of Student Services, only had three variables load, but all loaded at .720 or higher. Variables loading on this factor had means ranging from 1.89 to 1.95. Table 27 represents the data.

Table 27

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 5: Lack of Student Services

Variable Number	Variable description	Factor Loading	*M*	*SD*
cc	Lack of student services (registration, financial aid, etc)	.771	1.95	.863
dd	Lack of access to library or other resources for instructional support.	.720	1.93	.846
ii	Lack of student services	.746	1.86	.808

Table 28 shows the factor loading scores for Factor 6, Institutional Culture. Institutional culture had one statement load at .803, another load at .724 and the final load at .475. These variables had means ranging from 1.45 to 1.98.

Table 28

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 6: Institutional Culture

Variable Number	Variable description	Factor Loading	*M*	*SD*
a	Lack of fit with institution's mission.	.803	1.45	.811
b	Lack of perceived need (e.g. limited student market).	.724	1.95	1.006
c	Lack of support from institution administrators.	.475	1.98	1.033

Factor 7 was named "Legal Concerns". Both variables loaded at .749 or higher. The means for the barrier statements were 1.77 and 1.96. Table 29 shows the variable statements, loadings, means and standard deviation for the variables loading on Factor 7.

Table 29

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 7: Legal Concerns

Variable Number	Variable description	Factor Loading	*M*	*SD*
n	Loss of intellectual property	.749	1.96	.887
ff	Legal concerns (e.g. intellectual property rights, Copyright laws).	.783	1.77	.788

Table 30 shows the loadings for the two variables that loaded on Factor 8, Regulatory Restrictions.

Table 30

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 8: Regulatory Restrictions

Variable Number	Variable description	Factor Loading	*M*	*SD*
gg	Restrictive federal, state, or local policies (e.g. limitations on the number of distance education credits students may earn, student ineligibility for financial aid, residency requirements).	.729	1.71	.810
hh	Lack of accreditation for distance courses.	.811	1.65	.730

The last variable loaded on the last factor, Factor 9. As this barrier statement dealt with program development costs, the factor was named "Expense". This variable only loaded at .487, but this was a higher loading score than on any other factor. Table 31 reports the statistics for the variable loading on Factor 9.

Table 31

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 9: Expense

Variable Number	Variable description	Factor Loading	*M*	*SD*
g	Program development costs	.487	2.95	.928

Identifying the Factors for the Attitude Variables.

The three methods used to determine the number of factors to retain are as follows: (a) eigenvalues equal to or greater than one (Tabachnick & Fidell, 2001); (b) a scree plot of eigenvalues plotted against factors to visualize changes in the slope (Tabachnick & Fidell, 2001); and (c) factor loadings greater than ± .3 (Hair, 1998).

The five factors that were extracted after Principal Components Analysis with oblimn rotation were named as follows: (a) Personal Use of Distance Education, (b) Effective Method of Teaching, (c) Impact on Teaching, (d) Value to Students, and (e) Pedagogy. The eigenvalues and percent variances for the five factors are summarized in Table 32.

Table 32

Statistics for Five Extracted attitude Factors

Factors	Eigenvalues	% of Variance	Cumulative %
Factor 1	9.08	41.25	41.25
Factor 2	1.48	6.74	47.99
Factor 3	1.44	6.52	54.51
Factor 4	1.17	5.33	59.84
Factor 5	1.02	4.63	64.47

The pattern matrix was used in interpret the variable values. Values on the pattern matrix represent the unique relationship between the factor and variable as opposed to correlations in the loading matrix from an orthogonal rotation.

The first factor identified and named was, "Personal Use of Distance Education". This factor had three variables load at the .6 level or higher. The forth variable loaded at .53. The average mean for the four variables was 4.08. Table 33 summarizes the variable description, factor loading score, mean and standard deviation for each of the variables that loaded on Factor 1.

Table 33

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 1: Personal Use of Distance Education

Variable Number	Variable description	Factor Loading	*M*	*SD*
d	I would be willing to teach a course using distance education technologies.	.813	4.26	.907
i	Distance education courses are appropriate in our academic area.	.630	4.05	.939
q	Faculty should be encouraged to use distance learning technology for delivery of instruction	.531	4.01	.766
r	I would like to use (or already use) distance education for my courses.	.875	4.00	.944

The second factor was named, "Effective Method of Teaching". This factor had five variables load with scores from .488 to .672. The average variable mean score was 3.99. Data for the Effective Method of Teaching factor are displayed in Table 34.

Table 34

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 2: Effective Method of Teaching

Variable Number	Variable description	Factor Loading	*M*	*SD*
c	Our department needs to develop more distance education courses.	.488	3.96	1.042
e	Distance education is an effective educational method.	.590	4.01	.925
f	Distance education courses could be offered as substitutes for some on-campus courses.	.636	3.95	1.039
u	Distance education courses can be an effective educational method at the undergraduate level.	.672	3.84	.916
v	Distance education courses can be an effective educational method at the graduate level.	.535	4.21	.843

Factor 3 represented the impact that respondents felt distance education had on teaching. The factor had two variable loading scores in the .8 range, one score of .501, and the last variable loading at .490. The average for the variable means was 3.70. Table 35 shows all of the statistical data for Factor 3, Impact on Teaching.

Table 35

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 3: Impact on Teaching

Variable Number	Variable description	Factor Loading	*M*	*SD*
j	Teaching a distance education course would improve my on-campus teaching.	.803	3.27	1.101
m	Distance education in not worth the effort because of technological difficulties.	.490	3.97	.958
n	Using distance learning technology to deliver instruction improves faculty teaching skills.	.831	3.34	1.032
o	Teaching a distance class is a valuable educational contribution and should be considered during promotion, tenure and salary increases.	.501	4.23	.897

Table 36 summarizes the data for the Value to Students, Factor 4. This factor had loading scores ranging from the low of .392 to the high of .809. Six variable loaded on the factor, and the average mean score was 3.71.

Table 36

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 4: Value to Students

Variable Number	Variable description	Factor Loading	*M*	*SD*
a	Distance education courses can be as academically rigorous as on-campus courses.	.690	4.18	.995
b	Distance education courses should become an integrated part of university curricula.	.392	4.03	.876
h	Students spend less time working on distance education courses than on-campus courses.	.809	3.43	1.000
k	Effective student-professor interaction is possible in distance education courses.	.457	3.57	.941
l	Distance education degrees should be valued as equivalent to on-campus degrees.	.535	3.40	1.165
p	A course taught using distance learning technology does not use student's time as effectively as a traditional classroom course.	.557	3.64	.979

All attitude variables loaded to one of the five factors. Factor 5 (Pedagogy) was the final factor identified from the attitude variables. The loading scores had absolute values from .425 to .731. One variable statement stood out from the others by loading with a negative value, "students taught using distance technology learn more or better than traditional face-to-face taught students". The mean for this variable statement was 2.35; the other two variables had mean scores of 4.41 and 4.65. Statistical data for Factor 5 are shown in Table 37.

Table 37

Factor Loadings, Means (*M*), and Standard Deviations (*SD*) for Factor 5: Pedagogy

Variable Number	Variable description	Factor Loading	*M*	*SD*
g	Distance education courses should be offered for college credit.	.425	4.41	.745
s	Students taught using distance technology learn more or better than traditional face-to-face taught students.	-.622	2.35	.880
t	Spending ample time developing distance education courses is crucial to the success of the course.	.731	4.65	.637

Independent T- Tests

The fifth research question's purpose was to determine if significant differences at the .05 alpha level existed between respondents' scores on each of the nine barrier factors when grouped by level of adoption from Rogers' (1995) innovation-decision process. More specifically the null hypothesis stated:

> H_0: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on perceived barrier factor scores for distance education.

Independent *t* tests were used to determine if there were significant differences between the respondents' barrier factor scores when grouped by decision group and implementation group. Section 4 of the questionnaire was used to group respondents into two groups for each technology type. Those who answered in the *Use and continue*, and *Use and discontinue* columns of the questionnaire were placed into the implementation group, while those who answered in the *Plan to use* or *No plan to use* were placed into

the decision group. According to Rogers (1995), the decision stage of the innovation-decision process,

> "...occurs when an individual (or some other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation. Implementation occurs when an individual (or other decision-making unit) puts an innovation into use" (p. 162).

The regression factor scores were compared between the decision and implementation groups for each technology type. Equal variance was assumed and associated scores were reported unless indicated by "[a]" (equal variances not assumed as determined by Levene's test for equality of variances).

All statistics are reported in Table 38 for the audio conferencing technology. Only results from significant tests at the alpha level .05 are reported for the remaining group's *t* tests. Sixty percent of the respondents were in the decision group for audio conferencing, while 40% had implemented this technology. Two barrier factors were significant for audio conferencing, technology issues (p-value = .034, 2-tailed) and expense (p-value = .007,2-tailed).

Table 38

Independent *t* Test on Barrier Factors Between Decision Group and Implementation Group for Audio Conferencing

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Faculty attitudes and resistance to distance education	Decision	88	.0186	0.924	0.225	145	.822
	Implementation	59	-.0196	1.118			
Lack of personal contact	Decision	88	.0553	1.001	0.996	145	.321
	Implementation	59	-.1111	0.981			
Lack of faculty time/support	Decision	88	-.0652	1.031	-0.847	145	.399
	Implementation	59	.0771	0.949			
Technology issues	Decision	88	.1504	0.986	2.130	145	.034
	Implementation	59	-.2038	0.986			
Lack of student services	Decision	88	.0621	0.927	0.804	145	.423
	Implementation	59	-.0731	1.099			
Institutional culture	Decision	88	-.0126	0.957	0.042	145	.967
	Implementation	59	-.0196	1.034			
Legal concerns	Decision	88	-.0084	1.017	-0.165	145	.869
	Implementation	59	.0193	0.989			
Regulatory restrictions	Decision	88	-.0849	1.052	-1.210	145	.228
	Implementation	59	.1187	0.917			
Expense	Decision	88	-.1699	0.951	-2.721	145	.007
	Implementation	59	.2767	1.011			

There were no significant differences between groups in digital conferencing for any of the barrier factors. There were 76% of the participants in the decision group and 24% in the implementation group.

Table 39 reports the barrier factor that was statistically significant in the telecourse data. Lack of Personal Contact was significant between those participants

deciding about telecourses and those who have used them at one time or another. Fifty-six percent of the participants were in the decision stage, while the remaining 43% were in the implementation stage.

Table 39

Independent *t* Test on Barrier Factors Between Decision Group and Implementation Group for Telecourses

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Lack of personal contact	Decision	84	.1413	0.989	1.989	146	.049
	Implementation	64	-.1854	0.990			

Two factors stood out as significant at the .05 alpha level when looking at videoconferencing. Factor 1 (Faculty Attitudes and Resistance to Distance Education) and Factor 4 (Technology Issues) had p-values of .011 and .036 respectively. Table 40 summarizes this data.

Table 40

Independent *t* Test on Barrier Factors Between Decision Group and Implementation Group for Videoconferencing

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Faculty attitudes and resistance to distance education	Decision	83	.1837	0.998	2.575	146	.011
	Implementation	65	-.2346	0.958			
Technology Issues	Decision	83	.1525	0.983	2.122	146	.036
	Implementation	65	-.1948	0.99			

The final type of technology was the Internet or on-line courses. Only 34% of the respondents had implemented Web technology. The significantly different factor

between deciders and implementers for this technology was Institutional Culture. This factor contained the following barrier statements: lack of fit with institution's mission, lack of perceived need, and lack of support from institution administrators. Table 41 shows the data.

Table 41

Independent *t* Test on Barrier Factors Between Decision Group and Implementation Group for Internet or On-line Course

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Institutional culture	Decision	98	.1114	1.102	2.184[a]	136[a]	.031[a]
	Implementation	50	-.2184	0.721			

[a] Equal variances not assumed

Research question six was developed to determine if there were significant differences between the groups when looking at the attitude factor scores. The null hypotheses was stated as the following: H_0: There is no significant difference in perceived attitude factor scores between the two groups. Independent *t* tests were conducted on the attitude factor scores in the same manner as the barrier factor scores. The same groups, decision and implementation, were analyzed based on their answers for each type of technology. Only statistically significant (2-tailed p value $\leq .05$) results are displayed in the subsequent tables.

Table 42 shows the attitude factor that yielded a significant difference between the groups for the audio conferencing data. Attitude statements that loaded on the Personal Use of DE factor included:

d. I would be willing to teach a course using distance education technologies,

i. Distance education courses are appropriate in our academic area,

q. Faculty should be encouraged to use distance learning technology for delivery of instruction, and

r. I would like to use (or already use) distance education for my courses.

Table 42

Independent *t* Test on Attitude Factors Between Decision Group and Implementation Group for Audio Conferencing

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Personal use of DE	Decision	88	-.1599	1.068	-2.634	145	.009
	Implementation	59	.2706	0.804			

Two factors proved to be statistically significant for the digital conferencing technology. Factor mean scores showed significant differences between the groups for both Personal Use of distance education and Value to Students (*p* value = .002 and .024 respectively). Table 43 summarizes the results. Attitude variables that loaded on the Value to Student factor included:

a. Distance education courses can be as academically rigorous as on-campus courses.

b. Distance education courses should become an integrated part of university curricula.

h. Students spend less time working on distance education courses than on-campus courses.

k. Effective student-professor interactions possible in distance education courses.

l. Distance education degrees should be valued as equivalent to on-campus degrees.

p. A course taught using distance learning technology does not use student's time as effectively as a traditional classroom course.

Table 43

Independent *t* Test on Attitude Factors Between Decision Group and Implementation Group for Digital Conferencing

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Personal use of DE	Decision	112	-.1455	1.028	-3.221	146	.002
	Implementation	36	.4527	0.752			
Value to students	Decision	112	-.1049	0.955	-2.285	146	.024
	Implementation	36	.3266	1.075			

Table 44 indicates that the same two attitude factor scores were significant for the telecourses as for the digital conferencing courses.

Table 44

Independent *t* Test on Attitude Factors Between Decision Group and Implementation Group for Telecourses

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Personal use of DE	Decision	84	-.2544	1.054	-3.697	146	.000
	Implementation	64	.3340	0.817			
Value to students	Decision	84	-.1688	0.926	-2.391	146	.018
	Implementation	64	.2216	1.055			

Four of the five attitude factors showed significant differences for videoconferencing technology. The factors and their p-values are shown in Table 45.

Table 45

Independent *t* Test on Attitude Factors Between Decision Group and Implementation Group for Videoconferencing

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Personal use of DE	Decision	83	-.2869	1.072	-4.328[a]	145[a]	.000[a]
	Implementation	65	.3663	0.761			
Effect. method of teaching	Decision	83	-.2061	1.073	-2.905	146	.004
	Implementation	65	.2632	0.833			
Impact on teaching	Decision	83	-.1587	1.044	-2.211	146	.029
	Implementation	65	.2027	0.907			
Value to students	Decision	83	-.1525	0.950	-2.122	146	.036
	Implementation	65	.1947	1.034			

[a] Equal variances not assumed

The final table shows the significant attitude factors for Internet courses. The Personal Use of distance education factor has been significant for every type of technology between the two groups, and it is again significant for courses taught using the Internet. The data for courses taught using the Internet are summarized in Table 46.

Table 46

Independent *t* Test on Attitude Factors Between Decision Group and Implementation Group for Internet or On-line Courses

Factor Name	Group	*N*	*M*	*SD*	*t*	*df*	sig. (2-tailed)
Personal use of DE	Decision	98	-.3119	1.009	-6.781[a]	139[a]	.000[a]
	Implementation	50	.6114	0.638			
Impact on teaching	Decision	98	-.1727	0.905	-3.023	146	.003
	Implementation	50	.3385	1.095			
Value to students	Decision	98	-.2708	0.914	-4.972	146	.000
	Implementation	50	.5309	0.953			

[a] Equal variances not assumed

The seventh research question in the study was a check for significant differences between faculty and administrators on the barrier factor scores. The null hypothesis stated the following: *H*o: There is no significant difference between the faculty and administrators based on perceived barrier factor scores for distance education. Independent *t* test were conducted on the regression barrier factor scores between the faculty and administrators. There were no significant differences at the .05 alpha level between the faculty and administrators for any of the barrier factors.

The final research question in the study looked into significant differences between faculty and administrators on the attitude factor scores. The null hypothesis was

stated as: *H*o: There is no significant difference between the faculty and administrators based on perceived attitude factor scores for distance education. Independent *t* test were conducted on the regression attitude factors scores between the faculty and administrators. There were no significant differences at the .05 alpha level between the faculty and administrators for any of the attitude factors.

Summary

This chapter reported the results of statistical analysis on the data collected for the research project. The following statements summarize the major findings.

1. The program leaders and teaching faculty in agricultural education teacher preparation programs across the nation during the 1999-2000 academic year that responded to the questionnaire were male (88.5%), an average of 48 years old, with an average of five years in administration, 16 years teaching in higher education and 5.5 years teaching in secondary education. Forty-four percent of the respondents held the rank of professor and 68.9% indicated they were tenured.

2. The average agricultural education program in this study had three faculty members, 16 student teachers, did not have a DE specialist in their department, but had taught an average of 2.4 courses. Students were not able to earn an agricultural education teaching certificate entirely at a distance from the average agricultural education teacher preparation program in this study.

3. The majority of respondents were very aware of the distance education technologies, while approximately 40% of respondents felt they were very capable of using the various types of technologies.

4. Internet was the technology choice that showed the highest propensity for use. Seventy-four percent of participants indicated they planned to use this technology and 33.1% already adopted the Internet as a delivery method and planned to continue.

5. At least 70% of the participants had all four training opportunities listed in the questionnaire available for their benefit.

6. Reducing regular teaching load to allow more time for development and teaching using distance technologies, considering distance courses extra or overload, and providing extra monetary incentives for development and/or delivery of distance courses were three incentives that a majority of participants felt their department was not supporting.

7. The majority of respondents indicated that most of the resources listed in the questionnaire would be available for either some or all courses. Eighty-five percent of respondents indicated that online access to wide area networks would be available for either some or all courses in the next three years, and 83.8% of respondents said that toll-free telephone, e-mail or other online access to the instructor would be available for either some or all courses.

8. The barriers that the largest percentage of respondents indicated were either a moderate or major factor keeping their department from starting or expanding distance education offerings included the following: lack of adequate compensation for faculty's time, efforts, etc. (75.7%), lack of faculty rewards or incentives (70.3%), program development costs (68.3%), lack of ability to teach skills requiring "hands on" instruction (66.2%), concerns about faculty workload (64.9%), lack of administratively provided time/support to develop course and materials (64.2%), lack of personal contact (one on

one) between instructor and student (59.4%), lack of face-to-face contact (58.1%), and concerns about course quality (58.1%).

9. Overall, the surveyed group had positive attitudes toward distance education as reflected by positive agreement for most of the attitude statements. The statement that received the strongest disagreement was, "students taught using distance technology learn more or better than traditional face-to face taught students"; 54% of participants either disagreed or strongly disagreed to this statement.

10. Decision and implementation groups for the audio conferencing technology, showed significant differences in two barrier factors, Technology Issues and Expense, and one attitude factor, Personal Use of Distance Education.

11. There were no differences between the groups for digital conferencing on the barrier factors, although two attitude factors proved to have significant differences. Personal Use of Distance Education was a significant attitude factor as well as Value to Students.

12. Lack of Personal Contact was the barrier factor that produced a significant difference between the decision group and implementation group for telecourse technology. The same two attitude factors were significant between the groups for telecourses as were significant for digital conferencing, Personal Use of Distance Education and Value to Students.

13. Videoconferencing was the forth technology type. The two groups showed significant differences for the Faculty Attitudes and Resistance to Distance Education barrier and the Technology Issues barrier. Four attitude factors yielded significant differences between the groups. These attitude factors consisted of: Personal Use of

Distance Education, Effective Method of Teaching, Impact for Teaching and Value to Students.

14. Institutional Culture was the only barrier factor that was statistically significant between groups associated with the Internet as a distance education technology. Three attitude factors proved to have significant differences: Personal Use of DE, Impact on Teaching, and Valued to Students.

15. There were no significant differences between the faculty and administrators on the barrier factor scores or on the attitude factor scores.

Chapter 5

Findings, Conclusions, Discussion, and Recommendations for Future Research

Summary

Chapter 4 described the statistical treatment, analysis of data and the results of this study. The purpose of this chapter was to present a summary of the procedures and findings and present the conclusions, discussion, and recommendations for future research.

The purpose of this study was to identify if differences existed in perceived barrier factors to distance education and perceived attitude factors toward distance education between faculty and administrators in the decision stage of distance education technology adoption and those in the implementation stage of distance education technology adoption. Findings in this research may provide insight into which attitudes and barriers we should attempt to change or remove in order to move the participants in the decision stage to the implementation stage of distance education technology adoption. Information was gathered from teaching faculty and program leaders involved in agricultural education teacher preparation programs across the United States during the 1999- 2000 academic year.

The research questions that were addressed in this study were the following:

1. What are the demographics and characteristics for the respondents, the teacher education programs, and the universities for the population?
2. What are the current practices and processes of distance education in agricultural education teacher preparation programs across the United States during the academic year of 1999-2000?

3. What do faculty and program leaders of agricultural education teacher preparation programs perceive as the major barriers inhibiting the start and/or expansion of distance education?
4. What are the attitudes of faculty and program leaders in agricultural education teacher preparation programs toward distance education?
5. Is there a difference in how participants responded to barrier factors for distance education when grouped by stage of distance education technology adoption?
    a. *H*o: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on perceived barrier factor scores for distance education.
6. Is there a difference in how participants responded to attitude factors for distance education when grouped by stage of distance education technology adoption?
    a. *H*o: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on attitude factor scores for distance education.
7. Is there a difference in the perceived barrier factors for distance education between faculty and administrators?
    a. *H*o: There is no significant difference between the faculty and administrators based on perceived barrier factor scores for distance education.
8. Is there a difference in the perceived attitude factors for distance education between faculty and administrators?

a. *Ho*: There is no significant difference between the faculty and administrators based on perceived attitude factor scores for distance education.

The target population for this study was defined as current program leaders and current teaching faculty from all agricultural education teacher preparation programs across the United States during the 1999-2000 school year. Program leaders were defined as the individuals with direct leadership and responsibility for the teacher education programs in agriculture education at each university. Teaching faculty were those individuals who taught agricultural education pedagogy courses for agricultural teacher education programs at each university. The entirety of this population was selected instead of a sample, due to the relatively small population size and ease of accessibility.

The instrument used in this study was specifically developed to identify if differences exist in perceived barrier factors and perceived attitude factors toward distance education between faculty and administrators in the decision stage and the implementation stage of distance education technology adoption. Other questions in the questionnaire enabled the reporting of the population demographics, current practices and processes of distance education, and major barriers and attitudes that inhibit the use of distance education. Information was gathered from teaching faculty and program leaders involved in agricultural education teacher preparation programs across the United States during the 1999-2000 academic year.

The survey instrument was constructed specifically for this study and developed from related literature and previous studies (Appendix A). A panel of experts ($N = 5$;

Appendix C) examined the instrument for content validity and readability. The instrument was piloted with a group ($N = 7$) similar to the population (Appendix D). Because the entirety of the population was utilized for the study, the most closely related group appropriate for the pilot test consisted of former program leaders and teaching faculty.

The questionnaire was mailed out to the entire population ($N = 193$). Usable responses were received from 148 faculty and program leaders for an overall response rate of 76.68%. When analyzing all scaled items in the instrument for internal consistency, the overall alpha score was .79. Early and late responders were compared using independent t tests between the groups on the barrier and attitude factor scores. There were no statistically significant differences between the groups at the .05 alpha level. Therefore, it was concluded that the results of the study were generalizable to the population of program leaders and teaching faculty in agricultural education teacher preparation programs.

Findings

Research question one sought to describe selected demographic variables for the leaders and educators in the agricultural education teacher preparation programs across the United States during the 1999-2000 academic year. The demographic information was reported on the individual respondent, the department, and the university. Demographic information for the individual participants indicated that the mean age of the population was 48 years old. Eighty-nine percent of the respondents were male. Thirty-two percent of the respondents had never been in an administrative position, while nine years was the average number of years in administration for the 55.5% of

respondents that indicated they had been administrators (12.8% of respondents left the answer blank). The mean number of years respondents were in higher education was 16 years. Eighty-nine percent of the population had taught in secondary education with a mean of six years. Forty-five percent of the respondents were professors, 24% were associate professors, 20% were assistance professors and 11% were in a category labeled other, which was defined as instructor for the majority (n=8) of respondents in this category. Sixty-nine percent of the population indicated they had tenure. Forty-nine percent of the participants indicated they had never taught a distance education course, while 16% had taught five or more courses.

The demographic information summarized at the department level showed that 15.5% of the departments had not yet incorporated distance education technologies, 23% did not answer the question, and 51% incorporated distance education prior to 1999. The majority (64%) of the departments had 100% of their full time equivalent (FTE) allocation in the college of agriculture while 13% had 100% of their FTE in the college of education. Seventy-one percent of the departments did not have a distance education specialist, and 97.4% of the departments indicated that students could not complete the agricultural teaching certification exclusively by taking distance education courses. The mean number of faculty in each department was 2.58. One department indicted they had 13 faculty while two departments mentioned they had only a half-time faculty position in their department. The average number of student teachers in each agricultural education teacher preparation program was 14.26 students.

The final demographic variable reported was the total student enrollment at each university. The mean number of students was 18,906 students for the universities represented in the study.

The second research question sought to determine the processes and practices of distance education as perceived by each participant. The majority of participants felt that all of the goals listed in the survey instrument were either somewhat or very important to the agricultural education teacher preparation program, yet distance education technologies were not playing a major role in meeting the departmental goals listed, except for one goal, "increasing student access by making courses more available at convenient locations". A majority of the participants who indicated the access goal was either somewhat or very important (n=51%) indicated that the use of distance education technologies was either a major or moderate factor for meeting that goal.

A majority of the respondents were aware of all of the technology types and felt they were capable of using them. Telecourses and videoconferencing were the two technology types that the greatest percentage of participants indicated they had used (n=43.3% and n=43.9% respectively). Internet was the technology that the greatest percentage of respondents indicated they planned to use (n=47%). Audio conferencing was the distance education technology that the greatest number of participants indicated they had no plans to use (n=46%).

A majority of the faculty felt that all of the training opportunities listed in the survey instrument were available; with 93% indicating that consultation with support center staff was available. The two types of support that the highest percentage of respondents indicated their departments were providing either a moderate or major level

of support for were, "bring courses taught using distance technologies into regular teaching load (n=55.4%), and "consider course development and teaching as credit toward promotion and tenure (n=44.6%).

A majority of respondents indicated they would have the following resources available for all courses: "toll-free telephone, e-mail, or other online access to instructor" (n=61.5%), and "online access to wide area networks" (n=55.4%). A majority of participants indicated all of the resources listed in the questionnaire would be available for either some or all courses except for three resources. The following resources had less than 50% of the participants indicating probable availability: "teaching assistant, tutor, or facilitator regularly available at remote sites" (n=46%), "institution library staff assigned to assist distance education students" (n=41.2%), and "deposit collections at remote sites" (n=27.7%).

Research question three asked participants to identify the barriers that were keeping them from starting or expanding their distance education offerings. A majority of the respondents indicated that the following were either moderate or major barrier factors: (a) "lack of adequate compensation for faculty's time, efforts, etc. (n=75.7%), (b) "lack of faculty rewards or incentives" (n=70.3%), (c) "program development costs" (n=68.3%), (d) "lack of ability to teach skills requiring 'hands on' instruction" (n=66.2%), (e) "concerns about faculty workload" (n=64.9%), (f) "lack of administratively provided time/support to develop courses and materials" (n=64.2%), (g) "lack of administratively provided time/support to learn technologies" (n=61.6%), (h) "lack of personal contact (one on one) between instructor and student" (n=59.4%), (i) "concerns about course quality" (n=58.1%), (j) "lack of face to face contact" (n=58.1%),

(k) "lack of faculty commitment to spend the time to master the use of technologies" (n=54.7%), (l) "equipment failures/cost of maintaining equipment" (n=54.1%), and (m) "lack of nonverbal communication between instructor and student" (n=52.7%). A majority of the participants also indicated that two barrier variables were not inhibiting factors, "lack of fit with institution's mission" (n=69.6%) and "concern for faculty leaving due to increased use of technology" (n=61.5%).

The fourth research question addressed the major attitudes of the participants toward distance education. A majority of the respondents indicated agreement or strong agreement to all of the attitude statements except the following: (a) "students taught using distance technology learn more or better that traditional face-to-face taught students" (n=54% in disagreement or strong disagreement), (b) "teaching a distance education course would improve my on-campus teaching" (n=43.9% agreement or strong agreement, and n=29.1% undecided), (c) "using distance learning technology to deliver instruction improves faculty teaching skills" (n=46% agreement or strong agreement, and n=31.8% undecided), and (d) "students spend less time working on distance education courses than on-campus courses" (n=48% agreement or strong agreement, and n=35.1% undecided).

Research question five included the following null hypotheses: "*H*o: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on perceived barrier factor scores for distance education". The null hypothesis was rejected for all but one technology type; no significant differences were found in the barrier factor scores between respondents in the decision stage of adoption and respondents in the implementation stage of adoption for the digital

conferencing technology (alpha = .05). Two barrier factors were significant for audio conferencing, Technology Issues (*p* value = .034, 2-tailed) and Expense (*p* value = .007, 2-tailed). Lack of Personal Contact was the significant barrier factor in telecourse technology (*p* value = .049, 2-tailed). Factor 1 (Faculty Attitudes and Resistance to Distance Education) and Factor 4 (Technology Issues) had *p* values of .011 and .036 (2-tailed) respectively for videoconferencing between the decision group and the implementing group. Institutional Culture (*p* value = .031, 2-tailed) was the significantly different factor for the Internet or on-line course technology.

Research question six contained the null hypotheses, "*H*o: There is no significant difference between the groups (defined by stage of distance education technology adoption) based on attitude factor scores for distance education. The null hypothesis was rejected for all technology types. Personal Use of DE was the attitude factor that was significantly different between the two groups for audio conferencing (*p* value = .009, 2-tailed). Significant differences for digital conferencing were the attitude factors, Personal Use of DE (*p* value = .002, 2-tailed) and Value to Students (*p* value = .024, 2-tailed). Personal Use of DE (*p* value = .000, 2-tailed) and Value to Students (*p* value = .018, 2-tailed) were also the significantly different attitude factors for telecourses. Four attitude factors showed significant results for videoconferencing. These factors included: Personal Use of DE (*p* value = .000, 2-tailed), Effective Method of Teaching (*p* value = .004, 2-tailed), Impact on Teaching (*p* value = .029, 2-tailed), and Value to Students (*p* value = .036, 2-tailed). The final technology was Internet. Three attitude factor scores were significantly different between the decision and implementation groups. The factors

were: Personal Use of DE (p value = .000, 2-tailed), Impact on Teaching (p value = .003, 2-tailed), and Value to Students (p value = .000, 2-tailed).

Research question seven investigated a difference in the perceived barrier factors for distance education between faculty and administrators, and included the null hypothesis, "*H*o: There is no significant difference between the faculty and administrators based on perceived barrier factor scores for distance education". The null hypothesis was accepted as there were no significant differences between the faculty and program leaders on the barrier factors

The final research question addressed the differences in the perceived attitude factors for distance education between faculty and administrators. The null hypothesis stated, "*H*o: There is no significant difference between the faculty and administrators based on perceived attitude factor scores for distance education". The null hypothesis was accepted as there were no significant differences between the program leaders and faculty on the attitude factor scores.

Conclusions

The conclusions of this study were based on the responses from the agricultural education teacher preparation program faculty and program leaders. Generalization beyond the population for this study is not statistically appropriate. Based on the findings of this study, the following conclusions were formulated:

1. The majority of participants were in the decision stage of the adoption diffusion process for all technology types as opposed to the implementation stage. Sixty percentage were in the decision stage for audio conferencing, 76% were in the decision stage for digital conferencing, 57% were in the decision stage for

telecourses, 56% were in the decision stage for videoconferencing and 66% were in the decision stage for Internet courses.

2. The Internet or on-line courses was the delivery option most participants were using and either planned to continue using or were not currently using, but were planning to use (n=80.4%). The percentage of participants selecting the *Use and continue* and *Plan to use* options on the questionnaire for the remaining technology types were as follows: videoconferencing, 73.6%; digital conferencing, 68.2%; telecourses, 66.2%; and audio conferencing, 45.9%. Although the technologies were categorized differently, these trends are very similar to the data reported in the United States Department of Education's (1997) report on respondent's distance education technology plans for the next three years.
3. Even though the goals were considered either somewhat important or very important for a majority of the respondents, distance education was not considered a major factor for meeting important program level goals by a majority of respondents, except for increasing student access by making courses more available at convenient locations.
4. The population indicated that training opportunities were available for faculty who teach using distance education. The United States Department of Education's (1997) report also reported this same result from their sample.
5. The majority of the population indicated they were not adequately supported by the department to teach using distance education technologies, yet 55.4% of respondents specified they had support for bringing courses taught via distance

technologies into their regular teaching load. A majority of participants also indicated the following barriers were either a moderate or major inhibitor to starting or expanding distance education offerings: (a) a lack of adequate compensation for faculty's time, efforts, etc.; (b) a lack of faculty rewards or incentives; (c) concerns about faculty workload, and (d) a lack of administratively provided time/support to develop courses and materials and learn technologies. The combination of the faculty support results and barrier results indicated the lack external support was an important barrier inhibiting the incorporation of distance education. .

6. Participants were planning to have resources available for students taking courses via distance education technologies, yet were noticeably indecisive or unclear about three resource statements. Percentages of respondents marking the *Don't know* column for available resources in the next three years included: 45% for students ability to deposit collections at remote sites; 35% for institution library staff assigned to assist distance education students; 31% for cooperative agreements for students to use other libraries, and 20% for a teaching assistant, tutor, or facilitator regularly available at remote sites.
7. In addition to the faculty support and incentive barriers previously mentioned, cost, course quality, student contact, and equipment concerns were also considered barriers for a majority of the faculty. All except three of the 13 barrier variables that were selected as either major or moderate barriers by a majority of the respondents loaded onto two barrier factors (Lack of Personal Contact and Lack of Faculty Time/Support).

8. Significant barrier factors were found between the participants in the decision stage and those in the implementation stage for all of the distance education technology types, except one. The two groups for digital conferencing did not show a significant difference on any of the barrier factors.
9. Overall the respondents' attitudes were favorable to distance education, but significant differences in attitude factors between deciders and implementers existed when viewed by type of distance education technology. Attitudes regarding respondents' personal use of distance education technologies showed as significantly different between the groups for all of the distance education technology types. Attitudes surrounding the concept of distance education's value to students (Factor 4, Value to Students) was significantly different for four of the five distance education technology types.
10. Factors 1 through Factor 6 were reliable factors, as they had an adequate number of variables load with high loading scores ($\geq .40$, Tabachnick & Fidell, 2001). Factors 7 and 8 only had two barrier variables load, but they loaded with high loading scores ($\geq .73$) and were considered reliable factors. Caution is advised for interpreting Factor 9 (Expense) as reliable; this factor had only one variable load, but was left as a factor as it had a unique interpretation (Tabachnick & Fidell, 2001). The implementation group in audio conferencing considered Expense more of an inhibiting barrier than the decision group. This was the only barrier variable to show this trend.

11. All five attitude factors were considered reliable based on adequate case to variable ratio (Gorsuch, 1983). All variables loaded on the factors with a .39 or higher loading score.

Discussion

The first conclusion drawn from this study indicated that a majority of the participants were in the decision stage of the distance education technology adoption process. It is recommended to focus on removing barriers and changing attitudes identified in this study to bring deciders into the implementation stage.

As the majority of the respondents are planning to use the Internet for the delivery of courses, it is recommended that we focus efforts on overcoming barriers and attitudes that were identified as significantly different between the two adoption groups for this technology. We should attempt to remove the barrier of Institutional Culture and attempt to change the attitudes surrounding the Personal Use of Distance Education, Impact on Teaching and Value to Students.

Participants in the decision stage of on-line delivery of courses felt that Institutional Culture was more of an inhibiting barrier than those who use the Internet to deliver courses. The variables that loaded on the Institutional Culture factor were: "lack of fit with institution's mission, lack of perceived need (e.g. limited student market), and lack of support from institution administrators. Educational efforts should be created for both faculty and administrators in the decision group and should focus on how distance education can align with the institutions' missions, identify possible student markets and define the characteristics of the students that tend to take distance education classes.

Educational efforts to change the deciders' attitudes toward on-line delivery of

courses should focus on attitudes involved in the Personal Use of Distance Education, Impact on Teaching, and Value to Students. Changing attitudes about the Personal Use of Distance Education may require experiential learning. Rogers (1995) identifies trialability as one of the attributes of an innovation that will increase the rate of adoption. It may be very important to allow the participants in the decision group to "test" or experience teaching one course before they are more willing to adopt a distance education technology for their other courses. Providing the opportunity for a trial course may also help the faculty member see the possibilities for impact on their on-campus teaching. Distance education courses have the potential to provide alternative access to courses, learner autonomy, learner control, teacher-student interaction, and structured learning experiences (Shearer, 2003). If on-campus courses are not designed with these qualities, then the practice of building these attributes into distance courses should inspire the instructor to build the same attributes into their on-campus courses and significantly affect their on-campus teaching.

The third conclusion indicated that distance education technologies were not a major factor for meeting important program level goals. Although, the respondents indicated that the program goals were important, the use of distance education technologies was not seen as an educational strategy for meeting program goals. Smith (1998) states, "The key issue for distance educators at all levels is how distance education is placed in the strategic planning hierarchy. Is it seen as an objective in itself or as a strategy for achieving other social, education, or business objectives?" (p.64). The missing link may be the lack of clarity and accuracy of defining the goals and objectives

that a distance education strategy and distance education technology adoption are expected to serve.

Smith (1998) identified the following five goals commonly associated with distance education: access, reach, quality, efficiency, and customer service. It is recommended that program leaders and administrators view distance education as a strategy for reaching goals and define specifically how the use of distance educational technologies can be used to reach those goals. For agricultural teacher education programs the goals could be increased student numbers, increased communication with peers and current agricultural educators, increased flexibility for students' time, increased opportunities for personalized instruction, and increased access to subject matter experts. Once the program goals have been defined, distance education should be considered a strategy for reaching those goals.

Although the fourth conclusion stated that training opportunities were available for faculty who teach distance education, extrinsic support was viewed as a barrier in the fifth conclusion. If administrators do not value distance education, it will not receive support. Johnson (2000) outlines three factors that are critical to innovation implementation: framing, innovation environment and innovation attributes. Innovation environment aligns with the middle-management level, the level of the program administrators. Johnson (2000) indicated,

> "The initiation of innovations is more likely to occur in an internal environment in which people have easy access to information due to their mobility and interpersonal contacts; there are permeable boundaries between units; there are rewards for sharing, seeking, and utilizing new information; and there are rewards for risk taking, accepting, and adapting to change" (p.62).

Program leaders have the capability to provide the type of support Johnson (2000) outlined and the respondents indicated was lacking. To encourage this support, innovators will need to provide evidence of the value of distance education and distance education technologies involved in delivering courses.

As previously mentioned, realigning distance education as a strategy to achieve well defined goals may be one technique to demonstrate value, but additional methods of verifying the value of distance education may be necessary. Another method of exhibiting value is providing opportunities for administrators to experience distance education and learning first hand the value of distance education. Documenting student and faculty critiques and evaluations on distance courses would be another means of showing the value of distance education. Providing evidence of added revenue and additional resources from consortia efforts or grant opportunities can also play an important role for helping administrators to see the value of distance education. Once the value of distance education is accepted, administrators can work toward removing barriers such as the lack of support.

Conclusion seven summarized the barriers that a majority of the participants felt were either a moderate or major factor inhibiting the start or expansion of distance education offerings. All barrier variables summarized in conclusion seven loaded onto two factors, except for three of the barriers. Five out of the seven variable statements that loaded on Factor 2 (Lack of Personal Contact) in the Principal Components Analysis were chosen by a majority of the participants as inhibiting barriers. All of the variable statements that loaded on Factor 3 (Lack of Faculty Time/Support) were chosen as

moderate or major barriers by a majority of the participants. The lack of face to face interaction and the lack of faculty support were both inhibitive barrier factors for the agricultural education teacher preparation group. It is recommended to investigate creative ways of overcoming these barriers for all types of distance education technologies to encourage the expanded use of distance education.

The perceived lack of personal contact between students and instructor is often associated with course quality. Increasing and maintaining high course quality, increasing and maintaining instructor responsiveness, and increasing opportunities for students to interact among themselves, with the instructor and with outside expertise are objectives that would begin removing the personal contact barriers. New and different approaches to teaching are heavily scrutinized and critiqued by educators and administrators, so innovators need to conscientiously produce their very best courses and display achievements. Innovators need to diligently demonstrate how using various distance education technologies can result in excellent interaction with students.

Removing the barriers surrounding lack of faculty time and support requires the support of the university and the program leaders. Distance education needs to be incorporated into tenure policies and practices, resources need to be reallocated to provide financial incentives and continued support, university practices may need to be altered to provide accessible student services, and faculty need to be adequately supported for their time. Faculty need to see evidence of administrators' support through changes in policies and practices that align distance education with the rewards, policies

and practices of the institution in order to feel secure and confident experimenting with distance education technologies.

In addition to the barriers identified by a majority of the participants, conclusion eight indicates significant differences existed in the barrier factor scores between the decider and implementer groups for all of the technology types except one. Respondents in the decision stage showed significantly more agreement than the implementation group that certain barrier factors were inhibiting the adoption of distance education technologies. The one exception was the Expense barrier factor. This factor was seen as more of a barrier by the implementation group than the decision group. Although the Expense factor is not statistically reliable, interpretation of its significance is interesting. There may be hidden costs to audio conferencing that are not noticeable until after implementation of this technology.

Conclusion nine shows significant differences in attitude factor scores were identified for every technology type between participants in the decision stage and those in the implementation stage of distance education technology adoption based on Rogers' (1995) innovation-decision process. Significantly, less favorable attitudes were found from participants in the decision stage than from participants in the implementation stage. Personal Use of Distance Education was the attitude factor that was statistically different between the stages of adoption for all distance education technology types. These attitudes may be an inhibiting factor for faculty to move to the implementation group and may be suggesting the measure of overall attitudes may not be an accurate refection of how attitudes can affect distance education technology adoption.

In order to encourage movement from the decision group to the implementation group, agricultural education teacher preparation programs should focus efforts on the following statistical differences:

(a) For faculty involved in audio conferencing, we should concentrate on removing barriers related to Technology Issues and attempt to change attitudes regarding the Personal Use of Distance Education. To remove the technology barriers, program leaders should develop a technology update plan to keep the technology current and functioning properly for both the instructors and students. Resources should be dedicated to the technology plan at both the program level and university level, so instructors are not responsible for keeping the technology up to date.

The significant difference in the Personal Use of Distance Education indicates that participants in the decision groups are not willing to teach or do not feel comfortable teaching their classes at a distance. Changing the attitudes of faculty will involve Johnson's (2000) third factor for innovation implementation, the innovation attributes factor. Johnson (2000) refers to the innovation attributes as the level where the faculty tend to focus and make decisions relative to the functionality of innovations. This level incorporates Roger's (1995) innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. If innovators are going to change the attitudes associated with the personal use of distance education, then energy should be focused on clearly stating the positive innovation attributes of the distance education technology they plan to promote.

(b) For faculty involved in digital conferencing, we should attempt to change the attitudes surrounding the Personal Use of Distance Education and the Value to Students.

In addition to clearly addressing the positive innovation attributes related to Personal Use of Distance Education, innovation attributes related to the Value to Students should be addressed for digital conferencing. An example of positive innovation attributes related to Value to Students would include the compatibility of similar academic rigor, amount of time students spend on courses, and efficient use of student time.

(c) For faculty involved in telecourses, we should concentrate on removing the barriers involved in lack of Personal Contact and attempt to change the attitudes involved with Personal Use of Distance Education and the Value to Students. Adding personal contact to telecourse could be accomplished by integrating opportunities for students to correspond with instructors and peers through e-mail, interact via Internet discussion boards, and communicate through on-line chat sessions.

(d) For faculty involved with video conferencing, we should attempt to remove the barriers involved with Faculty Attitudes and Resistance to Distance Education and Technology Issues and attempt to change the attitudes dealing with Personal Use of Distance Education, Effective Method of Teaching, Impact on Teaching, and Value to Students. Removing the barriers associated with faculty resistance would include getting the faculty more comfortable using the video conferencing technology, developing structures to allow efficient use of faculty time, providing training and follow-up support, and exhibiting the advantages of video conferencing to increase awareness and interest.

Changing the attitudes about distance education as an Effective Method of Teaching would include expanding the offerings of distance education courses and utilizing video conferencing for on-campus courses as well as distance courses. Changing attitudes involved with distance education's Impact on teaching would involve

implementers or instructional designers explaining the pedagogy and instructional design involved with formatting content, delivering content, and providing opportunities for interaction with the instructor, the content, other students, and outside experts when delivering a course via video conferencing. Once faculty understand how the various design aspects enhance a distance education course, they may be more willing to add the same design aspects to their on-campus courses.

(e) For faculty involved with on-line courses we should attempt to remove the barriers of Institutional Culture and attempt to change the attitudes surrounding Personal Use of Distance Education, Impact on Teaching, and Value to Students. Removing the barriers of Institutional Culture will require incorporating the need and purpose for distance education into the institution's mission and identifying the student population that distance education will serve.

Certainly agricultural education teacher preparation programs need to begin looking at the types of distance education technology they are using or planning to incorporate and develop strategies for removing the barriers and changing the attitudes that were significantly different between the faculty in the decision group and those in the implementation group.

The final conclusion summarized the reliability of the newly created factors. Although statistical reliability could not be proven for one barrier factors, all nine were included for further statistical testing. Factor 9 (the unreliable factor) only showed a significant difference between the groups for audio conferencing technology. Factor 9 (Expense) was included in the study as it showed a unique result, the implementers considered it more of a barrier than the deciders. Practical reliability for all barrier

factors can be demonstrated by comparing the factors to similar factor analytic studies.

Muilenburg and Berge (2001) factored 10 barrier factors in their factor analytic study. They also recommended further factor analytic research to identify factors that would account for more variance than the 52% accounted for by their factors. Their factors were named as follows: (a) administrative structure, (b) organizational change, (c) technical expertise, support, and infrastructure, (d) social interaction and program quality, (e) faculty compensation and time, (f) threat of technology, (g) legal issues, (h) evaluation/effectiveness, (i) access, and (j) student-support services. Although Muilenburg and Berge (2001) conducted their study at almost the same time this study was underway, the studies were independent of each other, yet the factors produced from both studies are very similar. The current study's barrier statements loaded onto nine barrier factors with the nine factors accounting for 70% of the variance, and all variables except one loading at .63 or higher.

Recommendations

The following areas are recommended for future research:

1. Future research is needed to validate the attitude factors and barrier factors found in this study. New studies may choose to not include barrier Factor 9 (Expense), as the reliability of this variable is questionable. It may also prove beneficial to include additional barrier variables for future factor analytic studies in an attempt to "flesh out" this factors.

2. A combination of quantitative and qualitative research is needed at the university and departmental levels. First, quantitative research is needed to identify the significantly different barrier factors and attitude factors between the decision stage of

adoption and the implementation stage of adoption for the specific DE technologies in use at the university and department levels. Second, qualitative research is needed to identify how to help the decision group overcome their barriers and attitudes and move them into the implementation group.

3. Future research is needed to follow-up with department leaders and identify what barriers they have toward providing the type of faculty support that participants have indicated are barriers toward using distance education. Research needs to specifically address how departments can do the following: (a) adequately compensate faculty's time, efforts, etc., (b) provide adequate rewards or incentives, (c) alleviate or reduce faculty workload concerns, and (d) provide time/support for faculty to learn technologies and develop courses and materials.

4. Research based at the university level is needed to identify the stage of innovation the university is at according to Rogers' (1995) five stage spectrum of the innovation process in an organization. Identifying significant barrier and attitude factors between groups of faculty in the various stages of the innovation process in an organization could help a university implement an innovation such as distance education technologies.

5. Future research should focus on identifying if faculty are able to relate Rogers' (1995) five innovation attribute characteristics to distance education. Identifying any attribute characteristics that faculty do not feel is present in distance education technologies, may help change agents focus educational efforts more effectively.

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Appendices

Appendix A

Perceptions of Agricultural Teacher Educators Toward Distance Education Technologies Questionnaire

For this study, distance education technologies are defined as any method used to deliver instruction that utilizes technology. Traditional face to face delivery and written correspondence are excluded for the purpose of this study.

Section I Goals of Distance Education Technologies

How important are the following goals to your agricultural teacher education program? For each goal that is somewhat or very important, indicate to what extent the use of distance education technologies is meeting that goal.
(Circle an "importance" and an "extent goal met" response on each line, two responses per line.)

	Importance			Extent goal met			
	Not Important	Somewhat Important	Very Important	Not at All	Minor Extent	Moderate Extent	Major Extent
	(Circle one response in this column.)			*(Circle one response in this column.)*			
a. Reducing your institution's per-student costs	1	2	3	1	2	3	4
b. Making educational opportunities more affordable for students	1	2	3	1	2	3	4
c. Increasing institution's enrollments	1	2	3	1	2	3	4
d. Increasing student access to courses by reducing course time constraints	1	2	3	1	2	3	4
e. Increasing student access by making courses available at convenient locations	1	2	3	1	2	3	4
f. Increasing institution's access to new audiences	1	2	3	1	2	3	4
g. Improving the quality of course offerings	1	2	3	1	2	3	4
h. Meeting the needs of local employers	1	2	3	1	2	3	4
i. Other *(specify)*_____	1	2	3	1	2	3	4

Section II. Awareness of Technology Types

Please indicate your level of awareness for each of the following types of distance education delivery methods. **Circle the number that reflects your level of awareness for the following:**

Key for items: 1 = Very Aware, 2 = Somewhat Aware, 3 = Not Aware

	Very Aware	Somewhat Aware	Not Aware
a. Audio conferencing (instructional dialogue via telephone)	1	2	3
b. Digital *(desktop)* conferencing (instructional dialogue via computer)	1	2	3
c. Telecourses (Video programs combined with print media, using one of many TV delivery methods, including videocassettes, to carry video content)	1	2	3
d. Videoconferencing (instructional dialogue via live TV)	1	2	3
e. Internet or on-line courses	1	2	3
f. Other *(please specify)* _____	1	2	3

Section III. Ability to Use Technology Types

Please indicate your capability to use each of the following types of distance education delivery methods. **Circle the number that reflects your level of capability for the following:**

Key for items: 1 = Very Capable, 2 = Somewhat Capable, 3 = Not Capable

	Very Capable	Somewhat Capable	Not Capable
a. Audio conferencing (instructional dialogue by telephone)	1	2	3
b. Digital (*desktop*) conferencing (instructional dialogue via computer)	1	2	3
c. Telecourses (Video programs combined with print media, using one of many TV delivery methods, including videocassettes, to carry video content)	1	2	3
d. Videoconferencing (instructional dialogue via live TV)	1	2	3
e. Internet or on-line courses	1	2	3
f. Other *(please specify)* _____	1	2	3

Section IV. Level of Technology Adoption

Please indicate your level of adoption for each of the following types of distance education delivery methods. **Circle the number that reflects your level of adoption for the following:**

Key for items: 1 = Current use and plan to continue, 2 = Current use but plan is discontinue, 3 = No current use but plan to use, 4= No plan to use

	Use and Continue	Use and Discontinue	Plan to Use	No plan To Use
a. Audio conferencing (instructional dialogue by telephone)	1	2	3	4
b. Digital (desktop) conferencing (instructional dialogue via computer)	1	2	3	4
c. Telecourses (Video programs combined with print media, using one of many TV delivery methods, including videocassettes, to carry video content)	1	2	3	4
d. Videoconferencing (instructional dialogue via live TV)	1	2	3	4
e. Internet or on-line courses	1	2	3	4
f. Other *(please specify)* _____	1	2	3	4

Section V. Faculty Training

Are the following training opportunities available to faculty who teach using distance education technologies? *(Circle one response on each line.)*

	Available	Not Available
a. Training in the use and application of distance education technologies	1	2
b. Training in the development of curricula for distance education courses	1	2
c. Training in teaching methods for distance education courses	1	2
d. Consultation with support center staff	1	2
e. Other *(specify)*_____	1	2

Section VI. Faculty Support

Indicate the extent your department is providing support for each of the following types of faculty incentives and compensations to faculty who teach using distance education technologies.
(Circle one response on each line.)

	Extent Department is Providing Support			
	Not at All	Minor Extent	Moderate Extent	Major Extent
	(Circle one response in this column.)			
a. Reduce regular teaching load to allow more time for development and teaching using distance technologies	1	2	3	4
b. Consider distance courses extra or over load	1	2	3	4
c. Provide extra monetary incentives for development and/or delivery of distance courses	1	2	3	4
d. Consider course development and teaching as credit toward promotion and tenure	1	2	3	4
e. Provide more flexibility in work schedules	1	2	3	4
f. Bring courses taught using distance technologies into regular teaching load	1	2	3	4
g. Other *(specify)*_____	1	2	3	4

Section VII. Future Goals

In the next 3 years which of the following resources do you plan to have available for your students taking courses via distance education technologies? *(Circle one response on each line.)*

	Don't know	Not available	Available for some courses	Available for all courses
a. Instructor visits remote site(s) on occasion	1	2	3	4
b. Toll-free telephone, E-mail, or other online access to instructor	1	2	3	4
c. Teaching assistant, tutor, or facilitator regularly available at remote sites(s)	4	1	2	3
d. Toll-free telephone, E-mail or other online access to teaching assistant, tutor, or facilitator	1	2	3	4
e. Toll-free telephone, E-mail, or other online access to technical support staff	1	2	3	4
f. Access to an electronic link with institute's library	1	2	3	4
g. Institution library staff assigned to assist distance education students	1	2	3	4
h. Cooperative agreements for students to use other libraries	1	2	3	4
i. Deposit collections at remote sites	1	2	3	4
j. Online access to wide area networks (e.g., Internet)	1	2	3	4
k. Courses delivered using audio conferencing	1	2	3	4
l. Courses delivered via digital conferencing	1	2	3	4
m. Courses delivered via videoconferencing	1	2	3	4
n. Courses delivered via telecourses	1	2	3	4
o. Courses delivered via Internet or online	1	2	3	4
p. Online (automated) help system	1	2	3	4
q. Other *(specify)*_____	1	2	3	4

Section VIII: Barriers

To what extent, if any, are the following factors keeping your department from starting or expanding distance education offerings? *(Circle one response on each line.)*

		Not At all	Minor factor	Moderate factor	Major factor
a)	Lack of fit with institutions mission	1	2	3	4
b)	Lack of perceived need (e.g. limited student market)	1	2	3	4
c)	Lack of support from institution administrators	1	2	3	4
d)	Lack of administratively provided time/support to learn technologies	1	2	3	4
e)	Lack of administratively provided time/support to develop course and materials	1	2	3	4
f)	Lack of faculty rewards or incentives	1	2	3	4
g)	Program development costs	1	2	3	4
h)	Equipment failures/cost of maintaining equipment	1	2	3	4
i)	Lack of access to state-of-the-art hardware	1	2	3	4
j)	Technological failures/ limitations for effective teaching	1	2	3	4
k)	Lack of infrastructure to support use of technology in distance education (tech. experts, system administrators)	1	2	3	4
l)	Concerns about faculty workload	1	2	3	4
m)	Lack of adequate compensation for faculty's time, efforts, etc.	1	2	3	4
n)	Loss of intellectual property	1	2	3	4
o)	Lack of faculty interest	1	2	3	4
p)	Lack of faculty commitment to spend the time to master the use of technologies	1	2	3	4
q)	Faculty comfort/discomfort level with the technology	1	2	3	4
r)	Lack of training to use technology in teaching	1	2	3	4
s)	Faculty resistance to distance learning	1	2	3	4
t)	Negative faculty attitudes/ unwillingness to accept new technologies	1	2	3	4
u)	Lack of faculty competence developing instructional materials for distance tech.	1	2	3	4
v)	Concern for faculty leaving do to increased use of technology	1	2	3	4
w)	Lack of face to face contact	1	2	3	4
x)	Lack of nonverbal communication between instructor and student	1	2	3	4
y)	Lack of personal contact (one on one) between instructor and student	1	2	3	4
z)	Lack of ability to teach skills requiring "hands on" instruction	1	2	3	4
aa)	Concerns about course quality	1	2	3	4
bb)	Lack of students' ability to receive a quality educational experience	1	2	3	4
cc)	Lack of student services (registration, financial aid, etc..)	1	2	3	4
dd)	Lack of access to library or other resources for instructional support	1	2	3	4
ee)	Students' ability to cooperatively form groups and problem solve	1	2	3	4
ff)	Legal concerns (e.g., intellectual property rights, copyright laws)	1	2	3	4
gg)	Restrictive federal, state, or local policies (e.g., limitations on the number of distance education credits students may earn, student ineligibility for financial aid, residency requirements)	1	2	3	4
hh)	Lack of accreditation for distance courses	1	2	3	4
ii)	Lack of student services	1	2	3	4
jj)	Other *(please specify)*	1	2	3	4

Circle the number that reflects your personal level of agreement to the following statements.
(Circle one response on each line.)

Key for items: 1 = Strongly Agree, 2 = Agree, 3 = Undecided, 4 = Disagree, 5 = Strongly Disagree

	SA	A	UN	D	SD
a. Distance education courses can be as academically rigorous as on-campus courses.	1	2	3	4	5
b. Distance education courses should become an integrated part of university curricula.	1	2	3	4	5
c. Our department needs to develop more distance education courses.	1	2	3	4	5
d. I would be willing to teach a course using distance education technologies.	1	2	3	4	5
e. Distance education is an effective educational method	1	2	3	4	5
f. Distance education courses could be offered as substitutes for some on-campus courses.	1	2	3	4	5
g. Distance education courses should be offered for college credit	1	2	3	4	5
h. Students spend less time working on distance education courses than on-campus courses.	1	2	3	4	5
i. Distance education courses are appropriate in our academic area	1	2	3	4	5
j. Teaching a distance education course would improve my on-campus teaching	1	2	3	4	5
k. Effective student-professor interaction is possible in distance education courses.	1	2	3	4	5
l. Distance education degrees should be valued as equivalent to on-campus degrees	1	2	3	4	5
m. Distance education is **not** worth the effort because of technological difficulties.	1	2	3	4	5
n. Using distance learning technology to deliver instruction improves faculty teaching skills	1	2	3	4	5
o. Teaching a distance class is a valuable educational contribution and should be considered during promotion, tenure and salary increases.	1	2	3	4	5
p. A course taught using distance learning technology does **not** use student's time as effectively as a traditional classroom course	1	2	3	4	5
q. Faculty should be encouraged to use distance learning technology for delivery of instruction.	1	2	3	4	5
r. I would like to use *(or already use)* distance education for my courses.	1	2	3	4	5
s. Students taught using distance technology learn more or better than traditional face-to-face taught students.	1	2	3	4	5
t. Spending ample time developing distance education courses is crucial to the success of the course.	1	2	3	4	5
u. Distance education courses can be an effective educational method at the undergraduate level	1	2	3	4	5
v. Distance education courses can be an effective educational method at the graduate level	1	2	3	4	5

To aid in interpreting the results of this study, please complete the following demographical information. This information will remain confidential, and will not be used to identify you or your university in the final report.

1. (1) Male (2) Female

2. What is your age? _____

3. How long have you been in an administrative position? _____

4. How many years have you taught in higher education? _____

5. How many years have you taught in secondary education? _____

6. What is your academic rank?

   (1) Professor (2) Associate Professor (3) Assistant Professor (4) Other _____

7. Do you have tenure?

   (1) Yes (2) No

8. How many courses have you taught using distance education technologies?

   (1) No courses (2) One course (3) Two courses (4) Three courses (5) Five or more courses

9. What year did you first incorporate distance education technologies into your program? _____

10. Is your agricultural teacher preparation program FTE allocation in the College of Agriculture or College of Education? *(Put the % in the appropriate blank.)*

    (1) College of Agriculture_____%(2) School of Education_____%

11. Does your department have a distance education specialist? (1) Yes (2) No

12. Can students complete their agricultural teaching certification at your institution by exclusively taking distance education courses? (1) Yes (2) No

13. How many faculty are in your agricultural teacher preparation program? *(FTE)* _____

14. What is the total student enrollment at your institution? _____

14. What is the average number of student teachers in your agricultural teacher preparation program per year?

    _____

THANK YOU VERY MUCH!!

Appendix B

E-mail to Department Heads

Thursday April 20, 2000

Dr. _____

I need your help identifying the program leader and teaching faculty in the agricultural teacher preparation program at your university. I will be mailing out my dissertation questionnaire to these two populations very soon and need your help to accurately identify the people at your institution that are part of these two groups. A program leader is the person with direct responsibility for providing the leadership for the agricultural teacher preparation program. Teaching faculty would go directly to these program leaders as the first person for program issues and concerns. Teaching faculty would be any person involved in the delivery of pedagogical courses in the process of preparing secondary agriculture teachers.

I hope these definitions will help you to identify the person(s) in each of the roles at your university. If you are unable to name all of the teaching faculty or the program leader, please forward this e-mail on to someone who can.

Thank you for your assistance and efforts toward helping me identify these two populations in our profession. If you are a program leader or teaching faculty in an agricultural teacher preparation program, please be looking for my questionnaire that will be addressing the uses, adoption, and barriers of distance education technologies in agriculture teacher preparation programs.

I am hoping to mail my questionnaire as soon as I get your response, so I will be anxiously awaiting your reply.

Thanks again.

Susie Nelson
Ph.D. Candidate
Oregon State University
112 Strand Ag. Hall
Corvallis, OR 97331
(541) 737-1338
fax: (541) 737-2256

Greg Thompson
Assistant Professor
Oregon State University

Appendix C

Panel of Experts

Dr. Lee Cole
Agricultural Education/ General Agriculture
Oregon State University
Corvallis, Oregon

Dr. Greg Thompson
Agricultural Education/ General Agriculture
Oregon State University
Corvallis, Oregon

Dr. Wayne Fanno
Agricultural Education/ General Agriculture
Oregon State University
Corvallis, Oregon

Dr. Mark Merickel
Distance and Continuing Education
Oregon State University
Corvallis, Oregon

Dr. Joanne Engel
School of Education
Oregon State University
Corvallis, Oregon

Appendix D

Pilot Study

Dr. Paul Vaughn
Agricultural Education and Communications
Texas Tech University
Lubbock, Texas

Dr. David McCracken
The Ohio State University
Columbus, Ohio

Dr. Curtis Norenberg
University of Minnesota
St. Paul Minnesota

Dr. Kirby Barrick
University of Illinois
Urbana, Illinois

Dr Edgar Persons
University of Minnesota
St. Paul Minnesota

Dr. Bob Stewart
University of Missouri
Columbia, Missouri

Dr. Richard Carter
Iowa State University
Ames, Iowa

Appendix E

Instrument Cover Letter

April 25, 2000

«FirstName» «LastName»
«Company»
«Address1»
«City», «State» «PostalCode»

Dear «Title» «FirstName» «LastName»

You have been selected to participate in a timely and important study describing the current status of distance education technologies used throughout the nation. The purpose of this questionnaire is to gather information that will provide a complete description of the barriers, attitudes, goals and future plans that program leaders and teaching faculty have for using distance education technologies to prepare secondary agriculture teachers. In addition, this questionnaire will attempt to define the stage of technology adoption and the type of technology adaptors in our profession as described by Rogers' (1995) Theory of Adoption and Diffusion.

This questionnaire is part of my dissertation, which attempts to thoroughly describe the present state of distance education technology usage as viewed by program leaders and teaching faculty throughout the nation. The questionnaires are number coded for return verification, but no individuals or institutions will be identified and all information will be strictly confidential. Completion of this questionnaire is completely voluntary, but we are looking forward to a high questionnaire return rate in order to describe the populations as accurately as possible. Questions may also be left unanswered if you feel they are inappropriate.

Although there are several sections, please take the time to complete the entire questionnaire as this will help provide a thorough and detailed picture of National experiences and plans for the preparation of agriculture teachers using distance education technologies. Please return the questionnaire using the enclosed stamped return envelope by May 10, 2000.

If you have any questions, please feel free to contact me by calling 541-737-1338 or sending e-mail to <susie.nelson@orst.edu>. You may also request a copy of the instrument and the questionnaire results via the phone number or e-mail address above. Thank you very much for your time and willingness to participate.

Sincerely,

Susie Nelson
Ph.D. Candidate
Oregon State University

Greg Thompson
Assistant Professor
Oregon State University

Appendix F

Second Mailing Instrument Cover Letter

May 22, 2000

«Title» «FirstName» «LastName»
«Company»
«Address1»
«City», «State» «PostalCode»

Dear «Title» «FirstName» «LastName»

As I have not yet received your completed questionnaire entitled, "Perceptions of Agricultural Teacher Educators Toward Distance Education Technologies", I am enclosing another copy for your convenience. Because you may be the only person to receive this questionnaire at your University, your response is critical to my research. Please disregard this letter and accept my apologies if you have already mailed in the questionnaire.

The purpose of this questionnaire is to gather information that will provide a complete description of the barriers, attitudes, goals and future plans that program leaders and teaching faculty have for using distance education technologies to prepare secondary agriculture teachers. In addition, this questionnaire will attempt to define the stage of technology adoption and the type of technology adaptors in our profession as described by Rogers' (1995) Theory of Adoption and Diffusion.

This questionnaire is for my doctoral dissertation. Although the questionnaire is lengthy, it is very thorough and has been validated by a panel of experts and pilot tested by former agricultural teacher educators. Please take the necessary time to fully complete the questionnaire and return it in the enclosed stamped return envelope by June 10.

The questionnaires are number coded for return verification, but no individuals or institutions will be identified and all information will be strictly confidential. Completion of this questionnaire is completely voluntary, but we are looking forward to a high questionnaire return rate in order to describe the populations as accurately as possible. Questions may also be left unanswered if you feel they are inappropriate.

If you have any questions, please feel free to contact me by calling 541-737-1338 or sending e-mail to <susie.nelson@orst.edu>. You may also request a copy of the instrument and the questionnaire results via the phone number or e-mail address above. Thank you very much for your time and willingness to participate.

Sincerely,

Susie Nelson
Ph.D. Candidate
Oregon State University

Greg Thompson
Assistant Professor
Oregon State University

Appendix G

Reminder E-mail

Thursday June 8, 2000

Dr. _____,

You recently received a questionnaire entitled, "Perceptions of Agricultural Teacher Educators Toward Distance Education Technologies". This e-mail is to remind you if you haven't done so already to please complete the questionnaire and return it in the preaddressed envelope. Once again completion of the questionnaire is voluntary, but we are trying to describe the population as accurately as possible and value your responses. If you have miss placed your questionnaire, I will be happy to send you another one.

Please complete and return your questionnaire by Thursday, June 15.

Thank you very much for your help.

Appendix H

Rotated Component Matrix with Varimax Rotation – Nine Barrier Factors

Barrier Statement	Factors 1	2	3	4	5	6	7	8	9
s	.85	.13	.00	-.00	.00	.123	.00	-.00	.00
t	.84	.00	.00	.00	.12	.00	.00	.00	.12
q	.83	.11	.16	.00	.14	.00	.00	-.00	-.17
p	.80	.14	.20	.00	-.00	.14	.00	-.00	-.20
u	.77	.00	.00	.00	-.00	.00	.12	.00	.23
o	.63	.21	.18	-.15	.13	.19	.00	-.00	-.00
r	.62	.19	.29	.23	.26	.00	.00	.14	-.00
v	.56	.00	.00	.26	.00	-.00	.00	.11	.00
y	.17	.87	.00	.22	.00	-.00	-.00	.00	-.13
w	.23	.84	.00	.15	.00	.00	-.00	.16	-.12
x	.16	.81	.16	.21	.11	.00	-.00	.12	-.27
z	.00	.72	.13	-.11	.00	.00	.11	.00	.26
aa	.15	.69	.00	-.12	.00	.25	.20	-.18	.27
bb	.00	.65	.00	-.00	.11	.27	.24	-.23	.41
ee	.14	.43	.12	-.00	.43	-.00	.33	.00	.11
e	.12	.00	.79	.00	.27	.16	-.15	.00	.13
f	.18	.11	.76	.00	.00	.18	.12	.00	.00
m	.19	.00	.73	.00	-.18	-.00	.25	.17	-.15
d	.17	-.00	.69	.18	.32	.19	-.00	-.00	.19

Rotated Component Matrix with Varimax Rotation – Nine Barrier Factors

(Continued)

Barrier Statement	Factors								
	1	2	3	4	5	6	7	8	9
l	.00	.23	.67	-.00	-.00	-.23	.15	-.00	-.14
i	.00	.00	-.00	.84	.00	.00	.11	-.00	.10
k	.00	-.00	.10	.75	.12	.00	.00	.00	-.13
h	.14	.00	.10	.71	.11	-.00	.00	.20	.29
j	.00	.32	.00	.66	.00	.28	.00	.00	-.17
cc	.24	.00	.13	.16	.77	.17	.22	.00	.00
ii	-.00	.19	.00	.12	.75	.00	.00	.32	-.00
dd	.30	.11	.00	.00	.72	.00	.25	.00	.00
a	.00	.15	.00	-.00	.14	.80	.00	.16	.00
b	.24	.14	.14	.17	-.00	.72	.00	.00	-.00
c	.00	-.00	.39	.26	.17	.48	-.00	-.00	.38
ff	.00	.00	.0	.00	.24	.00	.78	.21	.00
n	.19	.12	.13	.16	.17	.00	.75	.00	-.00
hh	.00	.00	.00	.00	.13	.18	.00	.81	.21
gg	-.00	-.00	.00	.15	.18	.00	.33	.73	-.23
g	.20	.11	.41	.39	.00	-.12	-.00	.26	.49

Appendix I

Rotated Pattern Matrix with Oblimin Rotation – Five Attitude Factors

Attitude Statement	Factors				
	1	2	3	4	5
r	.88	.00	.00	.00	-.00
d	.81	-.00	.00	.00	.00
i	.63	.21	.00	.21	-.00
q	.53	.21	.29	-.00	-.00
u	.00	.67	.00	.22	.15
f	.38	.64	-.22	-.00	.00
e	.28	.60	.12	.11	-.00
v	-.13	.54	.44	.00	.00
c	.38	.49	.16	.00	.00
n	-.00	.00	.83	.00	.00
j	.25	-.00	.80	-.14	.00
o	.13	.11	.50	.17	.20
m	.32	-.27	.49	.26	.00
h	.00	-.10	-.18	.81	-.00
a	-.16	.33	-.00	.69	.16
p	.18	-.13	.30	.56	-.00
l	-.11	.20	.31	.54	.00
k	.26	.00	.16	.46	.00
b	.20	.34	.00	.39	.00

Rotated Pattern Matrix with Oblimin Rotation – Five Attitude Factors (Continued)

Attitude Statement	Factors				
	1	2	3	4	5
t	-.00	.26	.21	.00	.73
s	-.00	.35	.36	.17	-.62
g	.30	-.00	.16	.30	.43