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The study of the impact of the M.S. in Agronomy Distance Education Program on student careers

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The study of the impact of the M.S. in Agronomy Distance Education Program on student careers

by

Jesse Duane Drew

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Curriculum and Instructional (Curriculum and Instructional Technology)

Program of Study Committee:
Constance Hargrave, Major Professor
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Iowa State University
Ames, Iowa

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CHAPTER 1: INTRODUCTION

The need for lifelong learning has never been more critical for agricultural professionals than it is today. Advances in technology, changes in environmental regulations, and pressures for personal advancement require learning to be a way of life for those who desire to succeed. (K. Moore, 2004, p. 1)

Lifelong learning opportunities for agricultural professionals, like a majority of other field professionals, are growing exponentially. These lifelong learning opportunities range from complete graduate degree programs to remedial job-training short courses. Adults can pursue these learning opportunities in traditional on-campus settings or through non-traditional distance education settings. As lifelong learning opportunities have increased, non-traditional distance education instructional delivery options have also expanded; however little research on the impact that distance education programs have on students’ economic status and career mobility has been conducted.

The purpose of this chapter is to provide an overview of this study, which measured the degree of economic status impact and career mobility impact that the Master of Science in Agronomy Distance Education Program had on graduates and current students. This chapter contains the following sections: background; statement of problem; purpose of study; guiding research question; methods; definition of terms; limitations of study; and summary.
Background

History of Distance Education in Agriculture

Distance education has been an essential and effective means of disseminating information and new techniques in agriculture. Since the 19th century, a variety of media and methods have been used to facilitate education when the teacher and student have been physically separated (McIsaac & Gunawardena, 1996). Media formats have included: specifically-prepared correspondence texts and books, newspaper articles and supplements, text and image posters, content-specific radio and TV broadcasts, content-specific audio- and video-cassettes, content-specific films, local instructor short courses and counseling, computer-assisted instruction, CD-ROMs, World Wide Web (WWW), and various other synchronous and asynchronous communication tools (Kaye & Rumble, 1981).

Iowa State University has been a leader in agriculture education in the state of Iowa and around the world for many years. In 1864, Iowa State University became the first land-grant institution in the nation (via the Morrill Act of 1862 by Senator Justin Morrill of Vermont), and is currently among 200+ universities and colleges currently classified as National Association of State Universities and Land-Grant Colleges (NASULGC). Former Iowa State University President Martin Jischke said: "The land-grant university is a uniquely American idea, defined by a commitment to the land-grant values of access and opportunity, combining practical and liberal education, conducting basic and applied research, and reaching out to extend the university to serve the people of the state" (Charles, 1997, ¶ 5). Still today, land-grant universities are trying to provide quality instruction to the people of their state and nation, and distance education instruction is becoming increasingly mainstream (Charles, 1997).
In the view of many, the concept of university extension was pioneered and developed by land-grant institutions (Moore & Kearsley, 2005). In January of 1902 Perry Holden, then a manager at Funk Brothers Seed Company, was asked to present a short course on corn at Iowa State University. Interest in the topic was so high that additional sessions were added to enable surrounding farmers to hear Holden’s presentation. Seeing the need for outreach to Iowa farmers, then Iowa State University President William Beardshear asked Holden to organize a new department of agronomy. Holden accepted and immediately had a positive impact working with Iowa farmers. He went on to develop the agricultural extension office at Iowa State University. With the help of the Sioux County Farmers Institute, Holden also established the nation's first county cooperative experimental farm, and by 1918 every Iowa county had an assigned agriculture extension agent. Holden and others also implemented many short course programs in communities across the state of Iowa. These short course programs that first brought Holden to Iowa State University already were being offered in Ames, Iowa, for farmers across the state. Holden took these short course programs directly to the people, delivering some via the famous “Corn Gospel Train”, which was just the beginning of agriculture education offered at a distance by Iowa State University faculty and staff (Shoemaker, 1999).

**Distance Education in Agriculture**

“What one wants to learn, what is offered, and the ways in which one learns are determined to a large extent by the nature of the society at any particular time” (Roadmap, 2003, p. 2). Ever increasing technology demands and ever changing global economic markets have made continuing education a requirement for many working adults, and have thus
resulted in the creation of many new post-baccalaureate degree programs designed for adults working in various global markets (Verduin & Clark, 1991). Additional education and training methods are needed for agricultural professionals to remain competitive, since the field of agriculture is affected immensely by global market changes (Carter, 1995, Conroy, 2000; K. Moore, 2004; Murphy & Terry Jr., 1998; Scanlon, Bruening, & Cordero, 1996).

Distance education programs designed for working professionals in either industry or government must provide students with time, location flexibility, and relevant course content. These programs also need to demand strong academic performance from their non-traditional adult students (Kaye & Rumble, 1981). A majority of distance education academic offerings provide these characteristics targeted specifically for working professionals, though delivery of instruction may differ. Some distance education courses are still delivered by correspondence via post, audio cassettes, and video cassettes. A large percentage of distance education instruction is delivered via CD-ROM and may require synchronous and asynchronous communication tools as the standard for student-to-instructor, and student-to-student interaction. Several emerging communication tools are providing highly cost-effective solutions for student-to-instructor, and student-to-student interaction. These include: Instant Messaging (IM, ICQ, AIM, Yahoo, and Google), Discussion Boards, On-Line Chat Rooms, Blogs, E-mail, Video Conferencing, and Listservs. According to McIsaac and Gunawardena (1996), the amount of information produced from these technology tools will continue to increase exponentially every year. Distance education opportunities also differ in the amount of on-campus attendance they require for degree completion and rely on either synchronous or asynchronous communication tools to bridge the location gap. Distance
education opportunities may require various levels of on-campus attendance; while others may require no on-campus attendance.

Although technology advances have made distance education opportunities easier to access, student motivation has a large influence on why adults are pursuing more education. Understanding why an adult student is enrolled in a distance education course or program can be helpful for developing program resources focused on student retention and professional growth. Adult students are either intrinsically or extrinsically motivated in their pursuit of advanced education (Fjortoft, 1995). Students’ academic motivation can depend upon personal learning characteristics, career ambition, and present and future academic and career goals. Bye, Pushkar, and Conway (2007) found the following:

Being intrinsically motivated in an academic task indicates that the student’s participation in the task is an end in itself. An intrinsically motivated student is likely to display autonomy and employ self-initiated exploratory strategies. By contrast, for a student high in extrinsic goal orientation, engaging in a learning task is the means to an end. An extrinsically motivated student seeks approval and external signs of worth and is more likely to ask procedural questions than content-enhancing questions. (p. 144)

Intrinsically motivated students are defined as those for whom the motivation to learn comes from within themselves; they are motivated by personal challenges such as goals, aspirations, enhanced job performance, awareness of insufficient work-related knowledge, and possibly a decreasing level of job satisfaction. Personal achievements such as promotion, prestige, and income are secondary to intrinsically motivated learners (Stoecker, 1991).
Extrinsically motivated students are defined as those for whom the motivation to learn comes from factors outside of themselves; they are motivated by environmental characteristics such as financial gain, promotion, and prestige. Some examples of this may be people who continually strive for better career field characteristics. Career field characteristics may include better working conditions, enhanced job security, career mobility, and any other advantage when applying for a future job or promotion (Fjortoft, 1995).

**History of the Master of Science in Agronomy Distance Education Program**

In July of 1995, the College of Agriculture at Iowa State University surveyed over 2,000 alumni about their professional development needs and their general interest in distance education. There were 702 alumni who responded identifying a need for a new type of distance education in agriculture. Results from the survey indicated that there were many career opportunities available to individuals with advanced training in agronomy, and that there was considerable interest in graduate education via distance. More rewarding work opportunities were also seen as a benefit for individuals with advanced training in agronomy.

Based upon the results of the alumni survey, the Master of Science in Agronomy Distance Education Program was established as a distance only degree program and first implemented in the fall of 1998. The initial and current program goals for students who successfully complete the Master of Science in Agronomy program are to: understand the scientific principles underlying crop management and physiology, plant improvement, climatology, soil management and fertility, integrated pest management, and the interaction of these principles; critically evaluate research in terms of design, content, potential application, and limitations with respect to agronomic systems; apply agronomic knowledge
to real-world problems via application of scientific principles; understand moral, ethical, and legal perspectives of agricultural activities; understand group dynamics and facilitate the accomplishment of individual and collective goals; communicate effectively with scientists, professionals, farmers, other professionals, and the general public for the purposes of learning and informing; and communicate electronically and utilize various Internet information services.

At the end of the fall 2005 semester, the M.S. Agronomy program had 20 graduates and 110 active students pursuing a degree. Students resided in either the United States or Canada, with about 40% living and working within the state of Iowa.

**Review of Research on Distance Education in Agriculture**

**What has been studied?**

Distance education for adult students in the United States has been established in some capacity, since the early 1900s (Moore & Kearsley, 2005). However, distance education has experienced tremendous expansion since the early 1980s, nationally and internationally (McIsaac & Gunawardena, 1996). Military and a small number of university/college continuing education centers were isolated areas of distance education use until recently when instruction delivered via a distance became more of a mainstream option for corporate and academic learning environments (McIsaac & Gunawardena, 1996). In the last 20 years, a great deal of research has been conducted in the area of distance education. The five broad areas of mainstream distance education research are: comparing academic quality of traditional on-campus courses to distance education courses; comparing traditional and distance education teaching methods; comparing traditional and distance education adult
learner characteristics; comparing distance education courseware development and instructional design principles; and distance education instructor teaching efficiency (McIsaac & Gunawardena). According to McIsaac and Gunawardena (1996) distance education research has only examined “issues that have been of particular interest to administrators of distance education programs” (p. 403). Since technology has played such a large role in the development of distance education learning environments, research has been more of a reflection of what has been done rather than the an examination of the impact of distance education learning opportunities on adult learners.

**Comparison studies on academic quality**

As distance education delivery has become increasingly mainstream in higher education and K-12 learning environments, the research has focused to a great degree on academic quality. Academic quality is often one of the first areas investigated with the development of distance education, since there is the concern that distance instruction is of less quality than traditional instruction (Benson, 2003). Academic quality was defined as the implementing of systemic evaluation cycles for continued curriculum and instructor improvement (Benson, 2003). The various geographic locations of students and instructors are not intended to dilute the quality of distance education instruction. Traditional and distance education learning environments should be comparable in the degree of rigor involved to master course content.

Instructors in both learning environments must effectively communicate to students the content being taught and integrate technology tools that will assist students in learning the content. Agriculture instructors, like instructors in other disciplines, have had to adapt their
teaching style for distance education students, and this has been and is still a learning process (G. Miller & Pilcher, 2000a).

**Comparison of traditional and distance education teaching methods**

Research has shown that distance education methods are as effective as traditional education methods in terms of cognitive outcomes when content and student characteristics are comparable (Phipps & Merisotis, 1999). However motivation and assessment play a significant role and influence students’ cognitive outcomes (Verduin & Clark, 1991). Often, distance education instructors cannot view students’ non-verbal expressions during instruction. In both instructional environments, instructor, must assess the learning styles of students. Instructors of distance education environments must use various technologies and media to assess the learning styles of students, and how they may compare or differ from traditional students.

**Comparison of traditional and distance education adult learner characteristics**

The research of Greg Miller, one of the first faculty members to research distance education in agriculture at Iowa State University, concluded that adult students prefer being able to control the pace of their learning, prefer independent study, have less need for structured learning experiences, and sometimes need less interaction with the instructor and other students than traditional on-campus students (1997). With further research, Miller also came to the conclusion that “distance education students are often older and are coordinating various job and family commitments with their learning opportunities” (G. Miller & Pilcher, 2000). These distance education student characteristics are not limited to agriculture
professionals, but encompass a large number of professional distance education students (G. Miller & Pilcher, 2000).

Distance education courseware development and instructional design principles

Research has indicated that students, who are unfamiliar with the selected user-interface embedded in distance education learning modules, spend excessive amounts of time trying to learn new technology user-interfaces and not on the content/instruction (McIsaac & Gunawardena, 1996; Phipps & Merisotis, 1999; Pomales-Garcia & Liu, 2006). Thus, the inability to efficiently access the content and instruction becomes a major obstacle in student learning (McIsaac & Gunawardena, 1996; Phipps & Merisotis, 1999; Pomales-Garcia & Liu, 2006). It is because of this that learner-designed instructional interfaces must enable successful student interaction or the possibility of content mastery many be hindered (McIsaac & Gunawardena, 1996; Phipps & Merisotis, 1999; Pomales-Garcia & Liu, 2006). Learner-designed instructional interfaces are developed with the learner’s learning style in mind. In these environments, access to student and academic resources is easy, and synchronous and asynchronous communication tools are integrated.

Technology in education should provide “…the ability to accommodate individual differences in education goals, learning styles, and abilities while allowing the convenience to access this information any time and from any place” (Born & G. Miller, 1999, p. 31). However, there is a growing realization by many distance education instructional designers, instructors, and students that no one technology, media or method can encompass all learners, rather the effective integration of several technologies, media and methods will enable more students to learn content more effectively (G. Miller, 1997). Several
technologies and media are used in distance education course development and delivery; distance education program designers must determine what technologies and media provide the best delivery of instruction to their students.

**Distance education instructor teaching efficiency**

It has been documented that teaching at a distance can be more complicated, especially when teaching non-traditional students, than teaching face to face (Born & G. Miller, 1999; Garrison, 1989). Though instructor communication/contact with distance education students may sometimes be limited, instructors must understand the characteristics of their students. Distance education instructors must identify external aspects of student learning and the connection those have to the technology, and the opportunity for increased cognitive development (Born & G. Miller, 1999; Garrison, 1989).

Using different technologies and media to effectively present students with content is one area in which instructors must be skilled, or student interest and achievement outcomes may decline (B. Willis, 1994). Instructors must also be skilled in facilitating synchronous and asynchronous communication. However, many times students wait for the instructor to lead listservs, discussion boards, and blogs. Students must have technology tools that use resourceful user-interfaces, because without these, the ability to learn content and communicate with others effectively may be hindered (B. Willis, 1994).

In summary, distance education programs designed for working professionals, and more specifically agriculture professionals provide flexible 24/7 access, location flexibility, and relevant course content. Analyzing the impact that these learning opportunities have provided to students is an area of research that we will examine.
Statement of Problem

Increased use and availability of technology in many global economies are two contributors to why adult education has evolved into a critical component for many business and academic institutions. Academic institutions have a long history of developing new educational training programs for adults. For the first time in American society, adults outnumber youth, and this population trend, at least within the United States is likely to continue (Roadmap, 2003). Globalization and increase in technology use bring about change and the need to learn new career skills (Merriam & Caffarella, 1999). Lifelong learning is no longer an option for many working professionals, but a requirement that can be achieved with many of today’s distance education learning opportunities.

Education, whether in a traditional or distance setting, is aimed at enabling students to achieve mastery of content and apply this knowledge to real-world situations. So far, distance education research has focused on numerous comparison studies between traditional and non-traditional learning environments and instructional design principles. However, few research studies have focused on the impact that earning a distance education Masters degree has on students’ current and future career mobility and economic status.

Purpose of Study

The purpose of this study was to examine the impact of an online Master’s degree in Agronomy on adult students’ economic status and career mobility.
Guiding Research Question

This study sought to answer the following research question: Has the Master of Science in Agronomy Distance Education Program had an impact on students’ economic status and career mobility?

Methods

To address the guiding research question, a survey of M. S. Agronomy students was conducted. The survey was quantitative in nature and included open-ended items to gather narrative data from respondents. Quantitative researchers are interested in the collection and analysis of data. Data can be gathered using several instruments, but questionnaires and other formal paper-and-pencil instruments are commonly used (Gay & Airasian, 1996, p. 8). The data collected through this study were used to measure the impact that the M.S. in Agronomy Distance Education Program had on economic status and career mobility of the students. The Distance Education Impact Assessment Survey (DEIAS) was developed and administered to the participants.

Definition of Terms

Distance Education - Formal education where instructor and students are separated by geographical location, several instructional telecommunication tools are used to connect students, resources and instructor/s, and communication occurs synchronously and asynchronously.

Master of Science in Agronomy - College of Agriculture graduate distance education degree program at Iowa State University. The focus of the program integrates knowledge and
development in the areas of climatology, crop production, soil and water management, and integrated pest management.

**Non-traditional Student** - A student who is over the age of 24, and meets any of the following characteristics: employed full-time by their employer while enrolled in M.S. Agronomy program coursework; pursuing an advanced degree from a higher education institution; has dependents other than a spouse; and receives content instruction via various distance education technology tools.

**Career Mobility** - Flexibility and ease with which a career can change to meet new demands and opportunities.

**Economic Status** - Form of compensation, usually monetary, that sometimes signifies one’s job importance. Current and future economic promotion and prestige, job morale, job satisfaction, and job security should be taken into account when considering this.

**Teaching Efficiency** – Using instructional resources to assist in the creation and instruction of curriculum, so that students are better able to attain and apply learned materials in real-world settings.

**Limitations of Study**

There were four limitations that may have affected the data generation process, the results of the study, and the interpretation of the results. They were: varying definitions of perceptions, administration of survey, association of DEIAS to program, and voluntary DEIAS participation. Impact evaluations are a difficult challenge faced by evaluators of any type of educational program and may be the most neglected facet of evaluation. Cautious conclusions need to be made from impact claims since there are a number of uncontrolled
variables with the potential for impact that may or may not have been measured. Also, it should be acknowledged that reliability is often a concern with self-reported, impressionistic data collection (Ring & Reeve, 2002). First, respondents were asked to identify the perceptions of their supervisor/s and co-worker/s. Perceptions can mean different things to various people, resulting in inconsistencies. Assessing perceptions has proven complex and challenging as it relates to behaviors on the job (Thompson, Brooks & Lizarraga, 2003).

Second, the Distance Education Impact Assessment Survey (DEIAS) was not part of an end-of-the-year regular program or course evaluation, and could possibly have been delivered when students were not currently enrolled in a course. The M.S. in Agronomy Program defines active students as those who have registered for at least one course within the last academic year. With the completion of 10 or more credits as a way of selecting the sample, many students in the program whose career or economic status may have been affected were not included in the survey. Completion of ten or more credit hours was the requirement for participation in the study because it represented one-third of the program credits needed for degree completion.

Third, the distribution of the DEIAS was connected to the M.S. Agronomy program and this may have caused students to inaccurately portray the degree of career and economic impact that the Master of Science in Agronomy distance education program had on them. Possibly organizing and delivering the survey with no program affiliation may have allowed survey respondents to portray their career and economic experiences more truthfully.

Finally, no incentive or penalty was offered to students for their DEIAS participation or lack thereof. This may have affected student motivation to complete the survey.
Summary

The purpose of this chapter was to provide an overview of the research study. Distance education has been an important delivery method for education, and more specifically agriculture education for many years. Developments in communication tools and technologies have enabled educational opportunities to geographically dispersed students, not only for mainstream course instruction, but more importantly specialized course instruction (McIsaac & Gunawardena, 1996). Certain characteristics of instructional delivery methods allow for some to be more effective than others. This study used a survey to measure the impact the M.S. in Agronomy Program had on students’ economic status and career mobility.
CHAPTER 2: LITERATURE REVIEW

Introduction

Access to convenient and relevant continuing education and on-the-job graduate programs for field agronomist should be developed. Convenience could be enhanced by using emerging distance learning techniques…optional graduate programs should be developed specific to needs of company field agronomists and crop consultants. These should emphasize communication skills, field crop diagnostics, and business skills, with less than the traditional focus on research (Carter, 1995, p. 136).

The landscape of education in general has changed dramatically in the last 30 years. Most evident is the need and growing demand for distance education, especially in agriculture. The purpose of this chapter is to provide an overview of the development and growing need for distance education in higher education and to review the relevant research literature. In this chapter a brief history of the development of distance education is presented. This sets the stage for examining current models of distance education, types of distance education courses, programs, and student participants. Finally, distance education offerings in agriculture are presented.

The Need for Distance Education in Agriculture Higher Education

In 1995 at the 50\textsuperscript{th} Annual Corn & Sorghum Research Conference, Paul Carter, a well-known agronomist and global agronomy sciences manager at Pioneer Hi-Bred International, Inc., delivered a challenge to higher education institutions. He asked them to integrate emerging distance education technologies into their continuing education offerings, as well as improve/add to their offerings (Carter, 1995). Developing advanced degree
programs with content that is pertinent to the needs of company field agronomist and crop consultants he argued is no longer an option, but a must for working professionals (Carter, 1995).

With advances in technology and economic development, there has been an increased demand for continuing education (McIsaac & Gunawardena, 1996). There is growing pressure for many workers to increase their knowledge base and technology skills to survive professionally. Providing learning opportunities to current and future adult workers is an area of increased priority for both businesses and higher education institutions (McIsaac & Gunawardena, 1996).

In July 1995, the College of Agriculture at Iowa State University surveyed more than 3,000 alumni residing in Iowa about their professional development needs and their general interest in distance education instruction. There were over 700 responses to the survey from alumni. (Some of the returned surveys were removed if the alumni member had already received an advanced degree, identified an undergraduate degree outside the target population, or received their undergraduate degree prior to 1980.) There were 617 responses that were analyzed identifying a need for a new Masters degree program offered via distance education in agriculture (Moore, Shibles, Burras, Campbell, Cruse, Hall, Killorn, Knapp, Owen, & Taylor, 2000).

Results from the survey indicated that there were many career opportunities available to individuals with advanced training in agronomy, and that there was considerable interest in graduate education via distance. The main emphasis was for students to develop superior problem-solving and communication skills in agronomy by integrating crop, soil, climate, and pest management disciplines. More rewarding work opportunities were also seen as a
benefit for individuals with advanced training in agronomy (Moore, Shibles, Burras, Campbell, Cruse, Hall, Killorn, Knapp, Owen, and Taylor, 2000).

**History of Distance Education Models and Methods**

To fully understand the current methods and approaches of contemporary distance education, it is necessary to understand the progression that distance education has undergone. Distance education, distance learning, or e-learning are terms used to define a structured learning environment in which the student and instructor are separated by time and place, and where learning and teaching take place at a distance (Moore & Kearsley, 1996; Bates, 1990; Keegan, 1986). Distance education is not a new method of instruction although newer technologies have made it an accessible and viable option for students at all levels, especially adult students wanting to pursue career-specific advanced degrees. In the following section, a review of the history of distance education is presented. This brief history focuses on the methods and technologies used to provide education at distance.

Distance education was a way for learners who were unable to obtain a traditional education, and more recently for non-traditional students who wanted a university degree, to earn a degree (Keegan, 1980). Distance education is a way for adult students to partake in essential life-long learning opportunities. Currently, distance education is the fastest growing form of domestic and international education and is predicted to become even more integrated in society’s educational and business entities (Moore & Kearsley, 2005). The 2005 Sloan-C Foundation report stated 56% of all higher education institutions identified distance education as part of their critical long-term strategy (Allen & Seaman, 2005). Concepts of lifelong learning, individualized or personalized learning, and time-free, space-free and just-
in-time learning arrangements have emerged and have and will continue to grow in popularity (American Council on Education, 1996).

Numerous journal articles, dissertations, books, conferences, and research projects have focused on distance education research. Many researchers have defined and assigned technologies into specific eras of distance education history. In 1989, Søren Nipper classified distance education into three generations: correspondence teaching/single mode; multi-media distance education; and tele-education. More recently, Michael G. Moore and Greg Kearsley classified distance education into three (1996) and five (2005) historical generations. In 2005, they defined the five historical generations of distance education as: correspondence, broadcast radio and television, open universities, teleconferencing, and computers and internet-based virtual classes. Moore and Kearsley’s five generations of distance education are described in detail below.

Moore and Kearsley’s Five Generations of Distance Education

Distance Education via Correspondence

The first generation of distance education, according to Moore and Kearsley (2005) is correspondence education. Correspondence education is a one-way mode of communication model in which the student and instructor interact via postal mail. Correspondence education allows for instructor to student or student to instructor communication, and usually consists of assigned readings and homework (Moore & Kearsley, 2005). Print media, such as journals and textbooks that students receive by postal mail, are forms of correspondence educational materials used for distance education instruction (Bates, 1991). In most cases, the instructor’s
only interaction with the student is in the form of comments on their homework returned to the student via post mail.

Early pioneers of correspondence courses include Sir Isaac Pitman and Anna Eliot Ticknor. In 1840, Sir Isaac Pitman developed “Composition Through the Medium of Post” in Great Britain, which provided shorthand vocational and non-credit instruction via correspondence. In 1873, Anna Eliot Ticknor developed the first home study schools as a Boston-based society; and in over 24 years of service, she enrolled more than 10,000 students.

Originally, correspondence education was considered inferior to traditional education, since a majority of the students were not considered part of society’s elite (Moore & Kearsley, 2005). A majority of correspondence students were unable to enroll full-time at colleges or universities due to many factors. “Many educators regarded correspondence courses as simply business operations” (McIsaac & Gunawardena, 1996, p. 403).

Land-grant universities introduced correspondence instruction into the practical arts of agriculture, engineering, business, and home economics in the late 1800s. In fulfilling the land-grant mission, correspondence instruction was a powerful tool for reaching citizens not on campus. Land-grant universities have led the world in developing the correspondence methods of instruction (Moore & Kearsley, 2005). Correspondence instructional offerings are still available today in many disciplines and countries.

A high-dropout rate was and is one of the drawbacks with correspondence education (Bates, 1990). Correspondence education by its very nature is distance education.
Distance Education via Broadcast Radio and Television

According to Moore and Kearsley (2005), radio and television is the second generation of distance education. Radio and television were first introduced as a method of education in 1921 and 1934 respectively (Moore & Kearsley, 2005). Access to broadcast technology, the equipment that makes radio and television operate, made radio and television a one-way mode of communication. Generally, the instructor broadcasts instruction via radio or television, and students receive the instruction by listening and watching. Some radio and television instructional programs provide print materials as a supplement to the instruction (Moore & Kearsley, 2005).

In the 1920s, there were more than 176 radio stations constructed at educational institutions; few of them survived the decade. In 1932, the Joint Radio Survey Committee surveyed 71 land-grant colleges and separate state universities. Of those 71 land-grant colleges and separate state universities, 24 owned and operated broadcasting stations; 19 of which were owned by land-grant institutions. Agricultural extension played an important role as land-grant colleges tried to reach a large number of farmers and homemakers in each state through the radio (Tyler, 1933). “Discovering that they have in the radio a new medium for reaching large numbers, the agricultural colleges have been quick to seize the radio and use it for giving weather reports, market reports, and technical information in agricultural colleges and home economics” (Tyler, 1933, p. 93).

In the early 1930s, experimental television teaching programs were produced at the University of Iowa, Kansas State College, and Purdue University. However, it was not until the 1950s that college credit courses were offered via broadcast television. Beginning in 1951, Western Reserve University was the first to offer a continuous series of such courses,
and the Sunrise Semester was offered by New York University on CBS from 1957 to 1982 (Holmberg, 1986; Moore & Kearsley, 2005; Schlosser & Anderson, 1994).

Radio and television had the attraction of “immediacy”, since their delivery flexibility allowed for updated reports, access from almost anywhere in the world, provided students a sense of community, and allowed for panel discussions, phone-ins and presentations (Moore & Kearsley, 2005, p. 78). Although radio presentations were more cost effective than television presentations, both media forms fostered similar benefits, and allowed adults educational opportunities that previously did not exist (Thompson, Simonson, & Hargrave, 1991).

**Distance Education via Open Universities**

The third generation of distance education, according to Moore and Kearsley is Open Universities. The United Kingdom Open University (UKOU) is considered the most successful distance education institution in the world and was established in 1969. The most unique characteristic of the UKOU is that it requires no formal education requirements for admission. Most of the UKOU students are pursuing associate, undergraduate, or postgraduate degrees. The mission of the UKOU is to combine several communication technologies, entire degree curriculum and offer instruction via distance education (Moore & Kearsley, 2005).

In 1972, the UKOU began to emerge as the premier distance education university in the world. With an annual enrollment of 200,000 adult students and approximately 20,000 graduates each year, the UKOU demonstrated the potential for delivering high quality distance education regardless of student geographic locations or previous academic experiences (Moore & Kearsley, 2005). The UKOU model was based on the 1969 University
of Wisconsin’s Articulated Instructional Media Project (AIM), which combined several communication technologies of the time, and delivered distance education instruction as a total system (Wedemeyer & Najem, 1969).

The UKOU model has been adopted by many countries in both the developed and developing parts of the world (Keegan, 1986). Some of the most highly successful open universities in regard to student enrollments include: Communication University of China (China), Universitas Terbuka (Indonesia), and Anadolu University (Turkey). These institutions have enrollments of 250,000 students per semester. However, some of these open universities only use a one-way mode of communication as their primary instructional method, and a great deal of instruction is done through print correspondence.

**Distance Education via Teleconferencing**

Teleconferencing or Interactive Television (ITV) is a system that allows for live two-way audio and video communication. Teleconferencing allows for students at two or more locations to actively participate in a real-time electronic conversation (Moore & Kearsley, 2005; B. Willis, 1994). Teleconferencing was significant in that it allowed adult students, who were motivated to participate in a formal educational setting, an option of instruction that previously was not available (McIsaac & Gunawardena, 1996). An Adult student is defined as one “whose principal identities have evolved beyond the role of full-time student” (CAEL, 1999, p. 1). In the 1970s and 1980s, a variety of technologies were used for teleconferencing, including telephones, telephone lines, televisions, cable lines, fiber optics, satellites, and satellite links (McIsaac & Gunawardena, 1996; Moore & Kearsley, 2005). Developed for group use and integrated into mainstream education in the 1980s, teleconferencing is still a commonly used form of distance education.
There are four categories that usually define teleconferencing; audio-only, audiographics, video, and computer conferencing (McIsaac & Gunawardena, 1996). Audio-only allows for two-way communication, and has been classified as the simplest form of teleconferencing (B. Willis, 1994). Audiographic combines voice communication with still image and data technologies, although audio remains the main communication mode (B. Willis, 1994). Video combines audio and video technologies (full motion and still images) to deliver instruction, and video is the primary communication mode. Computer conferencing is a way for an instructor to support and organize all student communication using a system that resembles a bulletin board (B. Willis, 1994). A computer conference can maintain all class communication and be a hub for course instructional files (B. Willis, 1994). Students with an Internet connection are able to participate in course discussions between instructor-to-class, instructor-to-student, or student-to-student (B. Willis, 1994). Although the technologies used between the four categories differ, they are all considered forms of teleconferencing.

One technology used in the teleconferencing era was fiber optics. Fiber optics is glass or plastic threads/fibers that are bundled and capable of transmitting data via light waves. Two main advantages for using fiber optic cables is that the bandwidth has a larger carrying capacity, signals are stronger, which allow for more data to be transmitted, and transmitted data is digital (ARC Electronics, 2005). While the initial cost of fiber-optic systems is high, the long-term savings and benefits of the technology outweigh the initial cost (Moore & Kearsley, 2005). The development of fiber-optic communication systems in the late 1980s and early 1990s allowed for the expansion of live, two-way, high-quality audio and video systems in education. With these advances, several states and business organizations
developed technologies to provide lifelong learning opportunities to almost all geographic locations.

In 1987, the United States Congress authorized the Star Schools Program Assistance Act that encouraged the integration of telecommunications in education (Sorensen, 1997). The aim of the Star Schools Act was to “develop, construct, and acquire telecommunication facilitates and equipment in order to improve the instruction of mathematics, science, and foreign languages, and for other purposes” (U.S. Congress, 1987, p. 1). K-12 education was the main emphasis of the Star Schools Act, but higher education institutions as well as state educational organizations also benefited from the program and in 1992, Iowa received a special statewide Star Schools grant to demonstrate the use of fiber-optic technology in education. Fiber-optic technology allowed for greater levels of interactivity than earlier technologies used for distance education instruction (Sorensen, 1997). The grant and several more funding initiatives allowed Iowa became the most comprehensive statewide fiber-optic system in the United States (IPTV, 2006). The Iowa Communication Network (ICN) provides full-motion, two-way interactive video, data (Internet), and voice services as part of their video site classrooms. There are over 774 video site classrooms at the end of 2005 and approximately 3,300 miles of fiber-optic cable covering the state, putting every citizen within 15 miles of a video site classroom (IPTV, 2006). The classroom sites range statewide to include K-12 learning environments, community colleges, public universities, private colleges, public libraries, medical facilities, federal and state agencies and National Guard armories.
Distance Education via Computers and Internet-Based Virtual Classes

In 1939, the first digital computer was developed by Dr. John Vincent Atanasoff, who was an Iowa State University professor at the time. He didn’t receive full credit for his invention until 58 years later in 1987. Between 1939 and 1987 computers improved many times and became more integrated as a means of communication. In the 1970s, the first computer network system was established through the Programmed Logic for Automatic Teaching (PLATO) project at the University of Illinois. It allowed sites to communicate using either dial-up telephone lines or committed telephone line connections (B. Willis, 1994).

Based on the inventions in the 1970s, computer-based instruction increased dramatically by the end of the decade. Intel developed the first microprocessor in 1971, and the Altair 8800 was the first personal computer in 1975. Although the Altair 8800 was sold as a kit through Popular Electronics magazine, the computer was powerful, useful and had an expandable system design. In the 1980s and 1990s, computer graphics, color, audio, and authoring languages became more readily available. This allowed computers with a variety of software capabilities to become integrated into education, businesses, and home environments (B. Willis, 1994; Moore & Kearsley, 2005).

The National Sciences Foundation (NSF) developed NFSNet in the mid-1980s, which was a network of five supercomputer centers connected to universities and research organizations and was called the first “Internet” (B. Willis, 1994, p. 201). Later on, NFSNet included additional universities, colleges, community colleges and K-12 schools and provided access to the Internet (B. Willis, 1994). NFSNet was used for asynchronous communication (e-mail and bulletin boards), exchanging data files, and accessing library
resources via a wide-area network (WAN). This allowed for one local-area network (LAN) to link to another LAN, and other LANs, to form a WAN (B. Willis, 1994). The NFSNet system was updated in 1987, and again in 1992 (B. Willis, 2004; Moore & Kearsley, 2005). This was the predecessor to the World Wide Web (WWW) as we know it today.

Not until 1993 did distance education programs start developing and delivering instruction using computer-related technologies and software that could be accessed using personal computers (Moore & Kearsley, 2005). In 1993, Mosaic was the first web browser that made it possible to deliver instruction over the WWW. The WWW first linked users to pages created in Hypertext Markup Language (HTML), to be viewed by a Web Browser (Mosaic and Netscape) (Patterson, 1996). The WWW gave educators a powerful new medium for distance learning environments (Moore & Kearsley, 2005). Later on, other computer programming languages (JavaScript, Java, ASP, C++, etc.) were used with HTML for web page development, and were viewable by several web browsers (Internet Explorer, Firefox, Opera, Safari, Netscape, and others). With billions of web pages available on the WWW today, it is hard to believe that in 1992 it was estimated to contain only fifty pages (Maddux, 2001).

Moore and Kearsley’s five generations of distance education chronicle the development and uses of technology to support teaching and learning at a distance. Distance education has been apart of formal education for more than 125 years. As technology and media have become more cost effective, instruction has required more efficient instructional delivery modules. During the late 1990s, distance education courses started using Compact Disc-Read Only Media (CD-ROM) and asynchronous communication tools to assist in the
delivery of instruction (Allen & Seaman, 2003). These forms of technology, along with the WWW are prevalent in distance education today.

**Current Distance Education Methods**

Today’s society is facing a technological revolution where technology and information are constantly changing. This society is requiring that the workforce continually gain new knowledge to remain productive. It is clear that someone that continues to learn throughout his/her lifetime will be a productive member of the workforce. Distance education provides an avenue by which individuals can access this new information and continue to learn for the rest of their lives (Miller & Pilcher, 2000, p. 61).

A key difference between traditional and distance education learning environments is that traditional learning environments require learners to meet at a regularly scheduled time, in a regularly scheduled place to receive instruction. This type of traditional course meeting is defined as synchronous. Synchronous, in distance education includes delivery methods that require regularly scheduled times to use communication technology tools. Technologies include: video-conferencing, teleconferencing, chat and video rooms. Asynchronous, in distance education includes delivery methods which allow students to engage in course content and activities when and where they want using various technology tools. Asynchronous distance education technologies include: interactive multimedia on the WWW, CD-ROM, or DVD, videotapes, discussion boards, email, blogs, and listservs. Asynchronous communication tools allow users the flexibility of interacting with classmates and the instructor anytime. This level of communication flexibility is one of the main reasons
adult students enroll in distance education courses and programs (McIsaac & Gunawardena, 1996).

There are two major approaches to providing education at a distance. The two approaches are: Online and Blended/Hybrid learning. An online course is one in which at least 80% of course instruction is delivered online (Allen & Seaman, 2005). Most distance education courses today deliver instruction on CD-ROM, DVD, or through the WWW (Allen & Seaman, 2005). Typically, online courses do not include any face-to-face meetings. If online courses have face-to-face meetings it is less than 20% of the course meeting time (Allen & Seaman, 2005). Some distance education programs require students to appear on campus for activities or workshops at various points during the duration of their degree program (Waits, 2003).

Blended/Hybrid distance learning is defined as instruction that integrates both online and face-to-face instruction. Blended/Hybrid course instruction contains between 30-79% of instruction online, and face-to-face instruction makes up the remainder (Allen & Seaman, 2005).

Both online and blended/hybrid approaches to distance education require educators to be concerned about the instructional design of course content. Program administrators, policy makers, instructional designers, and curriculum content experts encourage the use of the latest software and technology tools. However, they often have not identified which tools to integrate with student needs and characteristics (Sherry, 1995). That is, learning activities need to be planned and organized, assessments and evaluations (formative and summative) implemented, and the integration of the latest software and technology tools must assist students in the mastery of content. Educators, policy makers, and students need to realize
that “…there is no one super-technology for distance education” (Bates, 1991, p. 14).

Technology in education should provide “…the ability to accommodate individual differences in education goals, learning styles, and abilities while allowing the convenience to access this information any time and from any place” (Born & Miller, 1999, p. 31).

Many distance education programs are becoming creative in meeting the needs of their distance education students, and many students are becoming increasingly comfortable with the systems being used (Allen & Seaman, 2005). More recently, Digital Video Disc (DVD) and various synchronous communication tools are used to deliver course instruction (Allen & Seaman, 2003). A majority of courses use the WWW to deliver instruction, but CD-ROMs and DVDs are viable and popular options of delivering instruction (Allen & Seaman, 2005). These two options do not require students to have a 24/7 active Internet connection. WebCT and Blackboard are two distance learning management systems that integrate several synchronous and asynchronous communication tools. Chat-rooms, e-mail, instant messaging, and blogs, are some popular communication tools used for distance education classroom communication.

The research literature in distance education emphasizes the importance of well-designed user interfaces. Students, who are unfamiliar with the selected user-interface embedded in learning modules, spend excessive amounts of time trying to learn the user-interfaces and not mastering the content (McIsaac & Gunawardena, 1996). Technology tools that allow users to easily navigate a user-friendly interface give students the ability to learn content effectively (B. Willis, 1994). Although there are many technologies used to develop and deliver distance education instruction, it is important to realize that the technology tools need to complement the learning environments and meet/match learner characteristics. The
instructional design of distance education learning environments must be an integral part of effective distance education courses. Well-designed learning environments enable successful student interaction and mastery of content (McIsaac & Gunawardena, 1996). Distance education instructional designers and instructors have come to the realization that no one technology, media or method can meet the needs and styles of every learner. Rather these experts realized that the effective integration of several computer technologies, software, media, and teaching methods will meet the needs and styles of more students and help students learn more effectively (G. Miller, 1997).

**Distance Education Participants and Their Motives**

Today’s online students consist primarily of working adults who are trying to better their professional opportunities, as there is an increased need for knowledge and skills required by professionals (Moore & Kearsley, 2005). “Technology has driven the growth of distance learning opportunities, as students who are “time bound” due to job or travel difficulties, or “place-bound” due to geographic locations, can now access courses and degree programs at their convenience” (Zirkle, 2003, p. 13). The majority of United States distance education students are adults, between the ages of 25 and 50 years, work full-time, and have various family and social commitments (Allen & Seaman, 2005; Harasim, Hiltz, Teles & Turoff, 1995). Adult students enroll in several types of distance education courses, such as: high-school level courses, non-credit college courses, and credit undergraduate and graduate courses (Moore & Kearsley, 2005). Additionally, an increased number of adult students are enrolling in distance education undergraduate and graduate degree programs (Allen & Seaman, 2005). “The need for certification and for education to be viewed as a
continuing or lifelong need have brought an increasing number of adults into universities” (Harasim, Hiltz, Teles & Turoff, 1995, p. 13). There are a few major adult-centered distance education universities; all which are accredited. These include the University of Phoenix, Capella University, Western Governors University, and Penn State Universities World Campus.

Distance education instruction is particularly beneficial when essential learner characteristics have been identified; the essential student characteristics include age of learner, cultural or socioeconomic background, geographic location, academic interest, work experiences, and educational level (Sherry, 1995). A majority of adult students, particularly adult distance education students, are enrolled in courses part-time. Adult students’ work, family and social commitments take up the majority of their time, and this has an impact on the amount of study time they have available (Harasim, Hiltz, Teles & Turoff, 1995). Time required for mastery of content is more important than tuition costs, since adults students are more likely than traditional on-campus students to receive employer tuition reimbursement (Zirkle, 2003). Adult students prefer independent study and want to control the pace of their learning. In comparison to traditional college students, adult students have less need for structured learning experiences, and sometimes need less interaction with the instructor and other students (Moore & Kearsley, 2005). Agriculture professional adult students have the same work, family and social commitments and study characteristics as other adult distance education students (G. Miller, 1997). G. Miller and Shih (1999) reported faculty perceptions that “off-campus students were more eager to learn than on-campus students, brought considerable amounts of experience to their courses, and expected to be able to apply the information immediately” (p. 52).
Online student enrollment has increased from 1.6 million in 2002 to 2.35 million in 2004, representing an 18.2% per year growth rate. This is more than ten times that projected by the National Center for Education Statistics for the general postsecondary student population (Allen & Seaman, 2005). This growth rate greatly exceeds the overall growth rate of the traditional higher education student body. Learners enrolled in Master’s Degree programs or courses are more likely than undergraduates to report that their entire program is available at a distance (NCES, 2002). Sixty-nine percent (69%) of large public universities offer both face-to-face Master’s programs and online Master’s programs (Allen & Seaman, 2005). Adult learners can find distance education programs in many disciplines. Some of the most common fields include: social services, engineering, information technology, health-related fields, applied arts, education, and business (Allen & Seaman, 2005).

The academic programs at Capella University, (a for-profit, higher education institution based in Minneapolis, MN,) strive to provide their adult students with courses and programs that will have an immediate impact on their work, provide sustained value to them as professionals, and offer what they define as “intimate learning experience” (Educational Pathways, 2003, p. 2). More so than ever, adult students need to identify the connection between their careers and education (Educational Pathways, 2003). It is this relevance that is driving adult students into distance education courses and programs.

**Motivation of Adult Students**

Adult students are driven by intrinsic or extrinsic motivation factors, and a majority of the time they are driven by both (Harasim, Hiltz, Teles & Turoff, 1995). The on-going need to learn, coupled with the fact that students can learn new information from a desk at
work or at home, has significantly increased the number of adults who are pursuing instruction via distance education (Harasim, Hiltz, Teles & Turoff, 1995).

Students’ academic motivation can depend upon personal learning characteristics, career ambition, and present and future academic and career goals. Intrinsically motivated students are defined as those for whom the motivation to learn comes from within themselves; they are motivated by personal challenges such as goals, aspirations, enhanced job performance, awareness of insufficient work-related knowledge, and possibly a decreasing level of job satisfaction (Fjortoft, 1995; Stoecker, 1991). Personal achievements such as promotion, prestige, and income are secondary to intrinsically motivated learners (Fjortoft, 1995; Stoecker, 1991). Some researchers think that intrinsic motivation is what motivates adult learners the most (Harasim, Hiltz, Teles & Turoff, 1995; Fjortoft, 1995).

Extrinsically motivated students are defined as those for whom the motivation to learn comes from factors outside of themselves; they are motivated by environmental characteristics such as financial gain, promotion, and prestige. Some examples of this may be people who continually strive for better career field characteristics. Career field characteristics may include better working conditions, enhanced job security, career mobility, and any other advantage when applying for a job or promotion (Fjortoft, 1995). Students’ employment can provide motivation and stimulation to finish and do well in a course (Harasim, Hiltz, Teles & Turoff, 1995). However, their employment can also be the main contributor in regards to insufficient study time, since “time at work is in direct competition with time to study” (Harasim, Hiltz, Teles & Turoff, 1995, p. 75).

As adults continue to improve their career skills and knowledge, more adults will pursue opportunities to enter into occupations yielding higher returns in earnings. According
to the U.S. Department of Commerce, higher levels of education are associated with higher earnings (Education and Training for the Information Technology Workforce, 2003).

According to Becker (1993), education and training are the most important investments in human capital. A correlation between education and subsequent earnings is often explained by the human capital theory. The human capital theory suggests that skills acquired in school contribute to an individual’s subsequent economic and career productivity (Becker, 1993).

The economic benefits for individuals who pursue and complete post-secondary education are greatly enhanced compared to individuals who only finish high school. The possibility and societal importance of promotion, income, prestige, and professional rewards can be important influences on adult students’ extrinsic motivation (Fjortoft, 1995; Stoecker, 1991).

The potential for increased earnings is a popular reason why adult students are enrolling in distance education opportunities (Fjortoft, 1995; Stoecker, 1991).

**Adult Distance Education Students**

Research has shown that distance education methods are as effective as traditional education methods in terms of cognitive outcomes when content and student characteristics are comparable; however motivation and assessment factors can have a significant impact on cognitive outcomes (Fjortoft, 1995; Stoecker, 1991; Verduin & Clark, 1991). Whether in a distance or traditional educational setting, the goal for students is the same – master content, develop lifelong learning skills, comprehend instruction, and apply learned knowledge and skills (B. Willis, 1992).

Much of traditional education is based on the theory of pedagogy. Pedagogy is defined as the art and science of teaching children (Hiemstra & Sisco, 1990). More appropriate for distance education (and this study) is andragogy. Malcolm S. Knowles
developed the theory of andragogy and defined it as the art and science of teaching adult students (Knowles, 1970). His goal was to develop a theory specifically for adult learning and for adult learning programs. Knowles emphasized that adults need to know why they need to learn something, and should be expected to take responsibility for their own decisions (Knowles, 1970). He believed that adult students learned best when the instruction was of immediate value, took initiative to learn, and used problem-solving skills to master and apply the instruction. However, there has been much debate about the differences between pedagogy and andragogy; and Knowles later stated that

… andragogy is simply another model of assumptions about adult learners to be used alongside the pedagogical model of assumptions, thereby providing two alternative models for testing out the assumptions as to their ‘fit’ with particular situations. Furthermore, the models are probably most useful when seen not as dichotomous but rather as two ends of a spectrum, with a realistic assumption (about learners) in a given situation falling in between the two ends (Knowles, 1980, p. 43).

The population of adult education students is expected to grow significantly by 2012 in post-secondary education. According to the U.S. Department of Education, the post-secondary enrollment figures for students who were 25 years of age and over in 2000 was 6 million, which was a decrease of 2 percent from 6.1 million in 1992 (Husser & Gerald, 2002). The post-secondary enrollment figure for students who are 25 years of age and over for 2012 is 6.7 million, which would be an increase of 12 percent (Husser & Gerald, 2002). The need for adults to gain additional education and specialized training to update and improve their skill sets, accounts for the increase (Husser & Gerald, 2002).
Research in Distance Education

Distance education for adult students has been a part of education in the United States since 1873 (Moore & Kearsley, 2005). Until recently, distance education was relatively isolated as it was used primarily by the military and a small number of university/college continuing education centers. Distance education has become increasingly integrated into higher education, K-12 education, and corporate training (Allen & Seaman, 2005).

Although a great deal of research has been conducted in the area of distance education, McIsaac and Gunawardena (1996) and Schloseer and Anderson (1994), as well as others have concluded that most distance education research has focused on student outcomes for individual courses rather than for entire academic programs. McIsaac and Gunawardena (1996) stated that research examined “issues that have been of particular interest to administrators of distance education programs” (p. 403). Since technology has played such a large role in the development of distance education learning environments, research has been more of a reflection of what has been done and has not examined the personal, career, or economic impact that distance education learning opportunities have had on adult students (McIsaac & Gunawardena, 1996; Schloseer & Anderson, 1994).

Throughout the review of distance education literature, many studies have added to or built on past research. However, there are a handful of studies that have been used as foundation markers when examining categories of distance education research. Holmberg (1987) classified distance education research into eight categories: philosophy and theory of distance education; distance students, their milieu, conditions and study motivations; subject-matter presentations; communication and interaction between students and their supporting organization (tutors, counselors, administrators, other students); administration and
organization; economics; systems (comparative distance education, typologies, evaluations, etc.), and history of distance education. Sherry (1995) classified distance education research into four categories: learner characteristics and needs; media influence on the instructional process; access issues; and the changing roles of teacher, site facilitator, and student. Phipps and Merisotis (1999) divided distance education research literature into three categories: course and program design, effectiveness of technology, and general research. Berge and Mroczowski (2001) focused on distance education research literature over a ten-year period from 1990 to 1999, and developed a categorization method system. In 2004, Lee, Driscoll, and Nelson developed a six category review of distance education research.

Lee, Driscoll, and Nelson (2004) reviewed distance education research literature from four prominent distance education journals from 1997 to 2002, and built a categorization distance education topic system based on the work of Sherry (1995) and Phipps and Merisotis (1999). Lee, Driscoll, and Nelson (2004) selected these four distance education publications based on their acknowledgment among professionals as the most renowned. The publication reviewed were: *The American Journal of Distance Education, Journal of Distance Education, Distance Education,* and *Open Learning* publications They classified distance education research into six categories: Design-related, Development-related, Management-related, Evaluation-related, Institutional and Operational-related, and Theory and Research-related. Lee, Driscoll, and Nelson (2004) sought to clarify five questions while examining distance education research topics, methods, and citation trends by using content analysis. Their questions were: (1) What general research topics have been the focus of distance education research? (2) What specific topics have been discussed in distance education research? (3) Which research methods have been applied and are prevalent in
distance education research? (4) Whose inquiry conveys a major impact on distance education research? and (5) What implications might the findings of this study have on future distance education research?

Based on the foundational research of Sherry (1995) and their use of content analysis topics, Lee et al. (2004) offer a current and critical perspective on distance education research. Lee et al., six categories of distance education are discussed next with relation to their first research question.

**Design-related Distance Education Research**

Design-related topics of distance education research consist of studies that have examined: needs assessment, course scheduling, course design, instructional strategy development, course material design and visual design (Lee, Driscoll, & Nelson, 2004). Sherry (1995) referred to B. Willis (1992) description of instructional design in distance education. “In designing effective distance education instruction, one must consider not only the goals, needs, and characteristics of teachers and students, but also content requirements and technical constraints” (p. 344). Although most the instructional design models are based on behavioral or informational theories, models based on constructivist theories can result in learning environments where students construct an understanding of the knowledge by engaging with the materials to be learned (Sherry, 1995). “Thus, geographical distance becomes irrelevant, and technology (i.e., mode of delivery) is only important to the extent that it facilitates communication and construction of knowledge” (Diaz, 2000, p. 3). It is important for instructional designers and instructors to have minimal instructional technical requirements and a clear understanding of who their intended learners are (Sherry, 1995). Minimal instructional technical requirements help learners identify what is needed so that
instructional materials can be delivered successfully (Sherry, 1995). Delivery limitations of instructional materials can result in reduced content mastery on the part of students.

Garrison and Cleveland-Innes (2005) sought to study the nature of online interaction in four distance education course designs. They used their Study Process Questionnaire (which was delivered electronically via email) to measure how 75 respondents enrolled in four graduate online courses chose to strategize their learning in a particular learning setting. The courses were selected based on their level of interaction and variation in instructor presence. The courses used a combination of print and online conferencing to deliver instruction. Garrison and Cleveland-Innes’s findings identified design, structure, and leadership as important factors for student learning. Design significantly influenced the nature of the interactions. Structure and leadership were identified as critical for online learners to take a deep and meaningful approach to learning.

**Development-related Distance Education Research**

The development-related distance education research consists of studies that have examined: course support system and material development, Web-based learning management system building, online tools development, and online testing system development (Lee, Driscoll, & Nelson, 2004). Much of the research in this area describes distance education students and their achievements in individual courses (Phipps, & Merisotis, 1999).

Polmasles-Garcia and Liu (2006) conducted an experimental study on 12 instructional Web-based modules. The researchers sought to evaluate and systematically measure the effects of varying time lengths to access information recall, perception of content difficulty, perceived module length, persistence, and visual appearance aesthetic ratings. The modules
used in the study were lecture topics selected from an instructor at the School of Public Health at the University of Michigan for the Environmental Impact Assessment Course. There was no significant difference in information recall between module lengths and formats. In contrast, as module lengths increased, study participants were more likely to not complete the full instructional modules.

Examining the impact of various technology development-related aspects of distance education provides designers and instructors with vital information for effective course implementation. Technology tools used to disseminate course instruction should be selected based on the learner characteristics (Phipps, & Merisotis, 1999). “Knowing and understanding the strengths of each technology at our disposal, whether the latest Internet tool or an old faithful like print, are critical to defending and implementing our decision design” (Shearer, p. 285, 2003). The results of Development-related research on individual courses should be used as the basis for examining program development issues. Examining the delivery of instruction of an entire program via a distance is a research area that needs attention; such research could provide a better comparison for traditional on-campus degree programs (Phipps, & Merisotis, 1999).

**Management-related Distance Education Research**

The management-related distance education research consists of studies that have examined: learning resource management, technical support and trouble-shooting, attrition rate, and support for students, faculty, and staff (Lee, Driscoll, & Nelson, 2004). Student attitudes are one of the most important factors when assessing the quality of a distance education program (Keegen, 1990). Comparison research studies have compared traditional
teaching and learning environments to distance teaching and learning environments. Research has shown that distance education methodologies are as effective as traditional methodologies in terms of cognitive outcomes when content and student characteristics are comparable, however student motivation and assessment outcomes greatly influence cognitive outcomes (Verduin & Clark, 1991).

Distance education teaching efficiency by faculty is another area of research that has received attention, and research has documented challenges faced by faculty who teach at a (McIsaac & Gunawardena, 2004; Phipps & Merisotis, 1999). Although instructor contact with distance education learners is limited, faculty must be able to understand the characteristics of their learners. Sherry and Morse (1995) found that course instructors who were involved in structured training workshops for using instructional design technology software or technology equipment for instruction, developed strong classroom management and were better able to engage students in content mastery.

Student retention rates in distance education courses, compared to traditional course completion rates are low (Dupin-Bryant, 2004; Phipps & Merisotis, 1999). Garland’s (1993) study examined the motivational factors for students that withdrew from distance education courses. Face-to-face interviews were conducted with the 30 students who completed the course and with the 17 who withdrew. The study revealed that student withdrawals are more than just a lack of time issue, but more likely a lack of support from their inner-circle, lack of prerequisite knowledge, lack of technology skills, and the lack of a learning structure for distance education coursework.

Dupin-Bryant (2004) conducted a study to identify pre-entry variables related to course completion for students enrolled in online distance education courses offered by Utah
State University. Pre-entry variables consisted of: cumulative grade point average, class rank, previous courses completed online, years of computer experience, operating systems and file management training, Internet applications training, and searching the Internet training. The simple random sample was drawn from the accessible population of 1,000 students taking online courses during the spring 2003 semester; data from 464 participants were analyzed. Students were asked to complete a questionnaire at the beginning of the semester with regard to retention items. Course completion data was then combined with survey data at the end of the semester. Dupin-Bryant concluded that non-completing students usually had lower entry grade point averages than completing students, only a few non-completing students had completed an online course previously, and non-completing students had taken fewer computer classes than completing students. Dupin-Bryant’s study supported the idea that students who had participated in relevant computer trainings were more likely to complete the online courses they were enrolled in, since much of their attention can be used to learn and master course content and not computer skills.

**Evaluation-related Distance Education Research**

The evaluation-related category consists of studies that have examined: program quality control, evaluation of supporting system, assessment of learning outcomes, benefits and costs analysis, and return on investments (Lee, Driscoll, & Nelson, 2004). Rovia (2003) evaluated online programs and concluded that evaluations used by distance education programs must compile “enough evaluation information to articulate the place of technology and distance education in student and teacher learning” (p. 123).
Return on Investments research in distance education is an area that lacks depth, especially with regard to program-student impact (McIsaac & Gunawardena, 2004; Schloseer & Anderson, 1994). Many studies have examined the experiences of students in a class or of an instructor preparing for and teaching at a distance (McIsaac & Gunawardena, 2004; Phipps & Merisotis, 1999). In contrast, few studies have examined the impact of a complete degree program taught at a distance; moreover, even fewer studies have examined the impact a degree program has on students’ professional lives.

One area of the evaluation research that has been examined is academic quality control. Benson (2003) conducted a one-year qualitative study on academic quality and the impact that different quality definitions had on the planning and implementation of online degree programs. Data collection methods included: interviews, direct observation, and documents. Based on the results, it was recommended to stakeholders that online programs be developed around established course/program learning outcomes, and develop a program definition for academic quality early in the program planning process.

**Institutional and operational-related Distance Education Research**

The institutional and operational-related distance education research consists of studies that have examined: administration, academic affairs, accreditation, certification, policy, payment (Lee, Driscoll, & Nelson, 2004). “Implementation of distance education is resource-intensive. Sufficient money and time must be allocated to deliver whatever courseware was promised” (Sherry, 1995, p. 361). There is a growing student base for distance education courses/program. However, higher education administration must determine if the benefits of distance education are worth the cost (B. Willis, 2003).
In collaboration with Gaffney and Bancke (2003), B. Willis conducted a cost analysis survey of a graduate distance education degree program. They concluded that for such programs to be effective, institutions must identify niche programs, where an open market of students exists for the program/s delivered at a distance, identify competition, understand that the primary goal should not be to make money, and plan for continued technical program support and infrastructure costs. “By most measures, and under the best of circumstances, distance education is an expensive undertaking. This is an educational reality that’s often lost in the headlong administrative rush to generate excitement and garner a larger share of diminishing educational dollars” (Willis, 2003, p. 55).

**Theory and research-related**

The theory and research-related distance education research consists of studies that have examined: the history and review of literature, cultural and gender issues, student learning styles, theories, methodology, and copyright laws (Lee, Driscoll, & Nelson, 2004). Learning styles and characteristics are a major key with regard to student satisfaction of distance education courses (Phipps, & Merisotis, 1999). However, Diaz and Cartnal (1999) confirmed the results of research conducted by Tony Grasha (1996) by stating that “student learning styles are in a continual state of flux, changing significantly from year to year and year from the beginning of the term to the end” (p. 4). Diaz (2000) has noted when looking at learning styles and theories that “the extent to which teachers see themselves as “instructivist” or “constructivist” may implicitly determine the extent to which classroom activities are based on teacher or student preferences, and may also influence the focus of research design” (p. 4).
Fahy and Ally (2005) analyzed differences in learning styles in relation to measureable features of online interactions found in transcripts from a computer-mediated conferencing (CMC) online community. Learning styles were measured using the Kolb Learning Style Inventory; which “is an “ipsative” (rather than a normative)” measure of learning style” (Fahy & Ally, 2005, p. 9). The analysis of transcripts consisted of 5,900 sentences, which were generated by 40 of the 52 graduate students enrolled in one of two Athabasca University master’s level courses. From the data collected, Fahy and Ally concluded that even in an environment in which the complete learning cycle might be intended, individual differences in amounts and types of interaction may still be expected (2005).

In summary, Lee, Driscoll, and Nelson (2004) reviewed distance education research literature from four prominent distance education journals from 1997 to 2002, and built a categorization distance education topic system based on the work of Sherry (1995) and Phipps and Merisotis (1999). The majority of research in distance education was categorized within the design, and theory and research categories.

**Research in Agriculture Distance Education**

“As the technology of food, agriculture, and natural resources continues its rapid development, agricultural education programs must keep pace. Distance education technologies may be able to facilitate the modernization and improvement of secondary agriculture programs” (G. Miller & W. Miller, 2000, p. 1). Agriculture and distance education have had a partnership that started during the correspondence generation of distance education and has continued to develop during each subsequent generation.
Agriculture education is defined as “the scientific study of the principles and methods of teaching and learning as they pertain to agriculture” (Barrick, 1989, p. 26). Distance education research in agriculture education was grouped into three broad categories: program development; student attitudes and motivation; and comparison studies (Zirkle, 2003; G. Miller, 1999). Program development research consists of studies that have examined challenges developing and integrating new distance education programs into college of Agriculture curriculum and possible student recruitment. Student attitudes and motivation research consists of studies that have examined student attitudes towards distance education course environments, and motivational factors for program/course enrollment. Comparison research consists of studies that have examined traditional on-campus and distance education course instruction, faculty perceptions, and student-focused curriculum. Distance education research in agriculture has mirrored the same concerns that Phipps and Merisotis (1999) stated about a lack of research on program impact within mainstream distance education research literature (Zirkle, 2003).

**Program Development Research in Agriculture Distance Education**

A great deal of program development research has addressed future challenges that face college of agricultural educational programs as they seek to integrate distance education (Dooley, Linder & Kelsey, 2002; Dooley, & Murphy, 2001). The National Academy of Sciences concluded in its 1988 executive report, “teachers should seek out and share high-quality computer software and instructional materials and media for agricultural management and planning and for instructional application” (p. 5).
Dooley, Linder and Kelsey (2002) conducted a qualitative study on student satisfaction with Texas A&M and Texas Tech University’s joint Doc-at-a-Distance program. Begun in the fall 2000 this program was the first doctoral degree in agricultural education offered entirely at a distance. The program was developed so that skills learned would allow for agricultural professionals to advance in their current position without disruption of career activities. There were 18 men and women students that participated. Dooley et al. study found that participants were satisfied with the convenience of the program, which allowed students to maintain their lifestyle while earning an advanced degree. Students were also satisfied with the instructional design, faculty, and their cohort group. Overall, Dooley et al confirmed that students’ satisfaction and dissatisfaction were consistent with the research of (Biner, Dean, & Mellinger, 1994; Miller, McKena, & Ramsey, 1993; Ritchie & Newby, 1989; Tallman, 1994) literature cited.

Faculty and program development leaders have found that converting traditional on-campus course content to distance education course content requires significant time commitment resource allocation and administrative support (B. Willis, 2003; Dooley, Lindert, & Richards, 2003; G. Miller & Shih, 1999; Zirkle, 2003). G. Miller and Shih (1999) conducted a quantitative study comparing college of agriculture teaching faculty members’ perceptions of on-campus and off-campus courses. Their population included 262 faculty members within the College of Agriculture at Iowa State University. The results indicated that faculty support for off-campus instruction must be ongoing, faculty need support staff they can rely on to make sure technical downtime is minimal, and that faculty need the opportunity to consult with support staff when trying to design activities and materials for off-campus courses that can assist in students’ mastery of content.
Dooley, Lindert, and Richards (2003) found that asynchronous courses require more development time prior to delivery and instructors stated they must be more efficient while the course was being taught. They also concluded that the adoption of on-campus course materials for distance education delivery is a major obstacle for current and new agricultural programs. Time was identified as a major challenge in the implementation of distance technologies for program instructional delivery. This supported the earlier research of G. Miller and W. Miller (2000), who conducted a descriptive study to investigate the usefulness of the ICN for agriculture education at the secondary level in 1994 and 1997. Time was also identified as a major obstacle, which limited course access.

Programs are being developed in distance education for the primary purpose of attracting students from new demographic areas, so that enrollment levels can be maintained or improved (Wilson & G. Moore, 2004). “Agricultural education programs at the university level must continue to diversify to maintain enrollment levels for survival” (Cartmell & Garton, 2000, p. 531). Distance learning provides students expanded course curriculum options, even if their schools don’t offer certain subjects or have qualified instructors (G. Miller, 1997). Texas A&M concluded with their College of Agriculture and Life Sciences Vision2020 (2000) report that they would like to “increase to 50 percent the proportion of the master’s population enrolled in distance and other non-traditional master’s offerings” (p. 24). Wilson and G. Moore (2004) study what type of market analysis and needs assessments are being completed by higher education institutions before venturing into instruction arena of distance education. Wilson and G. Moore concluded that a market plan should be focused on potential students, who require advanced training and knowledge for their professional careers.
Student Attitudes and Motivation Research in Agriculture Distance Education

Student attitudes and motivation research consists of studies that have examined: student attitudes towards distance education course environments, and motivational factors for program/course enrollment (Dolisso & Martin, 1999; G. Miller, 1997; Roberts, Irani, & Teig, 2004, Shih & Gamon, 2001). Adult students prefer being able to control the pace of their learning, prefer independent study, have less need for structured learning experiences, and sometimes need less interaction with the instructor and other students than traditional on-campus students (G. Miller, 1997). These distance education student characteristics are not limited to agriculture professionals, but encompass a large number of professional distance education students.

Shih and Gamon (2001), analyzed the relationships between student achievement and the following variables in two web-based courses offered through the college of agriculture at a land-grant institution: attitude, motivation, learning styles, and selected demographics. Shih and Gamon’s findings were consistent with other distance education research, in that: students were more positive about the convenience of web-based instruction and the ability to control their pace of learning. Their study also found that students’ attitudes were neutral towards web-based instruction. The respondents identified two significant motivators: earning better grades than their classmates and the expectation to do well.

Dolisso and Martin (1999) tried to identify general intrinsic and extrinsic motivational factors that influence adult education in agriculture and farmer’s decisions to participate in learning experiences in particular, since none had been done at the time of their study. Respondents consisted of all members (n = 148) of the Iowa Young Farmers Educational Association during the summer of 1997.
Data were collected using a mailed questionnaire. Dolisso and Martin concluded that their findings confirmed the research literature in adult education: there are a number of reasons why a person wants to learn something and as long as the person has the opportunity to do so, there could be a number of intrinsic and extrinsic factors that influence their decision.

Student attitudes are deemed a vital factor when assessing the quality of distance education programs (Keegen, 2000). Through their review of distance education research in agriculture education, Roberts, Irani, and Teig (2004) concluded that “sufficient research does not exist to develop a broader picture of the use of student attitudes, particularly when examining agriculturally related institutions” (p. 1). The purpose of their case study was to study how evaluation instruments that assess student attitudes are used in the evaluation process for the selected 18 institutions that participated in this study. The participating institutions were agriculturally-related higher education institutions that offer distance education programs. Roberts et al. found that most evaluations focus on instructors or course organization and not enough focus was placed on the evaluation of entire distance education programs, nor support services of those programs.

**Comparison Studies Research in Agriculture Distance Education**

Similar to mainstream distance education research literature, comparison studies in agriculture distance education instruction covers a majority of the literature (Phipps & Merisotis, 1999; Zirkle, 2003). Comparison research consists of studies that have examined: traditional on-campus and distance education course instruction, asynchronous and synchronous instructional delivery tools, faculty perceptions, and student-focused
Various comparison studies have been conducted to determine the differences between traditional and non-traditional course instruction. G. Miller and Shih (1999) conducted a quantitative study comparing college of agriculture teaching faculty members’ perceptions of on-campus and off-campus courses. Their population included 262 faculty members within the College of Agriculture at Iowa State University. Faculty perceived off-campus courses to have a greater long-term learning effect on students when compared to traditional course instruction. Faculty recommended that off-campus courses continue to be designed with student needs in mind and take advantage of this pivotal quality issue. “If student needs are not met, it makes little difference whether the process (manufacturing-based) definition of delivering instruction is of high quality” (p. 54).

Dooley, Lindert, and Richards (2003) conducted a qualitative study comparing courses taught using synchronous and asynchronous instructional technology delivery methods. The study compared a 15-week graduate course delivered synchronously (ITV) in the spring of 2001 and a 15-week graduate course delivered asynchronously (Web-developed) in the spring of 2002. Dooley et al. found that regardless of synchronous or asynchronous instructional delivery methods, learning was similar between them.

Saba (2000) concluded with the amount of comparative studies conducted within the field of distance education, many of them found “no significant difference” with various forms of instruction. However, Saba was encouraged with the addition of discourse analysis, and in-depth interviews of learners becoming more mainstream within distance education literature (2000, p. 7). “These studies have further revealed the complexity of distance education, indicating the many variables involved in any instructional setting, not to mention...
other elements involved in distance education, such as social, economic, and global issues affecting the field” (p. 7).

Many of the same categories of research in distance education literature appear within agriculture as well. Overall, agricultural distance education research has done very little to address learning outcomes and student achievement (Zirkle, 2003). The advancement of distance education in agriculture is imperative given the new global economies and information technologies.

**Summary**

Distance education is not a new method of instruction and several emerging technologies have made it an accessible and viable option for students’ at all educational levels. “…research in distance education has been dominated by attempts to answer questions of immediate, practical significance” (Schloseer & Anderson, 1994, p. 16). Since technology has played such a large role in the development of distance education learning environments, research has been more of a reflection and examination of the technology and its impact; research has not examined the possible personal, career, or economic impact that distance education learning opportunities has had on adult students (McIsaac & Gunawardena, 2001; Berge & Mrozowski, 2001).

Moore and Thompson (1997) defined effective distance education as "...measured by the achievement of learning, by the attitudes of students and teachers, and by return on investment" (p. 59). With the increased pressure for working professionals to increase their knowledge base and technology skills to be competitive in the marketplace, it is not surprising that adult students are increasing their involvement in distance education courses
and programs (McIsaac & Gunawardena, 2001). Determining “return on investment” via student impact is something distance education research has yet to investigate.
CHAPTER 3: METHODOLOGY

“When planning for a year, plant corn. When planning for a decade, plant trees. When planning for life, train and educate people” (Chinese proverb: Guanzi (c.645BC)).

Mr. Nicholas J. Glakas, President of Career College Association, in a 2005 speech to the U.S. House of Representatives Committee on Education and the Workforce stated that “Sixty-six million adults and more than 50% of all employed persons participate in some form of continuing education”. More than ever, traditional higher education universities are being required by adult students to adopt distance education instructional methods to deliver learning opportunities. Determining the impact of a graduate degree program offered via distance education on adult students’ economic status and career mobility is vital when measuring the impact of distance education learning overall. The purpose of this chapter is to present the research methods used to conduct this study. This chapter contains the following sections: guiding research question; research design; instruments; research procedures; data analysis and summary.

Guiding Research Question

This study sought to answer the following research question: Has the Master of Science in Agronomy Distance Education Program had an impact on students’ economic status and career mobility?

Research Design

To address the research question, a survey was developed and administered. Quantitative research analyzes relationships between variables. Several types of instruments can be used in the collection of data, but questionnaires are commonly used by researchers to
gather quantitative survey data (Gay & Airasian, 1996). The data collected in this study were used to measure the impact the M.S. in Agronomy Distance Education Program had on students’ economic status and career mobility.

**M.S. in Agronomy Distance Education Program Overview**

The Master of Science in Agronomy Program was established as a distance only degree program and first implemented with a pilot group of 15 students in the fall of 1998. The M.S. in Agronomy Program Steering Committee (1998), with the feedback received from the pilot students outlined seven program goals for students who complete the degree:

1. understand the scientific principles underlying crop management and physiology, plant improvement, climatology, soil management and fertility, integrated pest management, and the interaction of these principles;
2. critically evaluate research in terms of design, content, potential application, and limitations with respect to agronomic systems;
3. apply agronomic knowledge to real-world problems via application of scientific principles;
4. understand moral, ethical, and legal perspectives of agricultural activities;
5. understand group dynamics and facilitate the accomplishment of individual and collective goals;
6. communicate effectively with scientists, professionals, farmers, other professionals, and the general public for the purposes of learning and informing; and
7. communicate electronically and utilize various Internet information services.

At the time of the study, the M.S. in Agronomy Program consisted of thirty-credits; 12 specified courses (26 credits), a 1-credit on-campus workshop, and a 3-credit creative component project. Technical knowledge and applications in the areas of climatology, crop production, soil and water management, and integrated pest management are the focus of the first 11 courses (21 credits) (M.S. Agronomy, 1998). Integration of knowledge and development of problem-solving and professional skills are the focus of the remaining 3
courses (9 credits). (Description of courses in the M.S. in Agronomy Program appear in Appendix A.)

The M.S. in Agronomy Program courses can be accessed and completed using the World Wide Web (WWW) or via a course Compact Disc-Read Only Memory (CD-ROM). The majority of courseware integrates text and interactive multimedia material. The term multimedia is used to define an instructional presentation that combines the use of text, graphics, video, audio and other animation tools so that the user can determine the sequence of content. Synchronous and asynchronous communication, along with a course calendar, assignments, and other computer resources are included for each course in a student notebook system (SNS) via WebCT. All M.S. in Agronomy Program courses use the asynchronous and synchronous communication tools within the course SNS. A HyperText Markup Language (HTML) and JavaScript web page template was developed and implemented so that all M.S. in Agronomy coursework utilize a consistent web page interface. It is recommended that students view the course web pages using the web browser Internet Explorer. This is to ensure that all course multimedia materials work effectively, and appear as intended by the program instructional designers and course instructors. A sample of the course template and icons used within the courses appears in Appendix B. All M.S. in Agronomy Program course lessons can be accessed and viewed through a web browser or as an Adobe Acrobat Portable Document Format (PDF) file. The course lesson PDF file is used primarily for the print function and is available for all program courses.

Each course has an optional course evaluation that is administered to students one week after course grades have been posted by the University. Students are informed in an e-mail that course evaluation participation is voluntary and that their participation in no way
affects their academic standing in the program or course. The data is then compiled and placed into a course report template. The evaluation reports are made available for program evaluation committee members and course instructors.

**Respondents**

The respondents in this study were selected using cluster sampling procedures. Contrary to simple random sampling and stratified sampling where single subjects are selected from the population, cluster sampling subjects are selected in groups or clusters (Joppe, 1996). Cluster sampling is used when the researcher wants to select groups with special characteristics (Gay & Airasian, 1996). For this study, groups that participated in the M.S. in Agronomy Program prior to the fall 2004 academic semester were selected. More specifically, groups of students who had either graduated from or completed 10 or more credits of the program were selected for this study. The completion of 10 program course credits represented a completion of one-third of the required program, and thus the completion of several core courses.

The sample for this study was comprised of 53 respondents from the Master of Science in Agronomy Distance Education Program. The study respondents were placed into two groups: M.S. in Agronomy graduates (graduates) and current M.S. in Agronomy students (current students). The respondents were employed in a wide variety of Agronomy work environments and had bachelor of science degrees from accredited U.S. institutions. The Graduates group was comprised of 17 respondents who had completed the program between spring 2001 and summer 2004. The Current Students group was comprised of 36 respondents. The Current Students group had completed a range of 10-29 program credits at the end of the summer 2004 semester.
Data Collection Instruments

To address the research question, the Distance Education Impact Assessment Survey (DEIAS) was developed and administered. The DEIAS was developed based on several in-depth conversations among faculty, staff, graduates, current students, and prospective students in the M.S. in Agronomy Program. The in-depth conversations centered on the job changes that students were experiencing while in or graduating from the program. After hearing several of these stories from the students, it was decided to survey the students and graduates involved with the M.S. in Agronomy Program. A review of distance education literature informed and assisted in the construction of the DEIAS instrument.

The questions that comprised each section of DEIAS were developed based on factors influencing non-traditional adult students working in industry and government, and agriculture life-long training opportunities. The DEIAS consisted of 107 items divided into 13 sections. The survey contained 74 five-point Likert scale items, 12 multiple choice items, 11 open-ended items, and 10 items were yes, no or not applicable. Below is a description of each section.

The DEIAS was developed to measure the impact of the M.S. in Agronomy Program on the respondents' career mobility and economic status. As was previously stated, the study respondents were divided into two groups: Graduate group - students who had completed and graduated from the M.S. in Agronomy Program (N = 17); and Current Students group - students who were enrolled in the M.S. in Agronomy Program and had completed 10 - 29 credits (N = 36). Since the respondent groups were at different stages of program completion, items in the DEIAS were modified to reflect the different stages by using past and current
tense. (For example, for the Graduate group: Part E: Job Security - Since I graduated from the M.S. in Agronomy Program, my current employment position is. . . . For the Current group: Part E: Job Security - With my enrollment in the M.S. in Agronomy Program, my current employment position is.)

In addition, the DEIAS for the Current Students group contained one additional Likert scale item in the section Your Supervisor's Perceptions. Appendixes C and D contains the DEIAS administered to the Graduate and Current Students groups, respectively.

**Background Information**

The purpose of the background information section was to gather demographic information about the respondents. This section contained three open-ended and seven multiple choice items. The three open-ended items asked respondents to describe their careers, the course that has had the most career impact to date, and if earning a M.S. in Agronomy degree could change their career status. The seven multiple choice items collected information regarding gender, age, living location, occupation, current employer and years of work service.

**Income Level**

The purpose of this section was to gather information regarding the respondents’ income level. Income Level was defined as the type of compensation, usually in the form of money, an employee receives that sometimes signifies one’s job importance. This section contained two yes, no or not applicable items and three multiple choice items.
Educational Support

The purpose of this section was to gather information regarding the respondents’ formal or informal study arrangements at work and other benefits that they may have received from their employer while pursuing the degree. This section contained eight yes, no or not applicable items, one multiple choice item and one multiple checkbox item.

Income Potential While Enrolled

The purpose of this section was to gather information regarding the respondents’ perceptions of potential increases in income due to enrollment in the M.S. in Agronomy Program. This section contained seven five-point Likert scale items.

Income Potential When You Graduate

The purpose of this section was to gather information regarding the respondents’ perceptions of potential increases in income due to completing the M.S. in Agronomy Program. This section contained seven five-point Likert scale items.

Job Security

The purpose of this section was to gather information regarding the respondents’ perceptions of their job security. Job Security was defined as the level of confidence respondents have that their position within the company is stable, safe, and protected. This section contained six five-point Likert scale items.

Information About Co-Workers

The purpose of this section was to gather information about the respondents’ co-workers. This section contained seven open-ended items centered around how many co-
workers they had, how many of those co-workers were pursuing a master’s degree, and if so, was the Masters degree through a distance education program.

**Perceptions of Co-Workers**

The purpose of this section was to gather information regarding how the respondents’ thought they were viewed by their co-workers. Perception was defined as an awareness or understanding of a situation. This section contained 11 five-point Likert scale items for the Graduate and Current Student groups, respectively.

**Your Supervisor’s Perceptions**

The purpose of this section was to gather information regarding the respondents’ perceptions of how they thought their supervisor viewed them. Perception is defined as an awareness or understanding of a situation. This section contained 10 five-point Likert scale items for the Graduate and Current Student groups, respectively. The Current Students group was asked one additional five-point Likert scale question that the graduates were not. The question focused on current coursework load and job performance.

**Self Perceptions of Impact on Work**

The purpose of this section was to gather information regarding the respondents’ perceptions of how their enrollment in the M.S. in Agronomy Program has impacted their work. This section contained ten five-point Likert scale items.
Self-efficacy Perceptions

The purpose of this section was to gather information regarding the respondents’ self-efficacy. Self-efficacy was defined as the belief that students influence and control their own destiny. This section contained ten five-point Likert scale items.

Career Mobility Perceptions

The purpose of this section was to gather information regarding career mobility. Career Mobility was defined as flexibility and ease with which a person’s career can change to meet new demands and opportunities. This section contained seven five-point Likert scale items.

Education

The purpose of this section was to gather information regarding respondents’ educational experience in the M.S. in Agronomy Program and future distance education course or program enrollment possibilities. This section contained seven five-point Likert scale items.

Research Procedures

During the sixth week of the 2004 fall semester, the respondents were asked to complete the DEIAS. The DEIAS was available online for the respondents to complete from September 28 through October 22, 2004. Consistent with the delivery method of course and program evaluations, the DEIAS was administered via the World Wide Web (WWW). To solicit their involvement in the study, the respondents were first contacted via electronic mail (e-mail) on September 28, 2004. In the e-mail message, the respondents were informed that participation in the study was voluntary, their participation would in no way affect their
academic standing in the M.S. in Agronomy Program, and the survey would take approximately 20 minutes to complete. Basic instructions for completing the DEIAS and directions for accessing the survey online also were provided in the email message. Respondents who did not complete the survey after one week were contacted again via email. The follow-up email message encouraged them to participate in the survey and provided instructions for accessing the DEIAS. Again, respondents who did not complete the survey after two weeks were encouraged to do so via email. If a respondent requested the survey as a hard copy, they were sent the instructions, the DEIAS, and a pre-paid self-addressed envelope via first-class United States Postal Service. After the subjects submitted their DEIAS, the results were coded, and compiled for data analysis.

Thirty-four (34) of 53 respondents completed and submitted the DEIAS, for a response rate of sixty-four percent (64.15%). Of the 17 respondents in the Graduate group, 11 responded for a response rate of sixty-five percent (64.71%). Of the 36 respondents in the Current Students group, 23 responded representing a sixty-four percent (63.89%) rate of return.

Data Analysis Procedures

Statistical Package for the Social Sciences (SPSS) software application was used to analyze the quantitative data. Descriptive statistics were calculated and computed for the respondents as a whole and for each group. Mean, median, mode, frequency were all run, as well as T-tests. The narrative data obtained in the survey were analyzed using standard methods. Appendix E contains the narrative date collected from respondents of the Graduate group. Appendix F contains the narrative date collected from respondents of the Current Student group. The data were examined for common themes and topics.
Chapter Summary

In this chapter a description of the methods used to implement this research study were presented. During the sixth week of the fall 2004 semester, 53 respondents of the M.S. in Agronomy Program were asked to complete the DEIAS. The DEIAS was designed to measure the impact of the M.S. in Agronomy Program on respondents’ career mobility and economic status. Thirty-four (34) of the 53 respondents completed the DEIAS instrument. The final survey response rate was sixty-four percent (64.15%).
CHAPTER 4: RESULTS AND FINDINGS

The purpose of this chapter is to report the results of the data collected from the Distance Education Impact Assessment Survey (DEIAS). The DEIAS was administered to the Masters of Science in Agronomy Distance Education Program graduates and current students to assess the impact of the Masters program on students’ economic status and career mobility. In this chapter the results of the study are presented.

Description of Respondents

Demographic Data

The first section of the DEIAS collected demographic and background information from the 34 respondents (Table 1). Of the 34 respondents, seventy-nine percent (N = 27) were male and twenty-one percent (N = 7) were female. For the Current Student group, seventy-four percent (N = 17) of the respondents were male and twenty-six percent (N = 6) were female. For the Graduate group, 10 of the eleven respondents were male; one was female. The number of male and female respondents represented in the response rate of the DEIAS varies slightly from the entire program demographic breakdown. When the DEIAS was administered, there were 101 students enrolled and active in the program. Fifteen percent (N = 15) of the students were female. Nineteen percent (N = 7) of the possible 36 Current Student group respondents who were asked to complete the DEIAS were female. Of the seven possible female respondents, six responded. The number of females in the Graduate group (N = 1) does not accurately represent the number of female students involved in the program. However, to date there was only one female graduate of the program and she completed the DEIAS.
Overall, seventy-nine percent of the respondents (N = 27) were between the ages of 25-40, twelve percent (N = 4) were between the ages of 41-50, and nine percent (N = 3) were over the age of 50. For the Current Student group, seventy-four percent (N = 20) of the respondents were between the ages of 25-40. For the Graduate group, seven of the 11 respondents were between the ages of 25-40.

Sixty-five percent of the respondents (N = 23) were located within the Midwest (Iowa, Minnesota, Illinois, Nebraska, Wisconsin, Michigan, Indiana, Missouri, Kansas, South Dakota and North Dakota), thirteen of whom were in Iowa. For the Current Student group, sixty-five percent (N = 15) were located within the Midwest, with more than half (N = 8) located in Iowa. For the Graduate group, seventy percent (N = 7) were located within the Midwest, with two-thirds (N = 5) located in Iowa.

Ninety-seven percent of the respondents (N = 33) indicated that they were employed full-time. Of that 97%, thirty-two percent (N = 11) were employed in the Seed Industry. Nearly twenty-one percent (N = 7) of the respondents were employed in: Government, Consultant/Co-op, or Other Occupations. One respondent was employed in the Chemical Industry. For the Current Student group, 26% percent (N = 6) were employed in the Seed Industry, 22% (N = 5) were employed as Consultant/Co-op, and 22% (N = 5) were employed by the Government. For the Graduate group, 45% (N = 5) were employed in the Seed Industry; two respondents worked as Consultant/Co-op and two worked for the Government.

Seventy-four percent (74%, N = 17) of the Current Student group were employed in the Agronomy sector between 3 and 11 years. Furthermore, 70% (N = 16) of respondents reported that their years of service with their current employer was between three to eleven years.
Two-thirds (67%, N = 6) of the Graduate group were employed in the Agronomy sector between 7 and 17 years. Seventy-three percent (73%, N = 8) of respondents reported that their years of service with their current employer was between one to five years.
Respondents Demographic Information

Table 1. Gender, age, geographic location and occupation of respondents by Group

<table>
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<th>Variable</th>
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<th>Graduate</th>
<th>Overall</th>
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<tr>
<td>Female</td>
<td>6</td>
<td>26.09%</td>
<td>1</td>
<td>9.09%</td>
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<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>10</td>
<td>43.48%</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td>31-35</td>
<td>7</td>
<td>30.43%</td>
<td>3</td>
<td>27.28%</td>
</tr>
<tr>
<td>36-40</td>
<td>3</td>
<td>13.04%</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td>41-45</td>
<td>2</td>
<td>8.70%</td>
<td>2</td>
<td>18.18%</td>
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<td>46-50</td>
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<td>4.35%</td>
<td>2</td>
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<tr>
<td>51-55</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>56-60</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td><strong>Demographic Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>2</td>
<td>8.70%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>Southeast</td>
<td>2</td>
<td>8.70%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>Midwest</td>
<td>15</td>
<td>65.21%</td>
<td>7</td>
<td>63.63%</td>
</tr>
<tr>
<td>Northwest</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>Southwest</td>
<td>3</td>
<td>13.04%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>9.09%</td>
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<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Industry</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>Consultant/Co-op</td>
<td>5</td>
<td>21.74%</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td>Government</td>
<td>5</td>
<td>21.74%</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td>Seed Industry</td>
<td>6</td>
<td>26.00%</td>
<td>5</td>
<td>45.46%</td>
</tr>
<tr>
<td>Other Occupations</td>
<td>5</td>
<td>21.74%</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not employed</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>2.94%</td>
</tr>
<tr>
<td><strong>Years with Employer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than (&gt;) 1 year</td>
<td>3</td>
<td>13.04%</td>
<td>3</td>
<td>27.28%</td>
</tr>
<tr>
<td>Between 1-3 years</td>
<td>4</td>
<td>36.36%</td>
<td>4</td>
<td>11.76%</td>
</tr>
<tr>
<td>Between 3-5 years</td>
<td>5</td>
<td>21.74%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>Between 5-7 years</td>
<td>5</td>
<td>21.74%</td>
<td>5</td>
<td>14.72%</td>
</tr>
<tr>
<td>Between 7-9 years</td>
<td>3</td>
<td>13.04%</td>
<td>1</td>
<td>9.09%</td>
</tr>
<tr>
<td>Between 9-11 years</td>
<td>3</td>
<td>13.04%</td>
<td>3</td>
<td>8.82%</td>
</tr>
<tr>
<td>Between 13-15 years</td>
<td>2</td>
<td>8.70%</td>
<td>2</td>
<td>5.88%</td>
</tr>
<tr>
<td>Between 17-19 years</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>2.94%</td>
</tr>
<tr>
<td>Between 21-23 years</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>2.94%</td>
</tr>
<tr>
<td>Over (&lt;) 25 years</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>2.94%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1</td>
<td>4.35%</td>
<td>1</td>
<td>2.94%</td>
</tr>
</tbody>
</table>
Research Question

As was previously stated in chapter 3, this study addressed the following research question: Has the Masters of Science in Agronomy Distance Education Program had an impact on students’ economic status and career mobility?

To address this research question, data regarding income were analyzed to determine impact on economic status. There were three sections in the DEIAS that addressed the respondents’ income. The sections were income level, income potential while enrolled in the program, and income potential upon graduating from the program.

Impact of Master’s Program on Graduates Economic Status

Respondents in the Graduate group on average had a yearly salary of $63,000. The salary ranged from $40,000 to over $100,000. Nearly forty percent (N = 4) of the respondents in the Graduate group had received promotions since they enrolled in the M.S. in Agronomy Program; one respondent had received a promotion as a direct result of their involvement in the M.S. in Agronomy Program. Finally, four of the five graduates who responded to the item regarding educational support stated that they received some financial support from their employer for educational expenses.

The Graduate group was asked about their income potential since graduating from the M.S. in Agronomy Program. Six items about Earning Ability were included in the survey. Using a five-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree and 5=I don’t know, the Graduate group had a mean score of 3.16. Thus, they believed that their income potential since graduating had positively increased. The
highest rated item was “my skills and knowledge are worth more income in the marketplace” with a mean of 3.36.

**Impact of Master’s Program on Current Students Economic Status**

Respondents of the Current Student group on average had a yearly salary of $49,000. The salary ranged from $30,000 to $79,999. Twenty-seven percent (N = 6) of the respondents in the Current Student group had received promotions since they enrolled in the M.S. in Agronomy Program. Three of these respondents reported that they received promotions as a direct result of their involvement in the M.S. in Agronomy Program. Ten of the 23 respondents stated that they received some financial support from their employer for their educational expenses.

Respondents in the Current Student group were asked to rate their potential for receiving income increases due to their enrollment in the M.S. in Agronomy Program. Five of the seven items included in this section were used to assess their perceptions of income potential. The items were: As a result of pursuing a degree in the M.S. in Agronomy Program, my skills and knowledge will be worth more in the market place; I will probably be promoted and receive a raise; my earning potential will increase; I will have more potential for promotion within my current company; and I will be more marketable and desirable by other companies.

Using a five-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree and 5=I don’t know, respondents had an overall mean of 3.02. Thus the Current Student group believed that their income potential was greater as a result of being
enrolled in the program. The item that received the highest rating was “I will be more marketable and desirable by other companies” with a mean of 3.55.

The data collected from the respondents of Graduates and Current Student groups show that the respondents from the Graduates group average yearly salary was $63,000. Where the respondents of the Current Student group average yearly salary was $49,000. The respondents from the Graduate group on average earned twenty-nine percent (28.6%) more than the respondents of the Current Student group. It is significant to note that fifty-five percent (N = 6) of graduates had 13 or more years of experience, whereas only seventeen percent (N = 4) of the Current Student group had 13 or more years of experience. All respondents from the Graduate group had more than seven years experience within the Agronomy sector, whereas seventy percent (N = 16) of the respondents from the Current Student group had more than seven years experience within the Agronomy sector, which may attribute to the Graduate group respondents increased annual salary.

**Career Mobility Perceptions of Graduates and Current Students**

To address the career mobility of the students in the M.S. in Agronomy Distance Education Program, data from four sections of the DEIAS were analyzed. These sections were: Career Mobility Perceptions, Self-Perceptions of Impact on Work, Self-efficacy, and Perceptions of Co-Workers and Supervisors. Career Mobility was defined as the flexibility and ease with which respondents’ careers can change to meet new demands and opportunities.

Seven items addressing career mobility perceptions were included in the survey. Using a five-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Agree,
4=Strongly Agree and 5=I don’t know, respondents indicated how they view their career mobility. The mean score for Career Mobility Perceptions was 2.80 and 2.75 for the Graduate group and the Current Student group, respectively. That is, the respondents were moderately positive about their career mobility. The item receiving the highest mean was “I am more aware of the need for my skills in the marketplace”. The Graduate group had a mean of 3.27, while the Current Student group mean was 3.0.

Respondents from both the Graduate and Current Student groups knew of or had directly observed the impact the program was having with regards to their career mobility and economic status. Responses from respondents completing the DEIAS had this to write concerning their involvement with regard to career mobility and economic status.

- “[The program] enabled me to apply and receive a better job. More money, better hours, closer to home.”

- “The program has given me a more in-depth agronomic knowledge than I previously had. The Degree is also allowing me to currently apply for a promotion that I would not have been able to if I had not completed this program.”

- “[The program] helped me "get" a job as head of a crop consulting department.”

- “I have not changed jobs since I started the program. The potential is very real that I can improve on my current position. However, the potential would be diminished had I not started and completed the M.S. program.”

- “My efforts in this program have resulted in a promotion.”

**Graduates and Current Students’ Self-Perceptions of Impact on Work**

Overall, all of the respondents were affirming and positive about their perceptions of their impact on work and their self-confidence. The 10 items that comprised the Self-Perceptions of Impact on Work were divided into four categories: Personal Confidence and
Attitude, Greater Responsibilities and Performance, Others’ Confidence, and Over Extended (Table 2).

In each of the categories both groups indicated that their enrollment in or completion of the M.S in Agronomy Distance Education Program positively affected their perceptions of their own effectiveness at work. In all four categories, the Graduate group average was slightly higher than the Current Student group, although there was no statistically significant difference between the groups on these categories. In the Personal Confidence and Attitude category, both groups had positive attitudes and were self-confident, (3.04, 3.18 Current Student and Graduate groups, respectively). The category receiving the highest mean by the Current Student group was General Personal Confidence and Attitudes. The item within that category with the highest mean was “I am more confident in my abilities on the job” (mean = 3.17). The categories receiving the highest mean by the Graduate group were Greater Responsibilities and Performance and Others’ Confidence; each had mean scores of 3.45.

In the Greater Responsibilities and Performance category, the Graduate group reported having significantly Greater Responsibilities and Performance than the Current Student group (t = 3.24, p=<.00). That is, as a result of having completed the M.S. in Agronomy Distance Education Program, the respondents of the Graduate group indicated that they were given greater work responsibilities and higher performance expectations.

On the category of Others’ Confidence, there was a significant difference between the Graduate and Current Student groups (t = 3.34, p=<.00). That is, the Graduate group had significantly higher levels of confidence as a result of the M.S. in Agronomy Distance Education Program than the Current Student group.
Table 2. Means of Graduates and Current Students’ Self-Perceptions of Impact on Work

<table>
<thead>
<tr>
<th>Category</th>
<th>Groups</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Student</td>
<td>Graduate</td>
<td></td>
</tr>
<tr>
<td>GENERAL PERSONAL CONFIDENCE AND ATTITUDES</td>
<td>3.04</td>
<td>3.18</td>
<td></td>
</tr>
<tr>
<td>- I am more confident in my abilities on the job</td>
<td>3.17</td>
<td>3.09</td>
<td></td>
</tr>
<tr>
<td>- I have a better concept of how to do my job</td>
<td>3.14</td>
<td>3.18</td>
<td></td>
</tr>
<tr>
<td>- I have a more positive attitude about my job</td>
<td>2.83</td>
<td>3.27</td>
<td></td>
</tr>
<tr>
<td>GREATER RESPONSIBILITIES AND PERFORMANCE</td>
<td>2.70</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>- I’ve been given more responsibilities at work</td>
<td>2.55</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>- I am more efficient in doing my job</td>
<td>2.86</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>OTHERS’ CONFIDENCE</td>
<td>2.68</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>- I’m viewed with greater confidence by my co-workers</td>
<td>2.62</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>- I’m viewed with greater confidence by my supervisor</td>
<td>2.80</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>OVER EXTENDED</td>
<td>2.86</td>
<td>3.21</td>
<td></td>
</tr>
<tr>
<td>- I feel overextended at my job</td>
<td>3.00</td>
<td>3.27</td>
<td></td>
</tr>
<tr>
<td>- I feel overwhelmed at my job</td>
<td>2.70</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>- I have a hard time completing work responsibilities</td>
<td>2.91</td>
<td>2.91</td>
<td></td>
</tr>
</tbody>
</table>

Self-efficacy Perceptions for Graduates and Current Students

In the Self-efficacy Perceptions section the respondents were to rate how their enrollment in or graduation from the M.S. Agronomy Program has impacted their self-efficacy in their work, professional knowledge and skills. (Self-efficacy was defined as the belief that a person influences and controls their own destiny). Nine items addressing self-efficacy were included in the survey. The items fit into three categories: General Self-confidence, Self-confidence and Job Performance/Work-related, and Job Satisfaction and Morale.

Overall, all the respondents were self-confident in general, at work, and had positive job satisfaction (Table 3). The Graduate group ratings for these categories were slightly higher than the Current Student group. The category with the highest mean for both groups was Self-confidence and Job Performance/Work-related (2.99, 3.40 Current Student and Graduate groups, respectively). Similarly, each group rated the category Job Satisfaction and
Morale the lowest (2.85, 3.18 Current Student and Graduate groups, respectively). Although this was the lowest rated category, the respondents in both groups had positive job satisfaction and morale.

Although the Graduates group means for the categories General Self-confidence, Self-confidence and Job Performance/Work-related, and Job Satisfaction and Morale were higher than those of Current Student group (Table 3), there were no statistically significant difference between the groups. Narrative data from the respondents of the Graduate group illustrate the impact the program had on their Self-efficacy Perceptions.

• “This program enriched my career. I have more confidence in what I do and it greatly enhanced my knowledge. It forced me to study areas that I would not have done so on my own.”
• “I've become more confident in my agronomic problem solving skills.”

Written comments from respondents of the Current Student group also suggest that the program positively impacted their Self-efficacy Perceptions.

• “The program has helped me in my career develop better relations with customers as I learn about Agronomy in greater detail. I feel both customers and co-workers look up to me because of my hard work and desire to learn.”
• “[The program gave me] added confidence when speaking with other professionals.”
Table 3. Means for Self-efficacy Perceptions for Graduates and Current Students

<table>
<thead>
<tr>
<th>Self-efficacy Perceptions</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Current Student</td>
</tr>
<tr>
<td><strong>GENERAL SELF-CONFIDENCE</strong></td>
<td></td>
</tr>
<tr>
<td>- my self-confidence has increased</td>
<td>2.91</td>
</tr>
<tr>
<td>- more overall self-esteem</td>
<td>2.91</td>
</tr>
<tr>
<td><strong>SELF-CONFIDENCE and JOB PERFORMANCE/WORK-RELATED</strong></td>
<td></td>
</tr>
<tr>
<td>- I possess greater confidence in my ability to perform my work</td>
<td>3.04</td>
</tr>
<tr>
<td>- I am better able to problem-solve when presented with obstacles</td>
<td>3.00</td>
</tr>
<tr>
<td>- more work-related confidence</td>
<td>3.00</td>
</tr>
<tr>
<td>- more work-related motivation</td>
<td>2.77</td>
</tr>
<tr>
<td>- more work-related knowledge</td>
<td>3.14</td>
</tr>
<tr>
<td><strong>JOB SATISFACTION AND MORALE</strong></td>
<td>2.85</td>
</tr>
<tr>
<td>- my job morale has been positively affected by my involvement in the program</td>
<td>2.90</td>
</tr>
<tr>
<td>- more job satisfaction</td>
<td>2.78</td>
</tr>
</tbody>
</table>

**Perceptions of Co-Workers and Supervisor on Career Mobility**

The final two survey sections used to address career mobility were Co-workers’ and Supervisors’ perceptions. The purpose of the sections was to gather information regarding the perceptions of the respondents’ co-workers and supervisors. Respondents were asked to rate how they believed their co-workers viewed their work, professional knowledge, and skills. Perception was defined as an awareness or understanding of a situation. Ten items addressing co-workers’ perceptions and 10 items addressing supervisor’s perceptions were included in the survey. The items fit into four categories: Professional Knowledge, Career Mobility, Performance Expectations, and Overall Opinion. Using a five-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree and 5=I don’t know,
respondents were asked to indicate how they believed their co-workers or supervisor perceived them.

Overall, both groups believed they were viewed favorably by their co-workers (Table 4). Again, the Graduate group means were slightly higher than the Current Student group in every category. The Overall Opinion category received the highest mean for the Graduate group (3.15) and the lowest mean for the Current Student group (2.76). The Graduate group perceived that their co-workers viewed them in a more positive light more so than the Current Student group.

The Professional Knowledge category received the highest mean for the Current Student group (2.91). The item that received the highest rating by the Current Student was “my co-workers’ view me as someone with enhanced potential” with a mean of 3.39.

The category receiving the lowest score for the Graduate group was Career Mobility, with a mean of 2.90. That is, the respondents believed that their peers viewed their career mobility moderately positive.

Overall, the respondents believed that as a result of their enrollment in or completion of the M.S. in Agronomy Program they were perceived positively by their supervisors. Again, the Graduate group had higher means in all three categories (Table 5). Both the Graduate group and the Current Student group rated the category Performance Expectations the highest (3.33 and 3.22, respectively). These data indicate that both groups of respondents perceived that their supervisors’ views them positively. The items rated highest by the Graduate group were “my supervisor expects me to perform more efficiently” and “my supervisor expects me to handle more responsibility”. Each item had a mean of 3.40. Interestingly, the item in this category that received the highest mean by the Current Student
group was “my supervisor expects me to perform less efficiently due to my coursework” with a mean of 3.48. (This item was only included for the Current Student group.)

In the Overall Opinion category, the Current Student group rated the item “My supervisor views me as someone with enhanced potential” with a mean of 3.15. The items rated highest by the Graduate group were “my supervisor expects me to perform more efficiently” and “my supervisor views me as someone with enhanced potential”. Each item had a mean of 3.33.

Table 4. Perceptions of Co-Workers on Career Mobility

<table>
<thead>
<tr>
<th>Perceptions of Co-Workers</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Student</td>
</tr>
<tr>
<td><strong>PROFESSIONAL KNOWLEDGE</strong></td>
<td></td>
</tr>
<tr>
<td>- view me as more knowledgeable</td>
<td>2.91</td>
</tr>
<tr>
<td>- seek out my opinion on topics related to my degree program</td>
<td>3.05</td>
</tr>
<tr>
<td>- seek out my opinion on topics related to my job but not degree program</td>
<td>2.83</td>
</tr>
<tr>
<td>- are more confident in my abilities</td>
<td>2.79</td>
</tr>
<tr>
<td><strong>CAREER MOBILITY</strong></td>
<td></td>
</tr>
<tr>
<td>- view me as more likely to move up the corporate ladder</td>
<td>2.66</td>
</tr>
<tr>
<td>- view me as a threat to their job security</td>
<td>3.00</td>
</tr>
<tr>
<td>- view me as more likely than they are to be promoted</td>
<td>2.32</td>
</tr>
<tr>
<td><strong>PERFORMANCE EXPECTATIONS</strong></td>
<td></td>
</tr>
<tr>
<td>- expect me to perform more efficiently</td>
<td>2.76</td>
</tr>
<tr>
<td>- expect me to perform at a higher level</td>
<td>2.71</td>
</tr>
<tr>
<td><strong>OVERALL OPINION</strong></td>
<td></td>
</tr>
<tr>
<td>- view me in a more positive light</td>
<td>2.76</td>
</tr>
<tr>
<td>- treat or view me no differently than before I enrolled in the MS in Agronomy Program</td>
<td>2.75</td>
</tr>
</tbody>
</table>
Table 5. Means for Perceptions of Supervisor on Career Mobility

<table>
<thead>
<tr>
<th>Your Supervisor’s Perceptions</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Current Student</td>
</tr>
<tr>
<td><strong>PROFESSIONAL KNOWLEDGE</strong></td>
<td>2.97</td>
</tr>
<tr>
<td>- view me as more knowledgeable</td>
<td>3.30</td>
</tr>
<tr>
<td>- seeks out my opinion on topics related to my degree program</td>
<td>2.87</td>
</tr>
<tr>
<td>- seeks out my opinion on topics related to my job but not degree program</td>
<td>2.74</td>
</tr>
<tr>
<td><strong>PERFORMANCE EXPECTATIONS</strong></td>
<td>3.22</td>
</tr>
<tr>
<td>- expects me to handle more responsibility</td>
<td>3.22</td>
</tr>
<tr>
<td>- expects me to perform more efficiently</td>
<td>3.26</td>
</tr>
<tr>
<td>- expects me to perform at a higher level</td>
<td>3.35</td>
</tr>
<tr>
<td>- expects me to perform less efficiently due to my coursework*</td>
<td>3.48</td>
</tr>
<tr>
<td><strong>OVERALL OPINION</strong></td>
<td>2.94</td>
</tr>
<tr>
<td>- has more confidence in my abilities</td>
<td>2.95</td>
</tr>
<tr>
<td>- views me in a more positive light</td>
<td>2.89</td>
</tr>
<tr>
<td>- views me as someone with enhanced potential</td>
<td>3.15</td>
</tr>
<tr>
<td>- treat or views me no differently than before I enrolled in the MS in Agronomy program</td>
<td>2.81</td>
</tr>
</tbody>
</table>

* The respondents in the Current Student group were asked one additional question that respondents in the Graduate group were not.

Summary

The purpose of this chapter was to report the results of the study. Thirty-four (34) respondents from the M.S. in Agronomy Distance Education Program participated in the study. The majority of the respondents was male, current students, and located in the Midwest. Seventy-nine percent (79.41%) of the respondents indicated they were employed in the Agronomy sector.

The results of this study indicate that the respondents’ involvement with the Master’s of Science in Agronomy Distance Education Program has had a positive impact on their economic status and career mobility. The results show that respondents from the Graduate
group responded more positively than respondents from the Current Student group for all four categories: Impact of Masters Program on Graduate and Current Student groups Economic Status; Career Mobility Perceptions; Graduates and Current Students’ Self-Perceptions of Impact on Work; Self-efficacy Perceptions; and Perceptions of Co-Workers and Supervisor on Career Mobility. Nearly forty percent (N = 4) of the respondents in the Graduate group had received promotions since they enrolled in the M.S. in Agronomy Program; one respondent had received a promotion as a direct result of their involvement in the M.S. in Agronomy Program. Overall, all of the respondents were affirming and positive about their perceptions of their impact on work and their self-confidence.

Based on the data, the economic status of the students was positively affected by the program. That is, the M.S. in Agronomy graduates perceived that their earning ability had increased as a result of completing the program. The Current Student group also reported that they believed their income potential was greater because of their enrollment in the program. Finally, the respondents believed they were more marketable because of their involvement in the M.S. in Agronomy Program.
CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

Discussion

There is a plethora of research in distance education (Berge & Mrozowski, 2001; Lee, Driscoll, & Nelson, 2004; McIsaac & Gunawardena, 1996; Phipps & Merisotis, 1999; Schloseer & Anderson, 1994; Sherry, 1995). Lee, Driscoll, and Nelson (2004) examined distance education research topics, methods, and citation trends by using content analysis. Their work, along with many others, reveals that a great deal of distance education research has focused on the technology and technical aspects of delivering instruction (Berge & Mrozowski, 2001; Lee, Driscoll, & Nelson, 2004; McIsaac & Gunawardena, 1996). Many studies have examined the experiences of students in a class or of an instructor preparing for and teaching at a distance (McIsaac & Gunawardena, 2004; Phipps & Merisotis, 1999). In contrast, few studies have examined the impact of a complete degree program taught at a distance; moreover, even fewer studies have examined the impact a degree program has on students’ professional lives.

The aim of this research study was to examine the impact of a graduate degree program offered via distance education. Looking beyond the effective design and implementation of a single course, these research studies examined the effects and impact an entire degree program had on students’ economic status and career mobility.

According to Lee et al., (2004), this study fits into the evaluation-related distance education research category. Only 12% of the 383 studies they analyzed were evaluation-related. By examining students’ perceptions of the program and its impact on them, the return
on investment focus was on the student and the agronomy field and not the academic program or higher education institution.

The literature in agriculture distance education suggests that there is a growing demand for advanced degrees in specialized areas of agriculture because of the expanding global economy (Carter, 1996; Lee, Driscoll, & Nelson, 2004). Carter (1996) concluded that retooling and expanding professionals’ knowledge is essential based on a 1995 survey of agronomists from Pioneer Hi-Bred and state university extension agents. Carter concluded that the changes needed for a Seed Company Agronomist to stay relevant with future clients were a combination of: communication skills, field crop diagnostic skills, business skills, and access to convenient and relevant distance education (Carter, 1996).

The results of this study indicate that the students in the M.S. in Agronomy Distance Education Program (a specialized field of agriculture) gained the knowledge needed to enhance their career mobility. The respondents within the Graduate group were particularly positive about the impact that the M.S. in Agronomy Program had on their career mobility. Respondents were more aware of the need for improved or updated job skills whereas the respondents from the Current Student group were moderately positive of the impact the program had had on their career mobility. (This may be due, in part, to the fact that respondents of the Current Student group had not yet completed the program.)

The results of this study indicate that online degree programs are viable options that meet the learning styles and busy personal schedules of adult students. “Technology has driven the growth of distance learning opportunities, as students who are “time bound” due to job or travel difficulties, or “place-bound” due to geographic locations, can now access courses and degree programs at their convenience” (Zirkle, 2003, p. 13). Today’s online
students consist primarily of working adults who are trying to better their professional opportunities, as there is an increased need for knowledge and skills required by professionals (Moore & Kearsley, 2005). The M.S. in Agronomy Distance Education Program was designed in such a way (e.g. easy to use instructional interface, asynchronous and synchronous communication, etc.) that the working adult learners were able to enroll in and complete the program while maintaining other personal commitments. As previously stated, distance education instruction is particularly beneficial when essential learner characteristics have been identified; the essential student characteristics include age of learner, cultural or socioeconomic background, geographic location, academic interest, work experiences, and educational level (Sherry, 1995). An overwhelming majority of students in the M.S. in Agronomy Program complete 1 to 2 courses per semester, while working full-time within the Agronomy sector and they are able to realize the immediate connection on their work, which provides sustained value to them as professionals, and offers them an immediate impact, which reinforces to them that the advanced coursework that they are completing is important and very beneficial to them increasing their knowledge base (Educational Pathways, 2003). It is this relevance that is driving adult students into distance education courses and programs.

**Recommendations**

In light of the research literature and the results of this study, three recommendations for future research are proposed. The recommendations are: 1) Replicate the current study with more students; 2) Conduct a follow-up study with M.S. in Agronomy graduates 3-5
years after they completed the program; and 3) Survey students’ employers and supervisors to measure program impact on worker performance.

The first recommendation for further research is to replicate the current study with more students. The current study was conducted with the first graduates of the M.S. in Agronomy program which was six years old when the study was completed. Therefore, the sample was relatively small; and the number of respondents (especially in the Graduates group) was low. Since then, the number of graduates has more than doubled. (As of December 2007, 38 students had completed the M.S. in Agronomy Distance Education Program.) In replicating the study, it is recommended that additional narrative data be gathered via online focus groups to help illuminate the quantitative data from the survey. Distance education literature has reinforced how beneficial entire programs offered at a distance are to students compared to a single course or courses offered via a distance. As stated previously, B. Willis, Gaffney and Bancke (2003), conducted a cost analysis survey of a graduate distance education degree program and concluded that for such programs to be effective, institutions must identify niche programs, where an open market of students exists for the program/s delivered at a distance, identify competition, understand that the primary goal should not be to make money, and plan for continued technical program support and infrastructure costs. At this time, there is no other M.S. in Agronomy program like M.S. in Agronomy Distance Education Program at Iowa State University.

The second recommendation for further research is to conduct a follow-up study with M.S. in Agronomy graduates 3-5 years after they completed the program. One of the limitations of this study was that the Graduates group had not been far enough removed from the program. Many of the graduates had been out less than two years; thus there was not
much time for them to fully experience the direct impact of the program on their career mobility and economic status. By surveying students 3-5 years after they complete the program, researchers may obtain a more accurate and complete picture of the impact of the M.S. in Agronomy program.

The third recommendation for further research is to survey students’ employers and supervisors to measure program impact on worker performance. In the current study, the respondents were asked to rate their perception of their supervisor’s opinion of them. This sort of self-reflection can be difficult and vary according to individual motivations and perspectives. Therefore, surveying supervisors directly may provide more accurate information regarding students’ actual performance at work, and thus their career mobility.

Conclusion

Distance education has been an essential and effective means of disseminating information and new techniques in agriculture. Moore and Thompson (1997) defined effective distance education as “…measured by the achievement of learning, by the attitudes of students and teachers, and by the return on investment” (p. 59). Future research on the Master of Science in Agronomy Distance Education Program should examine the long-term effects the program has on students’ careers; moreover, distance education research in other disciplines must go beyond single courses to examine the overall learning outcomes of complete degree programs (McIsaac & Gunawardena, 2004; Phipps & Merisotis, 1999).

This research study examined the impact of an online graduate program in agronomy on students’ economic status and career mobility. By examining the impact of an entire academic program, researchers, designers, and administrators are informed of the summative
and cumulative effects of the curriculum. The results of this study indicate that the students of the online Master’s in Agronomy Distance Education Program believed that the program positively impacted their economic status and career mobility. Respondents from both the Graduate and Current Student groups knew of or had directly observed the impact the program has had with regards to their career mobility and economic status.
APPENDIX A: DESCRIPTION OF COURSES IN THE M.S. IN AGRONOMY PROGRAM
M.S. in Agronomy Distance Education Program
All courses are required

**Agron 501. Crop Growth and Development**

**Agron 502. Chemistry, Physics, and Biology of Soils**

**Agron 503. Climate and Crop Growth**
2 cr. Fall. *Prereq: Agron 114 and Math 140.* Applied concepts in climate and agricultural meteorology with emphasis on the climate-agriculture relationship and the microclimate-agriculture interaction. Basic meteorological principles are also presented to support these applied concepts.

**Agron 511. Crop Improvement**

**Agron 512. Soil-Plant Environment**

**Agron 513. Quantitative Methods for Agronomy**

**Agron 514. Integrated Pest Management**
**Agron 531. Crop Management and Ecology**

**Agron 532. Soil Management**

**Agron 533. Crop Protection**
2 cr. *Prereq: Agron 514.* Integrated management systems for important crop pests. Cultural, biological and chemical management strategies applicable to major crops grown in the Midwest.

**Agron 591. Agronomic Systems Analysis**
3 cr. Spring. *Prereq: Agron 511, 513, 531, 532 and 533.* Analysis of cropping systems from a problem-solving perspective. Case studies will be used to develop the students' ability to solve agronomic problems.

**Agron 592. Current Issues in Agronomy**
3 cr. Spring. *Prereq: Agron 501, 503, 511, 512, 513 and 514.* Study and discussion of topics of current interest to the field of agronomy. While Agron 591 deals with agronomics at the farm and landscape level, Agron 592 seeks to address issues on a broader scale including off-farm agricultural impacts.

**Agron 594. Workshop in Agronomy**

**Agron 599M. Creative Component**
1-3 cr. (3 cr. total). Fall, Spring, Summer. A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.
APPENDIX B: COURSE TEMPLATE AND ICONS
Setup Lesson

Lesson Format

Icons and Links

The courses in the MS in Agronomy Distance Education Program use a series of icons and colored text links within the lessons. You have seen several of these already in this Setup Lesson. Those used in the lesson materials include: FYI (For Your Information), In Detail, Study Questions, Try This, Assignments, Discussion Topics, Check This Out, Reflection and Media icons along with Glossary and Review Links.

For Your Information
The words and phrases in the text that are orange bolded are links to FYI items. They explain a topic further and give tidbits of information. The information is interesting but is intended to be remedial.

In Detail
The microscope indicates that we may want to look at this topic in more detail. The corresponding brown bolded text links to the In Detail window. It probes a concept further without interrupting the flow of a lesson. After the In Detail window has been closed, the student returns to the lesson at the same place they left off. This is required information for the lesson and could involve activities like Assignments, Study Questions, or Check This Out.'s.

Study Questions
Study Questions generally provide immediate feedback to the students on how well they are grasping the concepts of a particular lesson. They can be simple questions about concepts or can ask the student to think beyond a particular concept. They are not assessed for a grade.
Try This!
These include an activity for the students to try out, which are intended to clarify the concept presented. These are usually followed by study questions.

Assignments
Assignments are graded exercises that are submitted to the Student Notebook System (SNS) or attached to emails for assessment by the instructor.

Discussion Topics
Discussion Topics are topics that the instructor wants the student to discuss with peer students or faculty. These topics usually extend beyond the topic at hand into real-world experiences or applications and are intended to promote communication within this program. The discussion postings are handled by the Student Notebook System. Students are also invited to post other items of interest to the discussion board that are not assigned discussion topics.

Check This Out!
Check This Out links are links to websites outside of the lessons to provide more information to the students on a particular subject. It is a great opportunity to put other well-developed sites to work for our program, especially Iowa's and other state's extension sites.

Lesson Reflection
Lesson reflection is important to both students and instructors. The purpose of the reflection exercise is to enhance your learning and information retention. Some of the questions are designed to help you reflect on the lesson and obtain instructor feedback on your learning. Other questions are designed to help you evaluate and improve your learning skills in this uncommon learning environment. Your answers also help course developers to improve lesson and course design for future students in this course-and for you in the subsequent courses you may take in this curriculum.

Media
Multimedia elements that further explain a concept through an animation, movie, or other visual presentation.
APPENDIX C: DEIAS FOR GRADUATE GROUP
The following is a program evaluation survey for the Master of Science in Agronomy Distance Education Degree Program. Questions are designed to help us examine if there has been an impact on students' economic and career status, since graduating from the M.S. in Agronomy program.

Please answer the following questions/statements to the best of your ability. Feel free to elaborate further on any of the questions/statements in the comment box provided (not required). After completing the survey, please press the "Submit" button to submit your responses. All information submitted will be kept confidential.

If you experience any technical problems or have questions, please contact the M.S. in Agronomy Evaluation Team (MSAgronEval@iastate.edu). Thank you for your participation!

Part A: Background Information

Please use the comment boxes to describe your opinions of the following questions.

1. How has the program affected your career?

2. What course had the greatest impact on your professional growth and why?

3. Has earning a M.S. in Agronomy Degree made a significant impact on your career status?

Please select the option that best describes your demographic and background information.

4. What is your gender?
   - Female
   - Male

5. What is your age?
   - <25
6. Where do you live?
   Please select

7. What is your current employment status?
   - Unemployed
   - Employed part-time
   - Employed full-time
   - Other... (Please explain:)

8. How long have you been employed in the Agronomy sector?
   - I've never been employed in the Agronomy sector
   - Less than 1 year
   - 1-3 years
   - 3-5 years
   - 5-7 years
   - 7-9 years
   - 9-11 years
   - 11-13 years
   - 13-15 years
   - 15-17 years
   - 17-19 years
   - 19-21 years
   - 21-23 years
   - 23-25 years
   - 25 or more years
   - Other... (Please explain:)

9. What is your current field of occupation?
   - I am not currently employed
   - Chemical Industry
   - Consultant/Co-op
   - Government/Extension
   - Production
   - Seed Industry
   - Other... (Please explain:)

10. How long have you been employed by your current employer?
    - I am not currently employed
    - Less than 1 year
Part B: Income Level

The purpose of this section is to gather information regarding your income level. Income Level is defined as the types of compensation, usually in the form of money, an employee receives for working that sometimes signifies their job importance.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

1. Did you receive a promotion in the last 12 months?

1A. If so, what is your new position title and how do your new position responsibilities differ from your previous responsibilities?

2. If you were promoted in the last 12 months, did you receive the promotion as a result of your graduation from the M.S. in Agronomy Program?

3. Did you receive a raise as a result of your promotion? If so, what percentage of a salary increase did you receive?

- I received no raise
- 0.1-2%
- 2.1-4%
- 4.1-6%
- 6.1-8%
- 8.1-10%
- 10% or more
4. Please select the current yearly salary (income) you earn from your employer:
   - $19,999 or less
   - $20,000 - $29,999
   - $30,000 - $39,999
   - $40,000 - $49,999
   - $50,000 - $59,999
   - $60,000 - $69,999
   - $70,000 - $79,999
   - $80,000 - $89,999
   - $90,000 - $99,999
   - $100,000 or more

5. Of the financial support resources listed below, from which two did you receive the greatest support for your educational expenses (i.e., tuition, books and fees)? **Only select two.**
   - Parents, other relatives or friends
   - Spouse
   - Savings
   - Employer funds
   - Scholarship (Based on academic merit)
   - Financial aid
   - Other (Please specify: ____________________________ )

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**Part C: Educational Support**

The purpose of this section is to gather information regarding your formal or informal study arrangements at work and other benefits that you may received from your employer during your enrollment in the program.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

1. Did you have a **formal** arrangement allowing you to complete coursework while at work?

2. Did your employer provide you with "paid study days" of leave while you were enrolled in a course? (Paid study days were work days that allowed you to study for a course during work hours)

3. Did you have an **informal** arrangement allowing you to complete coursework while at work?
4. If you had a **formal** or **informal** arrangement, how many hours were you allowed per week to complete coursework?
   - [ ] I am not allowed to do coursework during work time
   - [ ] Less than 2 hours
   - [ ] 2-4 hours
   - [ ] 4-6 hours
   - [ ] 6-8 hours
   - [ ] 8-10 hours
   - [ ] 10 or more hours

5. Did your employer provide you with technology or access to technology equipment/software while you were enrolled in a course?

6. Did your employer provide you with additional technology support because you were enrolled in a course? (i.e. technical support, training, etc.)

7. Did your employer arrange a study group session, mentor or tutor for you when you were enrolled in a course?

8. Did your employer provide you with any type of financial benefit if you completed a course in the M.S. in Agronomy program?

9. Did your employer provide you with any type of financial benefit when you completed the M.S. in Agronomy program?

10. If so, in what way was the financial benefit given to you?
   - [ ] Bonus Check
   - [ ] An Additional Retirement Contribution
   - [ ] Purchase Voucher
   - [ ] Vacation Voucher
   - [ ] Tuition Reimbursement
Part D1: Income Potential While Enrolled

The purpose of this section is to gather information regarding your perception for potential increases in income *while you were enrolled in* the M.S. in Agronomy program.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

As a result of pursuing a degree in the M.S. in Agronomy program:

1. I will earn more income in my current position
2. my skills and knowledge will be worth more income in the marketplace
3. I will probably be promoted and receive a raise
4. I will receive a raise while completing the same tasks
5. my earning potential will increase
6. I will have more potential for promotion within my current company
7. I will be more marketable and desirable by other companies

Part D2: Income Potential Since Graduating

The purpose of this section is to gather information regarding your perception for potential increases in income *since you graduated from* the M.S. in Agronomy program.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

As a result of graduating with a degree from the M.S. in Agronomy program:
1. I will earn more income in my current position

2. my skills and knowledge will be worth more income in the marketplace

3. I will probably be promoted and receive a raise

4. I will receive a raise while completing the same tasks

5. my earning potential will increase

6. I will have more potential for promotion within my current company

7. I will be more marketable and desirable by other companies

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**Part E: Job Security**

The purpose of this section is to gather information regarding your perceptions of your job security. Job Security is defined as the level of confidence you have that your position within the company is stable, safe, and protected.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

Since I graduated from the M.S. in Agronomy program, my current employment position is:

1. more secure because I graduated from the M.S. in Agronomy program

2. more secure because I am more versatile

3. more secure because of the knowledge and skills I gained

4. more secure because my professional responsibilities are increasing

5. more secure because my supervisor has more confidence in me
Part F: Information About Co-Workers

The purpose of this section is to gather information about your co-workers.

Please answer the following questions related to the M.S. in Agronomy program.

1. How many direct co-workers do you have? (direct co-workers are those you regularly work with on a day-to-day basis)

2. How many of your direct co-workers know you were enrolled and graduated with a M.S. in Agronomy distance education degree?

3. How many of your direct co-workers are pursuing a degree? (i.e. certification, associates, bachelors)

4. How many of your direct co-workers are pursuing a Master's degree?

5. How many of your direct co-workers are pursuing a degree via distance education? (i.e. certification, associates, bachelors)

6. How many of your direct co-workers are pursuing a Master's degree via distance education?

7. How many of your direct co-workers are pursuing a M.S. in Agronomy distance education degree from Iowa State University?

Part G: Perceptions of Co-Workers

The purpose of this section is to gather information regarding how you think your co-workers view you. Perception is defined as an awareness or understanding of a situation.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

Since I graduated from the M.S. in Agronomy program, I think my co-workers:
1. view me as more knowledgeable

2. view me as more likely to move up the corporate ladder

3. view me as a threat to their job security

4. view me as more likely than they are to be promoted

5. expect me to perform more efficiently

6. expect me to perform at a higher level

7. seek out my opinion on topics related to my degree program

8. seek out my opinion on topics related to my job but not my degree program

9. are more confident in my abilities

10. view me in a more positive light

11. treat or view me no differently than before I enrolled and graduated from the M.S. in Agronomy program

**Part H: Your Supervisor's Perceptions**

The purpose of this section is to gather information regarding your perceptions of how you think your supervisor views you. Perception is defined as an awareness or understanding of a situation.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

Since I graduated from the M.S. in Agronomy program, I think my supervisor:

1. views me as more knowledgeable
Part I: Self Perceptions of Impact on Work

The purpose of this section is to gather information regarding perceptions of how you think your M.S. in Agronomy degree has impacted your work.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

Since I graduated from the M.S. in Agronomy program:

1. I’ve been given more responsibilities at work

2. I’m viewed with greater confidence by my co-workers
Part J: Self-efficacy Perceptions

The purpose of this section is to gather information regarding self-efficacy. Self-efficacy is defined as the belief that you influence and control your own destiny.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

Since I graduated from the M.S. in Agronomy program:

1. I possess greater confidence in my ability to perform my work
2. my self-confidence has increased
3. I am better able to problem-solve when presented with obstacles
4. my job morale has been positively affected by my involvement in the
Part K: Career Mobility Perceptions

The purpose of this section is to gather information regarding career mobility. Career Mobility is defined as flexibility and ease with which your career can change to meet new demands and opportunities.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

Since I graduated from the M.S. in Agronomy program:

1. I have more interest in the company/organization that I work for

2. I have more interest in other agriculture companies/organizations

3. Other agriculture companies/organizations have more professional
interest in me


4. I am more aware of other positions in my company/organization

5. I am more aware of other positions in other companies/organizations

6. I am more aware of the need for my skills in the marketplace

7. I have a better understanding of how my company/organization is organized and managed

Part L: Education

The purpose of this section is to gather information regarding your educational experience in the M.S. in Agronomy program and possibly future distance education course or program enrollment.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

1. The M.S. in Agronomy program had a good academic reputation

2. I would pursue the M.S. in Agronomy degree again

3. I would pursue another on-line degree

4. I would or already have recommended this program to others

5. I would have pursued this degree if it were offered only on campus

6. My educational goals were met through this program

7. There is a direct correlation between concepts covered in the courses and what I do at work
Thank you for completing the survey. Please click the "Submit" button to finish the submission process of your survey. Once the "Submit" button is clicked you will be unable to edit your answers. Please select the "Print Survey" button if you would like a record of your results.

Submit  Reset  Print Survey

Again, thank you for your participation! If you experience any technical problems or have questions, please contact the M.S. in Agronomy Evaluation Team (MSAgronEval@iastate.edu).
APPENDIX D: DEIAS FOR CURRENT STUDENT GROUP
The following is a program evaluation survey for the Master of Science in Agronomy Distance Education Degree Program. Questions are designed to help us examine if there has been an impact on students’ economic and career status, since being enrolled in the M.S. in Agronomy program.

Please answer the following questions/statements to the best of your ability. Feel free to elaborate further on any of the questions/statements in the comment box provided (not required). After completing the survey, please press the "Submit" button to submit your responses. All information submitted will be kept confidential.

If you experience any technical problems or have questions, please contact the M.S. in Agronomy Evaluation Team (MSAgronEval@iastate.edu). Thank you for your participation!

Part A: Background Information

Please use the comment boxes to describe your opinions of the following questions.

1. How has the program affected your career?

2. What course has had the greatest impact on your professional growth and why?

3. Will earning a M.S. in Agronomy degree make a significant impact on your career status?

Please select the option that best describes your demographic and background information.

4. What is your gender?
   - [ ] Female
   - [ ] Male

5. What is your age?
   - [ ] <25
6. Where do you live?
   Please select

7. What is your current employment status?
   ○ Unemployed
   ○ Employed part-time
   ○ Employed full-time
   ○ Other... (Please explain:)

8. How long have you been employed in the Agronomy sector?
   ○ I've never been employed in the Agronomy sector
   ○ Less than 1 year
   ○ 1-3 years
   ○ 3-5 years
   ○ 5-7 years
   ○ 7-9 years
   ○ 9-11 years
   ○ 11-13 years
   ○ 13-15 years
   ○ 15-17 years
   ○ 17-19 years
   ○ 19-21 years
   ○ 21-23 years
   ○ 23-25 years
   ○ 25 or more years
   ○ Other... (Please explain:)

9. What is your current field of occupation?
   ○ I am not currently employed
   ○ Chemical Industry
   ○ Consultant/Co-op
   ○ Government/Extension
   ○ Production
   ○ Seed Industry
   ○ Other... (Please explain:)

10. How long have you been employed by your current employer?
    ○ I am not currently employed
    ○ Less than 1 year
Part B: Income Level

The purpose of this section is to gather information regarding your income level. Income Level is defined as the types of compensation, usually in the form of money, an employee receives for working that sometimes signifies their job importance.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

1. Have you received a promotion since your involvement in the M.S. in Agronomy Program?

1A. If so, what is your new position title and how do your new position responsibilities differ from your previous responsibilities?

2. If you were promoted, did you receive the promotion as a result of your involvement in the M.S. in Agronomy Program?

3. Did you receive a raise as a result of your promotion? If so, what percentage of a salary increase did you receive?
   - I received no raise
   - 0.1-2%
   - 2.1-4%
   - 4.1-6%
   - 6.1-8%
   - 8.1-10%
   - 10% or more
4. Please select the current yearly salary (income) you earn from your employer:
   - $19,999 or less
   - $20,000 - $29,999
   - $30,000 - $39,999
   - $40,000 - $49,999
   - $50,000 - $59,999
   - $60,000 - $69,999
   - $70,000 - $79,999
   - $80,000 - $89,999
   - $90,000 - $99,999
   - $100,000 or more

5. Of the financial support resources listed below, from which two will you receive the greatest support for your educational expenses (i.e., tuition, books and fees)? Only select two.
   - Parents, other relatives or friends
   - Spouse
   - Savings
   - Employer funds
   - Scholarship (Based on academic merit)
   - Financial aid
   - Other (Please specify: ___________________________)

Part C: Educational Support

The purpose of this section is to gather information regarding your formal or informal study arrangements at work and other benefits that you may receive from your employer.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

1. Do you have a formal arrangement allowing you to complete coursework while at work?

2. Does your employer provide you with "paid study days" of leave while you are enrolled in a course? (Paid study days are work days that allow you to study for a course during work hours)

3. Do you have an informal arrangement allowing you to complete coursework while at work?
4. If you have a formal or informal arrangement, how many hours are you allowed per week to complete coursework?
   - I am not allowed to do coursework during work time
   - Less than 2 hours
   - 2-4 hours
   - 4-6 hours
   - 6-8 hours
   - 8-10 hours
   - 10 or more hours

5. Does your employer provide you with technology or access to technology equipment/software while you are enrolled in a course?

6. Does your employer provide you with additional technology support because you are enrolled in a course? (i.e. technical support, training, etc.)

7. Does your employer arrange a study group session, mentor or tutor for you when you are enrolled in a course?

8. Does your employer provide you with any type of financial benefit if you complete a course in the M.S. in Agronomy program?

9. Will your employer provide you with any type of financial benefit if you complete the M.S. in Agronomy program?

10. If so, in what way will the financial benefit be provided to you?
    - Bonus Check
    - An Additional Retirement Contribution
    - Purchase Voucher
    - Vacation Voucher
    - Tuition Reimbursement
Part D1: Income Potential While Enrolled

The purpose of this section is to gather information regarding your perception for potential increases in income while you are enrolled in the M.S. in Agronomy program.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

As a result of pursuing a degree in the M.S. in Agronomy program:

1. I will earn more income in my current position
2. My skills and knowledge will be worth more income in the marketplace
3. I will probably be promoted and receive a raise
4. I will receive a raise while completing the same tasks
5. My earning potential will increase
6. I will have more potential for promotion within my current company
7. I will be more marketable and desirable by other companies

Part D2: Income Potential When You Graduate

The purpose of this section is to gather information regarding your perception for potential increases in income as a graduate from the M.S. in Agronomy program.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

As a result of graduating with a degree from the M.S. in Agronomy program:
Part E: Job Security

The purpose of this section is to gather information regarding your perceptions of your job security. Job Security is defined as the level of confidence you have that your position within the company is stable, safe, and protected.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

With my enrollment in the M.S. in Agronomy program, my current employment position is:

1. more secure because I am enrolled in the M.S. in Agronomy program
   - Strongly Agree  - Disagree  - Agree  - Strongly Disagree  - I don't know

2. more secure because I am more versatile
   - Strongly Agree  - Disagree  - Agree  - Strongly Disagree  - I don't know

3. more secure because of the knowledge and skills I am gaining
   - Strongly Agree  - Disagree  - Agree  - Strongly Disagree  - I don't know

4. more secure because my professional responsibilities are increasing
   - Strongly Agree  - Disagree  - Agree  - Strongly Disagree  - I don't know

5. more secure because my supervisor has more confidence in me
   - Strongly Agree  - Disagree  - Agree  - Strongly Disagree  - I don't know
Part F: Information About Co-Workers

The purpose of this section is to gather information about your co-workers.

Please answer the following questions related to the M.S. in Agronomy program.

1. How many direct co-workers do you have? (direct co-workers are those you regularly work with on a day-to-day basis)

2. How many of your direct co-workers know you are enrolled and working towards a M.S. in Agronomy distance education degree?

3. How many of your direct co-workers are pursuing a degree? (i.e. certification, associates, bachelors)

4. How many of your direct co-workers are pursuing a Masters degree?

5. How many of your direct co-workers are pursuing a degree via distance education? (i.e. certification, associates, bachelors)

6. How many of your direct co-workers are pursuing a Masters degree via distance education?

7. How many of your direct co-workers are pursuing a M.S. in Agronomy distance education degree from Iowa State University?

Part G: Perceptions of Co-Workers

The purpose of this section is to gather information regarding how you think your co-workers view you. Perception is defined as an awareness or understanding of a situation.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

With my enrollment in the M.S. in Agronomy program, I think my co-workers:
1. view me as more knowledgeable
2. view me as more likely to move up the corporate ladder
3. view me as a threat to their job security
4. view me as more likely than they are to be promoted
5. expect me to perform more efficiently
6. expect me to perform at a higher level
7. seek out my opinion on topics related to my degree program
8. seek out my opinion on topics related to my job but not my degree program
9. are more confident in my abilities
10. view me in a more positive light
11. treat or view me no differently than before I enrolled in the M.S. in Agronomy program

**Part H: Your Supervisor’s Perceptions**

The purpose of this section is to gather information regarding your perceptions of how you think your supervisor views you. Perception is defined as an awareness or understanding of a situation.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

With my enrollment in the M.S. in Agronomy program, I think my supervisor:

1. views me as more knowledgeable
Part I: Self Perceptions of Impact on Work

The purpose of this section is to gather information regarding perceptions of how you think your enrollment in the M.S. in Agronomy degree has impacted your work.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

With my enrollment in the M.S. in Agronomy program:

1. I've been given more responsibilities at work

2. expects me to handle more responsibility

3. expects me to perform more efficiently

4. expects me to perform at a higher level

5. seeks out my opinion on topics related to my degree program

6. seeks out my opinion on topics related to my job but not my degree program

7. has more confidence in my abilities

8. views me in a more positive light

9. views me as someone with enhanced potential

10. treats or views me no differently than before I enrolled in the M.S. in Agronomy program

11. expects me to perform less efficiently due to my coursework
Part J: Self-efficacy Perceptions

The purpose of this section is to gather information regarding self-efficacy. Self-efficacy is defined as the belief that you influence and control your own destiny.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

With my enrollment in the M.S. in Agronomy program:

1. I possess greater confidence in my ability to perform my work

2. My self-confidence has increased

3. I am better able to problem-solve when presented with obstacles
4. my job morale has been positively affected by my involvement in the program

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

As a result of being enrolled in the M.S. in Agronomy program, I have:

5. more work-related confidence

6. more work-related motivation

7. more overall self-esteem

8. more job-satisfaction

9. more work-related knowledge

10. Other... (Please explain:)

Part K: Career Mobility Perceptions

The purpose of this section is to gather information regarding career mobility. Career Mobility is defined as flexibility and ease with which your career can change to meet new demands and opportunities.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

With my enrollment in the M.S. in Agronomy program:

1. I have more interest in the company/organization that I work for

2. I have more interest in other agriculture companies/organizations
3. Other agriculture companies/organizations have more professional interest in me

4. I am more aware of other positions in my company/organization

5. I am more aware of other positions in other companies/organizations

6. I am more aware of the need for my skills in the marketplace

7. I have a better understanding of how my company/organization is organized and managed

---

**Part L: Education**

The purpose of this section is to gather information regarding your educational experience in the M.S. in Agronomy program and possibly future distance education course or program enrollment.

Please select the option that best describes your opinions of the following statements, and provide any additional information in the comment boxes.

1. The M.S. in Agronomy program had a good academic reputation

2. I would pursue the M.S. in Agronomy degree again

3. I would pursue another on-line degree

4. I would or already have recommended this program to others

5. I would pursue this degree if it were offered only on campus

6. My educational goals are being met through this program
7. There is a direct correlation between concepts covered in the courses and what I do at work.

Thank you for completing the survey. Please click the "Submit" button to finish the submission process of your survey. Once the "Submit" button is clicked you will be unable to edit your answers. Please select the "Print Survey" button if you would like a record of your results.

Submit  Reset  Print Survey

Again, thank you for your participation! If you experience any technical problems or have questions, please contact the M.S. in Agronomy Evaluation Team (MSAgronEval@iastate.edu).
APPENDIX E: BACKGROUND INFORMATION QUESTION RESPONSES FROM GRADUATE GROUP
<table>
<thead>
<tr>
<th>Student ID</th>
<th>How has the program affected your career?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>Enabled me to apply and receive a better job. More money, better hours, closer to home.</td>
</tr>
<tr>
<td>1002</td>
<td>I've become more confident in my agronomic problem solving skills.</td>
</tr>
<tr>
<td>1003</td>
<td>It helped me complete required MS degree for job.</td>
</tr>
<tr>
<td>1004</td>
<td>It has made me more proficient in giving a recommendation with a solid background of information.</td>
</tr>
<tr>
<td>1005</td>
<td>I have become better aware of the impact agriculture and farming has on our environment.</td>
</tr>
<tr>
<td>1006</td>
<td>The program has given me a more in-depth agronomic knowledge than I previously had. The Degree is also allowing me to currently apply for a promotion that I would not have been able to if I had not completed this program.</td>
</tr>
<tr>
<td>1007</td>
<td>This program was the stepping stone that helped me take the next step onto Doctorates</td>
</tr>
<tr>
<td>1008</td>
<td>it has provided advanced understanding and as a result it appeals to various potential employers</td>
</tr>
<tr>
<td>1009</td>
<td>It helped me &quot;get&quot; a job as head of a crop consulting department</td>
</tr>
<tr>
<td>1010</td>
<td>My intent with the program was part of a requirement to stay employed with extension. However, I left extension and having my MS is now mainly a distinction or title.</td>
</tr>
<tr>
<td>1011</td>
<td>This program enriched my career. I have more confidence in what I do and it greatly enhanced my knowledge. It forced me to study areas that I would not have done so on my own.</td>
</tr>
<tr>
<td>Student ID</td>
<td>What course had the greatest impact on your professional growth and why?</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1001</td>
<td>My soils classes with Roger Borges. I have done a lot of work with soils in my job and his classes enabled me to be able to explain myself to my customers in ways they could understand.</td>
</tr>
<tr>
<td>1002</td>
<td>The IPM and the soils courses were the most helpful for me.</td>
</tr>
<tr>
<td>1003</td>
<td>Soils, because have used some information since classes.</td>
</tr>
<tr>
<td>1004</td>
<td>Not just one course, but all the soils courses simply because I really enjoy them.</td>
</tr>
<tr>
<td>1005</td>
<td>Probably the soils classes, I feel these were my weakest areas prior to the MS classes.</td>
</tr>
<tr>
<td>1006</td>
<td>The creative component had the greatest impact on me because it gave me a new found respect for research and how difficult it is to end up with meaningful data. It also has given me the knowledge to more closely evaluate data the make sure that it is legitimate research and not skewed data to sell a product.</td>
</tr>
<tr>
<td>1007</td>
<td>Creative Component because it encompassed the entire program and helped me put together a project and proposed solution. This is critical in my current environment as I deal with projects on a daily basis.</td>
</tr>
<tr>
<td>1008</td>
<td>soil management/science</td>
</tr>
<tr>
<td>1009</td>
<td>Can't really say</td>
</tr>
<tr>
<td>1010</td>
<td>Statistics course: Helped me to understand data better.</td>
</tr>
<tr>
<td>1011</td>
<td>Crop growth and development (501). This course not only provided great knowledge and understanding, but it required me to improve my communication skills.</td>
</tr>
<tr>
<td>Student ID</td>
<td>Has earning a MS in Agronomy degree made a significant impact on your career status?</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1001</td>
<td>Yes, better job.</td>
</tr>
<tr>
<td>1002</td>
<td>Yes it has. The program has doubled my income.</td>
</tr>
<tr>
<td>1003</td>
<td>Yes, it helped get the job, since have degree.</td>
</tr>
<tr>
<td>1004</td>
<td>It helped me become a more valuable asset to the company.</td>
</tr>
<tr>
<td>1005</td>
<td>No, not really yet.</td>
</tr>
<tr>
<td>1006</td>
<td>Yes, see statement in number 1.</td>
</tr>
<tr>
<td>1007</td>
<td>Not yet, but will someday soon.</td>
</tr>
<tr>
<td>1008</td>
<td>yes</td>
</tr>
<tr>
<td>1009</td>
<td>It had, but then the company went out of business and the agronomy field is so full, that there just aren't many positions open.</td>
</tr>
<tr>
<td>1010</td>
<td>I'm not sure what you mean by career status?</td>
</tr>
<tr>
<td>1011</td>
<td>Not directly, but indirectly it is providing me opportunities that I probably would not have had, had I not completed the program.</td>
</tr>
</tbody>
</table>
APPENDIX F: BACKGROUND INFORMATION QUESTION RESPONSES FROM CURRENT STUDENT GROUP
<table>
<thead>
<tr>
<th>Student ID</th>
<th>How has the program affected your career?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>My efforts in this program have resulted in a promotion.</td>
</tr>
<tr>
<td>2002</td>
<td>It has helped expand my job responsibilities.</td>
</tr>
<tr>
<td>2003</td>
<td>My employer has asked that I get my Master's.</td>
</tr>
<tr>
<td>2004</td>
<td>I have gained more knowledge about the activities in my recent and current positions. I have not seen much affect on my career yet. I expect that it will not make a huge difference until after graduation.</td>
</tr>
<tr>
<td>2005</td>
<td>Aside from implementing concepts I've learned from this program into my research efforts and the increased knowledge base I've gained, this program has not greatly affected my career; however, some key retirements will occur in the next two years and I hope to position myself for promotion by completing this program.</td>
</tr>
<tr>
<td>2006</td>
<td>No, it has placed competed with the time I should have spent studying job related material.</td>
</tr>
<tr>
<td>2007</td>
<td>The program has helped me in my career develop better relations with customers as I learn about Agronomy in greater detail. I feel both customers and co-workers look up to me because of my hard work and desire to learn.</td>
</tr>
<tr>
<td>2008</td>
<td>I have been able to apply the material to my everyday work to better understand what I do. The program has helped me better understand agronomic aspects of my job.</td>
</tr>
<tr>
<td>2009</td>
<td>The information in this program has made me a much better agronomist. I think that I have a distinct competitive advantage over my competition as a result of this program. As long as my competitors stay idle this will work out great!</td>
</tr>
<tr>
<td>2010</td>
<td>Provided a deeper technical understanding of agronomic principles, how to practically apply that knowledge, and overview of the current major challenges facing crop production. Program has helped develop technical communication skills, such as consultant communicating ideas/suggestions to a farmer/customer, and critical thinking.</td>
</tr>
<tr>
<td>2011</td>
<td>To date it has not.</td>
</tr>
<tr>
<td>2012</td>
<td>At this time it has not had an effect on it.</td>
</tr>
<tr>
<td>2013</td>
<td>I have not changed jobs since I started the program. The potential is very real that I can improve on my current position. However, the potential would be diminished had I not started and completed the M.S. program.</td>
</tr>
<tr>
<td>2014</td>
<td>At this time the program has not affected my career significantly. It has, however, provided me with a lot of needed information in crop production. I foresee many changes in the next few years in the way crops are produced in my area. I think this program has situated me to be a leader in helping to implement those changes.</td>
</tr>
<tr>
<td>2015</td>
<td>It has helped me better understand the technical aspects of my job, and has helped me to become more focused, and organized in my daily dealings with agronomics.</td>
</tr>
<tr>
<td>2016</td>
<td>I have used the knowledge gained in the MS program to become an</td>
</tr>
</tbody>
</table>
instructor for Office of Surface Mining (OSM) National Technical Training Program (NTTP) courses, specifically, Soil and Revegetation. In my current position, I am able to apply all principles to individual projects, which are grading contracts that use a seeding cover for erosion control, etc. My understanding of contract specifications and principle concepts of the MS program help me to analyze the methodology used and how to improve it. With this understanding, I am better able to communicate with contractors, landowners, and the design engineers, which is beneficial for the program. I also work with private businesses that use by products and are interested in testing/studying them on our projects. Compost, aglime slurry from Cargill, and municipal water treatment plants all have alternative products that they are interested in studying, as well as have potential to be used in our program.

2017 I have more working knowledge than I would have had if I did a "traditional" MS program. Please pardon any typos I am doing this quickly

2018 It has given me more real world situations to go from. It has helped my career by being aware of what is going on today in agriculture.

2019 Added confidence when speaking with other professionals.

2020 I believe I was offered a position to work on a project that likely would not have been offered if I had not begun work on this program. My supervisors have taken note of my increased knowledge and I feel more prepared to deal with the issues in my job.

2021 It is providing me with information that I can utilize in career.

2022 It has made me busier!!! Trying to continue work and this program, as well as family commitments at times is difficult. I have not seen an advancement in my career, but I have learned much from this program.
Will earning a MS in Agronomy degree make a significant impact on your career status?

2001 I have learned a lot in all courses. It would be difficult for me to isolate one course as having the most impact.

2002 Agron 531 has to this point, had the greatest impact on my professional growth due to the holistic nature of the case study examinations, etc. involved in the course work.

2003 I am not sure of this answer yet.

2004 Agron. 512 -- I only took the required soil science courses for my undergraduate degree. This course has strengthened concepts learned in those courses while increasing my knowledge base in a host of soil-plant interactions, etc.

2005 This course so far. It is bring together many of my prior lesson.

2006 I would say 541. The curriculum provided by Elwynn Taylor was beneficial to me in better understanding weather and markets, two areas very important to farming.

2007 Crop growth and development has made the biggest impact. A lot of my job is plant breeding and this course helped me better understand the dynamics of breeding.

2008 The soil fertility course Agronomy 512 I believe and 502. These classes help me with fertility and soil management. I really enjoyed water dynamics and movement in these classes.

2009 Agron 592 - Course emphasized critical thinking, how to develop and defend one's position in an argument (and how to find faults in other's arguments).

2010 The stats class. I was able to show my immediate supervisor how to more easily make field plans and manipulate pivot tables.

2011 I would say 531 would have the greatest impact because it relates practical and strategic plans together. More thought provoking than any other.

2012 Agronomy 513 because it covered concepts and aspects of statistics that I needed to learn to correctly interpret research data.

2013 I think the 502 course has had the greatest impact. I spent years studying soil information and finally had a chance to learn it in a classroom. It was very beneficial to me.

2014 Agron 503 was right up there for the impact effect, because it contained the "science" of agriculture, and also the greatest "sociologic" portion of agriculture and growers...weather. What other topic is discussed as much as the weather...nothing comes to my mind, so I enjoyed the course, and had never previously taken a climate course before.

2015 AGRON 592. That course was well moderated by the professor, but the student participation was fantastic. The varied backgrounds and experiences that students bring to the discussion make each course very worthwhile. The
statistics course which forced analytical evaluation was very useful in sharpening these skills and applying the concepts to agronomy and our profession.

2017  I cannot pick just one yet.
2018  Agron 531. There is a lot of evaluating, thinking, and interacting. All of these traits help in everyday situations.
2019  No sure, most of the courses have little direct impact or influence since I am in the laboratory testing area.
2020  I can't really pick one course. Each course has offered knowledge that I use at some level in my job.
2021  Agron 514 was a course that helped me is a better field evaluator.
2022  Agron 514, due to the in depth looks at crop production.
What course has had the greatest impact on your professional growth and why?

2001 Yes
2002 I hope that it will.
2003 Yes
2004 Not at this time and in my current situation.
2005 Yes.
2006 I hope.
2007 Personally, I will feel a significant impact when that day comes because of my achievements, but in the short term I do not feel it will have a significant impact on my career status. Long term I feel it is necessary in order to achieve my career goals.
2008 Yes, there is a technical increase in salary for earning a master's degree as well as promotion possibilities.
2009 Yes. I have already seen pay increases. (significant)
2010 Maybe. The one thing it does do is give me more options than I had. This MS degree will also help get my foot in the door in many situations where a BS degree may not.
2011 When I return back to work, I will be hired at a higher salary.
2012 Where I am now...no because I am a business rep. It will enable me to do my job better unfortunately it will not get me more $ or likely a promotion. It does however open doors of opportunity in other fields.
2013 That's my primary reason for working through the program. I want to be challenged by the careers available to M.S. graduates.
2014 I do not know at this time.
2015 It's hard to tell. Education to me just makes sense, and it is something that can never be taken away from you once you have it. It is a necessary tool for the future, as far as I am concerned. It makes sense now, that's all I need to know. I will worry about the future when it gets here.
2016 Define significant impact. For the state of Iowa, there is no guaranteed Step increase of status of money. However, what has increased is the potential for involvement in activities besides basic job duties. "Other duties as assigned" works out well because special interest groups that focus on different topics such as Grasslands Alliance, STATEMAP GSB advisory panel, etc. have allowed me to network, carry on an educated conversation, and participate in problem solving conversations. I do feel that the MS will be sorting criteria in future job opportunities. I will get back to you on this one.
2017 Yes. It will help me get a better job down the line while picking up valuable work experience in the real world.
2018 Yes, I have been told by supervisors they respect this program and encourage it. They say it will help within my growth of the company
2019 Not really.
2020 In my current position at a cooperative extension office, an M.S. degree will
not make a significant impact in terms of increased salary or position. However, I believe it will make new opportunities available.

2021 Yes, because it is a graduate degree and it applies to my field.
2022 Probably not, but hopefully helps with job security
APPENDIX G: COVER LETTER AND DOCUMENTATION OF HUMAN SUBJECTS APPROVAL
Dear MS in Agronomy Student:
We are conducting a Web-based survey to collect information about your perceptions and attitudes towards the MS in Agronomy program. This specific survey will analyze the impact that the program has had on students' career and economic status. Your participation is extremely important for us to improve the program and the survey should take approximately 20 minutes of your time.

Please complete and submit the survey by Friday, October 8, 2004. Your responses will be used only for data analysis purposes and all information will be kept confidential. We will send you a follow-up email notice if we have not received a response from you by the given time period. However, your participation in completing this survey is voluntary.

If you experience any problems, have any questions, or prefer us sending you a hard copy of the survey instead, please contact the MS in Agronomy Evaluation Team at MSAgronEval@iastate.edu.

We appreciate your time and effort as we continue the process of evaluating the impact of the program.
http://masters.agron.iastate.edu/redirect/Impact.html

Sincerely,
Jesse

Jesse D. Drew
Iowa State University
MS in Agronomy Distance Education Program
http://masters.agron.iastate.edu
TO:          Ann Thompson

FROM:        Human Subjects Research Office

RE:          IRB ID # 03-319

DATE REVIEWED: January 29, 2003

The project, "M.S. in Agronomy Distance Education Program Evaluation" has been declared exempt from Federal regulations as described in 45 CFR 46.101(b)(2).

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

To be in compliance with ISU's Federal Wide Assurance through the Office of Human Research Protections (OHRP) all projects involving human subjects, must be reviewed by the Institutional Review Board (IRB). Only the IRB may determine if the project must follow the requirements of 45 CFR 46 or is exempt from the requirements specified in this law. Therefore, all human subject projects must be submitted and reviewed by the IRB.

Because this project is exempt it does not require further IRB review and is exempt from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects.

We do, however, urge you to protect the rights of your participants in the same ways that you would if IRB approval were required. This includes providing relevant information about the research to the participants. Although this project is exempt, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent, if applicable to your project.

Any modification of this research should be submitted to the IRB on a Continuation and/or Modification form to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

cc: Curriculum & Instruction

HSRO/OCR 9/02
Iowa State University
Human Subjects Review Form
(Please type this form & submit the original & two copies with three copies of all attachments)

Exempt 1-29-03

1. Title of Project: M.S. in Agronomy Distance Education Program Evaluation

2. I agree to provide the proper surveillance of this project to ensure that the rights and welfare of the human subjects are protected. I will report any adverse reactions to the committee. Additions to or changes in research procedures after the project has been approved will be submitted to the committee for review. I agree that all key personnel involved in conducting human subjects research will receive training in the protection of human subjects. This also includes all PI's and Co-PI's. Access to the 45 CFR 46, Belmont Report, and ISU's Federal Wide Assurance is available to all PI's via the WWW. http://grants-svr.admin.iastate.edu/VPR/humansubjects.html. I agree to request renewal of approval for any project continuing more than one year.

Ann Thompson
Typed name of principal investigator 01/17/03
Date Signature of principal investigator
Curriculum & Instruction
Department
292 - 0113 eat@iastate.edu
Phone number and email
N108 Lagomarcino Hall (59011 - 3192)
Mailing Address for Correspondence

2a. Principal investigator
☒ Faculty ☐ Staff ☐ Postdoctoral ☐ Graduate Student ☐ Undergraduate Student

3. Typed name of co-principal investigator(s) Date Signature of co-principal investigator(s)
Ching-Chun Shih 1/22/03
Julianne Craner 1/24/03

3a. Co-Principal investigator(s) (check all that apply)
☒ Faculty ☐ Staff ☐ Postdoctoral ☐ Graduate Student ☐ Undergraduate Student

3b. Typed name of major professor or supervisor (if not a co-principal investigator) Date Signature of major professor or supervising faculty member

4. Typed names of other key personnel who will directly interact with human subjects. (all key personnel must have training before approval will be made)

5. Project (check all that apply)
☒ Research ☐ Thesis or dissertation ☐ Class project ☐ Independent Study (490, 590, Honors project)

6. Number of subjects (complete all that apply)
☐ # adults, non-students 150 # ISU students 150 # other (explain)
☐ # minors under 18 (must obtain assent from minor & parental consent)
7. Status of project submission through Office of Sponsored Programs Administration (check one)
   ☐ Has been submitted  ☐ Will be submitted  ☒ Will not be submitted

7a. Funding Source: Foundation Account # 0400026

7b. Title of grant as listed on the Proposal Data Form (GoldSheet) if it differs from title above: M.S. in Agronomy Project

8. Brief description of proposed research Data Form (GoldSheet) if it differs from title above: M.S. in Agronomy Project
   (Include one copy of the complete proposal if submitting to a Federal sponsor.)
   This is a routine program evaluation involving students participating in the M.S. in Agronomy Distance Education Program. The purpose of the study will be to identify student perceptions and attitudes toward this program's web-based learning environment. The subjects of the study will include around 150 ISU students taking courses in the program from Spring 2003 to Spring 2008. Students will have the option to fill out the survey either on the web or by hard copy. Subjects involved will receive an e-mail containing the attached cover letter (information letter) asking them to complete an on-line survey (or a hard copy) regarding the program. Students involved in the program will be asked to fill out a survey questionnaire consisting of both multiple choice and open-ended questions designed to assess the content, quality, ease of use, and accessibility of the program including the student's experience regarding their current and potential use of resources, satisfaction with resources and services, current and potential use of hardware and software, professional development needs, barriers to technology use, attitudes towards technology, demographic information, and other comments. Students will be informed that participation is voluntary and that their responses will be kept strictly confidential with I.D. coding for analysis. Coding will be removed at the time of final data processing and respondent's names will be omitted from evaluation reports to protect their anonymity. Data will be discarded after analysis.

9. Informed Consent: ☐ Signed informed consent will be obtained. (Attach a copy of your form.)
   ☒ Modified informed consent will be obtained. (Attach a copy of your letter.)

10. Confidentiality of Data: Describe below the methods you will use to ensure the confidentiality of data obtained. (See instructions, item 10.)
   I.D. numbers will be assigned to participants. Coding will be removed at the time of final data processing and respondent's names will be omitted from evaluation reports to protect their anonymity. Data will be discarded after analysis. All staff will be informed of the importance of confidentiality.

11. Will subjects in the research be placed at risk or incur discomfort? Describe any risks to the subjects and precautions that will be taken to minimize them. (The concept of risk goes beyond physical risk and includes risks to subjects' dignity and self-respect as well as psychological or emotional risk. See instructions, item 11.)
   The only risk associated with this study is the potential for public exposure of student's names as they are associated with their responses. As stated above, coding will be removed in data processing and anonymity will be maintained when reporting findings of the research. Data will be discarded after analysis. All staff will be informed of the importance of confidentiality.

12. CHECK ALL of the following that apply to your research:
   ☐ A. Medical clearance necessary before subjects can participate   ☐ H. Deception of subjects
   ☐ B. Administration of substances (foods, drugs, etc.) to subjects   ☐ I. Subjects under 17 years of age
   ☐ C. Physical exercise or conditioning for subjects   ☐ J. Subjects in institutions (nursing homes, mental health facilities, prisons, etc.)
   ☐ D. Samples (blood, tissue, etc.) from subjects   ☐ K. Pregnant women
   ☐ E. Administration of infectious agents or recombinant DNA   ☐ L. Research must be approved by another institution or agency (attach letters of approval)
   ☐ F. Application of external stimuli
   ☐ G. Application of noxious or potentially noxious stimuli

If you checked any of the items in 12, please complete the following in the space below (include any attachments):

Items A-G Describe the procedures and note the proposed safety precautions.
Items D-E  The principal investigator should send a copy of this form to Environmental Health and Safety, 118 Agronomy Lab for review.

Item II  Describe how subjects will be deceived; justify the deception; indicate the debriefing procedure, including the timing and information to be presented to subjects.

Item I  For subjects under the age of 18, indicate how informed consent will be obtained from parents or legally authorized representatives as well as from subjects.

Items J-K  Explain what actions would be taken to insure minimal risk.

Item L  Specify the agency or institution that must approve the project. If subjects in any outside agency or institution are involved, approval must be obtained prior to beginning the research, and the letter of approval should be filed.
Iowa State University Human Subjects Review Form

Checklist for Attachments

The following are attached (please check):

13. ☐ Letter of information or written statement to subjects indicating clearly the elements of consent:
   a) the purpose of the research & a statement that the study involves research
   b) the use of any identifier codes (names, #’s), how they will be used, and when they will be removed (see item 19)
   c) an estimate of time needed for participation in the research activity
   d) if applicable, the location of the research activity
   e) how you will ensure confidentiality
   f) in a longitudinal study, when and how you will contact subjects later
   g) that participation is voluntary; nonparticipation will not affect evaluations of the subject
   h) contact information of the P.I. and if a student project, the major professor or supervising faculty member’s
      contact information

14. ☐ A copy of the signed informed consent form (if applicable). (Please note: this document will be stamped with the
    project’s approval and expiration dates. These stamped documents will be returned to the PI for copying and use;
    do not make copies of the document without the stamp)

15. ☐ Letter of approval for research from cooperating organizations or institutions (if applicable)

16. ☐ Data-gathering instruments

17. ☐ Recruitment fliers or any other documents the subjects will see

18. Anticipated dates for contact with subjects. If using secondary data, the start date will be when the PI has access to and starts to use the
    data. Allow at least two weeks for review of your proposal before your anticipated start date.

   First contact  Last contact
   02/01/03  05/30/08
   Month/Day/Year  Month/Day/Year

19. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or
    audio or visual tapes will be erased:

   Identifiers will be removed after data processing on December 31, 2008.
   Month/Day/Year

20. Signature of Departmental Executive Officer  Date

21. Initial action by the Institutional Review Board (IRB):

   ☐ Project approved  ☐ Pending Further Review  ☐ Project not approved
   ☐ No action required

   Date  Date  Date

22. Follow-up action by the IRB:

   Project approved  ☐ Project not approved  ☐ Project not resubmitted

   Date  Date  Date

Rick Sharp  IRB Chairperson
Signature of IRB Chairperson
Date

1/02
IRB Administrator CHECKLIST

1) Are all key personnel trained? Y ☒ N ☐

Names needed:

________________________________________________________________________

2) Are PI & Co-PI typed names & signatures the same and complete? Y ☒ N ☐

3) Is the DEO's signature on page 3? Y ☒ N ☐

If no, date sent back to PI: __________

4) Are contact dates future dates? Y ☒ N ☐

If not, contact PI:

5) Will project be submitted to OSPA?

☐ Will Be ☐ Has Been ☒ Will Not Be Submitted

If has been, look up ORACLE ID# & add to Form

6) If this is going to be Federally funded, is a copy of the grant attached? Y ☐ N ☐ N/A ☒

7) Consent Document:

Attached Clean: Y ☐  Attached Need Changes: Y ☐ N ☐
IRB COMMITTEE PROTOCOL CHECKLIST

CHAIR SECTION

1) Does this protocol fit the requirements for Expedited Review? (To be eligible for expedited review, research must be judged as minimal risk and either exempt or listed in the categories of research approved for expedited review).

☑ Minimal Risk
☑ Exempt from 45 CFR 46 as cited in 46.101(b):

☐ (1) Research conducted in established educational or commonly accepted educational settings...

☐ (2) Research involving use of educational tests... unless (i) information obtained is recorded in such a manner that human subjects can be identified... and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subject at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

☐ (3) Research under b (2) above if: (i) human subjects are elected or appointed public officials... or (ii) Federal statute(s) require(s) without exception that confidentiality will be maintained.

☐ (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified...

☐ (5) Research and demonstration projects... to examine (i) public benefit or service programs (ii) procedures for obtaining benefits or service under those programs, (iii) possible changes in or alternatives to those programs or procedures, or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

☐ (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe...

2) ☑ Research is present in the list of categories of research approved for expedited review as defined in 46.110(a)

Additional Committee Review Requested: ________________________________________________________

☐ Notes:____________________________________________________________________________________

COMMITTEE SECTION

3) Informed Consent ☑ ☐ Consent not required (usually involves archival data) ☑ ☐ Informed Signed Consent submitted ☐ ☐ Modified Consent proposed

Are all elements of consent present?

☑ a statement that the study involves research;

☐ for research involving more than minimal risk, an explanation as to whether any compensation and an explanation as to whether any medical treatments are available if injury occurs and, if so, what they consist of, or where further information may be obtained;

☑ a description of any benefits to the subject or to others which may reasonably be expected from the research;

☑ a disclosure of appropriate alternative procedures or courses of treatment, if any, that might be advantageous to the subject;

☑ questionnaire(s), script(s), survey instrument(s) attached;

☐ a description of any reasonably foreseeable risks or discomforts to the subject;

☑ an explanation of whom to contact for answers to pertinent questions about the research (to include Principal Investigator and Major Professor or supervising faculty member if PI is a student) and research subjects' rights, and whom to contact in the event of a research-related injury to the subject;

☑ a statement that participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled, and the subject may discontinue participation at any time without penalty or loss of benefits to which the subject is otherwise entitled; and

☑ a statement describing the extent, if any, to which confidentiality of records identifying the subject will be maintained.

☐ Notes:____________________________________________________________________________________

____________________________________________________________________________________________

11/02
References


Garland, M. (1993). Ethnography penetrates the “I didn’t have time” rationale to elucidate higher order reasons for distance education withdrawal. Research in Distance Education. 5(2), 6-10.


ACKNOWLEDGEMENTS
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