

**AN ANALYSIS OF DISTANCE EDUCATION ADOPTION BARRIERS WITHIN
COLLEGES AND PROGRAMS OF AGRICULTURE**

by

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ABSTRACT

Distance Education (DE) provides a means for which people, who are unable to attend on-campus courses for any of various reasons, to receive a college education. While there are many benefits cited for DE and many students show a partiality towards DE (Guthrie, 2009; Kelsey, Lindner, & Moore, 2002; Koch, Townsend, & Dooley, 2005; Mink & Moore, 2005; Murphy, 2000; Sampson, Leonard, Ballenger, & Coleman, 2010), institutions still struggle with the decision to create or expand their DE course offerings as there are many barriers hindering the growth and development of DE programs (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphy & Terry, 1998a; Murphrey & Dooley, 2000; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005a).

The primary purpose of this study was to determine what barriers are present in the implementation and development of DE courses within Colleges of Agriculture (COA). Research questions for this study included: What barriers prevent or hindered COA from providing distance education courses to their students amongst adopters and non-adopters? Is the development or expansion of distance education courses a viable option for COA? How can COA expedite the development of existing and future distance education courses?

The majority of participants ($n = 49$) were affiliated with an 1862 Land Grant institution having a student enrollment of 25,000 or below. Participants identified the perceived barriers as minor, with restrictive costs being considered as a moderate barrier and resistance from

faculty members as a major barrier. Respondents did not differ in their perceptions of DE barriers based on the institutional characteristics. Only one model showed a statistically significant relationship between DE availability and DE barriers and that was observability. All but one respondent thought DE development was a viable option for their COA. Lastly, respondents commonly indicated that COA can expedite the development of DE courses by focusing on funding ($n = 6$), time constraints ($n = 5$), faculty incentives ($n = 6$), adequate resources and support ($n = 7$), and cooperative programs focused on sharing course material ($n = 5$).

In this study, faculty resistance was a major barrier to DE diffusion. Observability was also a significant barrier to DE availability. It was found that faculty resistance to DE was related to their inability to observe DE prior to use. As faculty resistance was cited as a barrier in this study, determining the individual innovativeness of each respondent would have been useful in determining adopter categories as laggards are more traditional and, therefore, more resistant to change. Future research concerning DE barriers should include adopter categories when investigating causes of faculty resistance, as this information could prove insightful in determining how best to incentivize faculty to adopt DE programs.

I dedicate this paper to my grandmother, Elaine M. Johnson.

This research was the culmination of seven years' worth of life, growth, and education.

She knew better than most the importance of each.

This is also dedicated to my loves, Caleb and Colin.

May you always have the courage to dream big and to finish what you start.

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TABLE OF CONTENTS

	Page
ABSTRACT	ii
DEDICATION	iv
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS.....	vii
LIST OF TABLES	ix
CHAPTER	
I. INTRODUCTION	1
Background	1
Statement of Problem.....	4
Purpose of the Study	7
Objectives	7
Theoretical Framework.....	8
Significance of Study.....	9
Definitions and Terms.....	9
Limitations	12
II. REVIEW OF LITERATURE	13
Diffusing an Innovation	13
Disruptive Innovations.....	17
Benefits of Distance Education.....	19
Barriers to Distance Education	23
III. METHODS	29
Research Design.....	29
Selection of Participants	30
Instrumentation	30

Measures	31
Qualitative Analysis	34
Procedures	34
Data Analysis	35
Response Rate	38
 IV. FINDINGS	 39
Objective One: Findings	39
Objective Two: Findings	41
Objective Three: Findings	47
Objective Four: Findings	58
Objective Five: Findings	61
Objective Six: Findings	61
 V. CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS	 63
Summary	63
Summary of Purpose and Objectives	64
Summary of Methods	65
Conclusions, Implications, and Recommendations	66
Summary of Recommendations for Practice	76
Summary of Recommendations for Future Research	77
 REFERENCES	 79
 APPENDIX A	 86
 APPENDIX B	 88
 APPENDIX C	 89
 APPENDIX D	 91
 APPENDIX E	 92
 APPENDIX F	 93
 APPENDEX G	 95

LIST OF TABLES

TABLE		Page
1	Sample Statements from Each Construct.....	34
2	Number of Respondents by Institutional Characteristics.....	40
3	Number of Respondents by Department.....	41
4	Reliability Coefficients of Each Construct	42
5	Respondents' Perceptions of Attributes by Construct	42
6	Respondents' Perceptions of the Relative Advantage of DE Adoption by Individual Response Item	43
7	Respondents' Perceptions of the Compatibility of DE Adoption by Individual Response Item.....	44
8	Respondents' Perceptions of the Complexity of DE Adoption by Individual Response Item.....	45
9	Respondents' Perceptions of the Trialability of DE Adoption by Individual Response Item.....	46
10	Respondents' Perceptions of the Observability of DE Adoption by Individual Response Item.....	47
11	Analysis of Variance for Participants' Perceptions of DE Barriers by Institutional Classification	49
12	Analysis of Variance for Participants' Perceptions of DE Barriers by Institutional Student Enrollment	51
13	Analysis of Variance for Participants' Perceptions of DE Barriers by COA Student Enrollment	52
14	Comparison of Participants' Perceptions of DE Barriers by DE Availability	53

TABLE	Page
15 Comparison of Participants’ Perceptions of DE Barriers by DE Coordinator Availability	54
16 Analysis of Variance for Participants’ Perceptions of DE Barriers by DE Years Offered.....	56
17 Analysis of Variance for Participants’ Perceptions of DE Barriers by DE Student Enrollment	57
18 Comparison of Participants’ Perceptions of DE Barriers by DE Tuition Distribution	58
19 Linear Regression of DE Barriers from DE Availability.....	59
20 Linear Regression of DE Barriers from DE Coordinator	60
21 Respondents’ Perceptions of DE Development as a Viable Option for COA.....	61
22 Respondents’ Perceptions of how COA can Expedite the Development of Existing and Future DE Courses.....	62

CHAPTER I

INTRODUCTION

Distance education (DE) has been defined many times in the literature by multiple scholars (Casey, 2008; Greenberg, 1998; McIsaac & Gunawardena, 1996; Miller & King, 2003; Valentine, 2002). Greenberg (1998) has described DE as “a planned teaching and learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning” (p. 36) while Miller and King (2003) provided a more concise definition of “formalized instructional learning conducted at a distance” (p. 284). No matter the definition, there is consistent agreement that technology is a key component to DE (Casey, 2008; McIsaac & Gunawardena, 1996; Miller & King, 2003; Valentine, 2002). As technology has evolved, the way we define and execute DE has evolved as well.

History of Distance Education

Miller and King (2003) wrote that DE could arguably have begun as simply the exchange of written words, many others firmly believe the concept of DE first gained ground in the mid-1800s when correspondence courses were initiated (Casey, 2003; McIsaac & Gunawardena, 1996; Miller & King, 2003; Valentine, 2002). One example of such a course is the Phonographic Institute in Cincinnati, Ohio utilizing the United States Postal Service (USPS) to mail exercises to self-taught secretaries. Upon the completion of the required coursework, the secretaries would receive

a certificate of expertise in stenographic shorthand skills (Casey, 2008). By the 1920s, the radio became the primary means of delivering educational programs followed by the television in the 1950s. These mediums paved the way for other DE opportunities utilizing television technologies such as computers, satellites, and the internet (Casey, 2003). While DE programs were initially intended for individuals who are unable to pursue an advanced degree on a traditional college campus, they have always been based on the premise of offering education to those who do not have access to or whose career does not allow for them to participate in on-campus courses (Born & Miller, 1999).

Evolving Technology

As computers and computer technology have evolved, so too have the possibilities for course delivery. DE courses are driven by computer-based and compressed video-based instruction due to the technological advances of electronic networks such as the Internet and World Wide Web, as well as wireless networks. Laptops, tablets, i-pads and smart phones are being used as a means for distributing course information. In addition to these, there are many other technologies available such as computer conferencing and course management tools available. Examples of these technologies include WebCT®, Blackboard®, Concur® and Wimba Live Classroom®. Skype® and Zoom®. Voice-over-internet protocols allow users to communicate with peers by voice, video, and instant messaging over the internet. Email, fax and telephone are still currently used for DE course delivery. These technologies have made it easier for colleges and universities to provide an education to those who would otherwise be unable to attend on-campus courses due to financial or geographical reasons (Valentine, 2002).

DE is offered by some of the best universities in world (Casey, 2008; Miller & King 2003). The quality DE programs being provided by these top universities are making education a viable option for increasingly large populations of people who can now earn a college degree without having to step onto a college campus or, at the very least, with minimal campus attendance.

A Growing Demand for Distance Education

Figlio (2016) wrote that DE has become a mainstay in higher education, but that issues of quality instruction and student learning outcomes remains a concern that must be addressed. Since 2000, the percentage of undergraduate and graduate students taking DE courses has been steadily trending upwards. According to the National Center for Educational Statistics (NCES), in 2003-2004 approximately 16% of undergraduates had taken at least one DE course. In 2007-2008 that percentage had grown to 21% and by 2011-2012, 32% of undergraduates had taken at least one DE class. Similarly, the percentage of graduate students has also increased. In 2003-2004, 17% of graduate students had enrolled in at least one DE course, followed by 23% in 2007-2008 and 36% in 2011-2012 (NCES, 2016).

One of the main factors identified as a contributor to the rise in DE course enrollment is convenience (Miller & King, 2003). Students enrolled in DE courses are traditionally older, often having jobs and families (United States Government Accountability Office, 2002) and DE provides these students with a way to balance life and education (Koch, Townsend, & Dooley, 2005).

Benefits and Barriers to Distance Education

Much research has been conducted focusing on the efficacy of DE. Students often are very satisfied with their DE experience (Guthrie, 2009; Kelsey, Lindner, & Moore, 2002; Koch, Townsend, & Dooley, 2005; Mink & Moore, 2005; Murphy, 2000; Sampson, Leonard, Ballenger, & Coleman, 2010). Success of students enrolled in DE courses is often the same for those participating in traditional on-campus courses (Koch, Townsend, & Dooley, 2005; Shih & Gamon, 2001). Some studies suggest that DE students are more achievement-oriented with higher levels of self-efficacy and critical thinking skills than their on-campus counterparts (Qureshi, Morton, & Antosz, 2002; Roberts & Dyer, 2005b; Shih & Gamon, 2001).

Despite the many advantages and strengths that DE programs provide, higher education institutions still hesitate to expand their DE programs criticizing them for their inferiority to on-campus courses, lack of effectiveness, and poor quality (Born & Miller, 1999; Miller & Pilcher, 2000; Moore & Wilson, 2005; Figlio, 2016). Several studies (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphy & Terry, 1998a; Murphrey & Dooley, 2000; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005a) have sought to determine what underlying factors affect an institution's decision to implement DE courses. Commonly cited as the barriers most frequently affecting the adoption of DE, such as time constraints of faculty, cost or lack of funding, limitations with equipment, lack of support from administration, and concerns about course quality.

Statement of Problem

This study addresses the American Association for Agricultural Education National Research Agenda research priority of addressing the barriers to DE and examining how they

affect COA in order to improve the quality of existing DE programs and to facilitate the growth of new ones. Discovering what factors have played a role in determining if DE is a viable option of course delivery for COA, and if it is, what accommodations are needed to expedite the growth DE course offerings.

According to Enns, Martin, and Spielmaker (2016) in the American Association for Agricultural Education's (AAAE) National Research Agenda (2016-2020), 1% of the U.S. population works on farms and is supported by 15% of the total U.S. workforce (Goecker, Smith, Smith, & Goetz, 2010). Jointly, this agricultural sector accounts for \$278.4 billion of the \$17.4 trillion U.S. Gross Domestic Product (GDP) (Central Intelligence Agency, 2015). As the world's population is projected to reach 9.7 billion by 2050, the American agricultural sector has a tremendous challenge ahead (United Nations, Department of Economic and Social Affairs, 2015).

Faced with the challenge of feeding an expanding world population, innovations and the adoption of new technologies will be required (Conway, 2012). Additional research on and a better understanding of new technologies, practices, and products will help agricultural educators develop and implement agricultural teaching and learning processes which will in turn contribute to the development of sustainable agricultural systems we will need in the future (Lindner, Rodriguez, Strong, Jones, and Layfield, 2016). This focus is to include "...universities and colleges and their faculty and students, primary and secondary schools and their teachers and students, Extension services and outreach institutions and their professionals and clients, [as well as] farmers growing food and fiber, and scientists and professionals developing new innovations..." (p. 20).

Lindner et al. (2016) state, “to achieve positive outcomes in current and future agriculture-related diffusion efforts, related research, education, and outreach activities must continually change to address the new challenges and opportunities brought about by rapidly advancing technologies...” (p. 20), defining technologies as “video conferencing, websites, apps, learning management systems, reusable learning objects, mobile devices, and smart boards”. Lindner et al. (2016) identified two research priority questions that are recommended to guide other researchers’ work. These include: (1) What methods, models, and practices are most effective in leading change? and (2) What methods, models, and practices are most effective in diffusing innovations?

Despite evidence supporting DE is an increasingly popular and desirable form of course delivery (Guthrie, 2009; Kelsey, Lindner, & Dooley, 2002; Koch, Townsend, & Dooley, 2005; Mink & Moore, 2005; Murphy, 2000; Sampson, Leonard, Ballenger, & Coleman, 2010; Shih & Gamon, 2001), there is still much concern and criticism surrounding the posited inferiority to on-campus courses, ineffectiveness, and poor quality of DE courses (Born & Miller, 1999; Miller & Pilcher, 2000; Moore & Wilson, 2005; Figlio, 2016). Figlio (2016) indicated that online degrees were not valued as highly as traditional on campus degrees for these reasons.

There are many barriers associated with adopting or initiating DE programs (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphrey & Dooley, 2000; Murphy & Terry, 1998a; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005). Research supports faculty perceptions that DE has significant value as a tool in the learning process (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphrey & Dooley, 2000; Murphy & Terry, 1998a; Murphy & Terry, 1998b). Dooley and Murphy (2001) stated in their study that in order “to prepare to students successfully in [COA], educators must incorporate the use of digital

information technologies” (p. 1). Roberts and Dyer (2005) further note “the very nature of [DE] creates enhanced potential for joint efforts among agricultural education departments” (pp. 79-80). Researching adoption barriers to DE within COA addresses the stated problem and may provide useful recommendations for addressing DE adoption issues in the future.

Purpose of the Study

The purpose of this study was to determine what barriers are present in the implementation and development of DE courses within COA.

Objectives

1. Describe participating institutions by selected personal characteristics.
2. Describe the perceived barriers that affect COA from providing DE courses to their students among adopters and non-adopters.
3. Determine if significant differences existed between institutional characteristics and institutions’ perceptions of DE barriers.
4. Describe the relationship between DE barriers, DE availability and DE coordinator.
5. Determine institutions’ perceptions on the development or expansion of DE courses as a viable option for COA.
6. Determine institutions’ perceptions on how COA can expedite the development of existing and future DE courses.

Theoretical Framework

The theoretical framework for this study was based on Rogers' (2003) theory of the diffusion of innovations and bound by Christensen's (1997) disruptive innovation theory. Rogers' model of the Five Stages in the Innovation-Decision Process addresses the concept of a process people go through when making the decision of whether or not they should adopt an innovation (Rogers, 2003). According to Rogers (2003), the adoption of new innovations goes through stages: knowledge, persuasion, decision, implementation, and confirmation, as well as a sixth stage, no knowledge (Harder & Lindner, 2008; Li & Lindner, 2007), which is responsible for approximately 15 – 30% of the populations distribution for an innovation (Roberts, Harder, and Brashears, 2016).

It is during the persuasion stage that the five characteristics of an innovation (relative advantage, complexity, compatibility, trialability, and observability) are evaluated by the individuals considering the adoption. Rogers' theory states there are five perceived attributes of innovations that influence how quickly an innovation (in this case, DE) is adopted into a system (COA). These five attributes are: relative advantage, compatibility, complexity, observability and trialability (Rogers, 2003). Rogers' theory was used to assess COA's perceptions of DE barriers within constructs modeled after the five attributes of innovations.

Rogers' (2003) theory is often criticized for discounting the complexity of the adoption and diffusion system, instead, presenting it as a simplistic view on how individuals' adopt and diffuse. Rogers additionally identified criticisms to his theory: Pro innovation bias, individual-blame bias, recall, and equality. However, Rogers' theory is still a well-established theoretical framework for understanding adoption and diffusion within agricultural education (Lindner et al., 2016).

Previous research on DE barriers revealed that despite a widespread acceptance of DE as a necessary tool for post-secondary education, many faculty still hesitate to embrace DE technology. Therefore, this study used Christensen's (1997) disruptive innovation theory to assess whether the barriers associated with DE are still perceived as barriers or not.

Understanding the effect barriers have on the five perceived attributes of an innovation may give COA a better idea on how to navigate the adoption and implementation of DE programs into their course offerings.

Significance of Study

The findings of this study may have theoretical, empirical, and practical implications. This study uses Rogers' model of the diffusion of innovations to examine how to work best through those barriers. This study may provide empirical evidence that COA can use to make decisions about the implementation and diffusion of DE. COA faculty will be provided with the opportunity to voice their opinions and concerns about DE in a constructive manner. Through the process of participating in this study, COA's awareness of DE may be increased. Finally, this study may contribute to the knowledge base for the diffusion of innovations theory.

Definition of Terms

Adopters – Those who make the decision "...to make full use of an innovation as the best course of action available" (Rogers, 2003, p. 21)

Adoption – "A decision to make full use of an innovation as the best course of action available" (Rogers, 2003, p. 21)

Association of Public and Land-Grant Universities (APLU) – a research, policy, and advocacy organization dedicated to strengthening and advancing the work of public universities in the U.S., Canada, and Mexico with a membership of 236 public research universities, land-grant institutions, state university systems, and affiliated organizations. (APLU, 2012)

College(s) of Agriculture (COA) – For the purpose of this study, COA refers to all Colleges, Departments, and Programs of Agriculture who participated in the survey. References to COA do not imply that all institutions have a formal College of Agriculture, but that in general, agriculture curriculum is part of a college, program, or department

Compatibility – “The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (Rogers, 2003, p. 15)

Complexity – “The degree to which an innovation is perceived as relatively difficult to understand and to use” (Rogers, 2003, p. 16)

Distance Education (DE) – “A planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning” (Greenberg, 1998). For the purposes of this study, DE refers to a post-secondary education course in which all aspects of that course can be completed via distance. Types of DE include but are not limited to: audiotape, VHS or DVD video, laptop computer checkout, mobile van or lab, radio course, telecourse, videoconference two way interactive video, email, and internet. Key components of DE include:

...the separation of teacher and learner during at least a majority of each instructional process, the separation of teacher and learner in space and/or time, the use of educational media to unite teacher and learner and carry course content, the provision of two-way communication between teacher, tutor, or educational agency and learner, and control of

the learning pace by the student rather than the distance instructor. (California Distance Learning Project, 2005)

Food and Agricultural Education Information System (FAEIS) – Sponsored by the USDA, FAEIS is a comprehensive web based survey and database of student and faculty data from the 1862, 1890, 1994 and Non-Land Grant Institutions. The purpose of FAEIS is to gather, compile, and distribute a broad range of higher education information related to the food, agricultural and natural sciences. (FAEIS, 2012)

Innovation – “An idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 2003, p. 12). In this study, an innovation is considered to be the adoption of distance education course delivery methods within COA.

National Association of Agricultural Educators (NAAE) – a federation of state agricultural educators associations with more than 7,800 members involved in school-based agricultural education at any level, as well as state and national agricultural education leaders. The purpose of the NAAE is to “advocate for agricultural education, provide professional development for agricultural educators, and work to recruit and retain agricultural educators in the profession” (NAAE, 2012).

Non Adopters – Those who make the decision NOT “...to make full use of an innovation as the best course of action available” (Rogers, 2003, p. 21).

Observability – “The degree to which the results of an innovation are visible to others” (Rogers, 2003, p. 16)

Relative Advantage – “The degree to which an innovation is perceived as better than the idea it supersedes” (Rogers, 2003, p. 15)

Trialability – “The degree to which an innovation may be experimented with on a limited basis” (Roger, 2003, p. 16)

Limitations

This study only surveyed those institutions identified from the USDA’s Food and Agricultural Education Information System (FAEIS), the Association of Public and Land-Grant Universities (APLU), and the National Association of Agricultural Educators (NAAE) as having a college or academic program in agriculture. It is possible there were some institutions incorrectly excluded or included this study. From those institutions surveyed, a COA personnel was contacted as one who would have knowledge of that institution’s DE offerings. In some instances, it is possible the person that was contacted did not have full knowledge of their COA’s DE programs.

CHAPTER II

REVIEW OF LITERATURE

Previous research focused mostly on barriers present in DE programs within COA. Studies of the implementation of DE courses in COA and studies concentrating on identifying DE barriers within COA as well as other were reviewed for findings that would provide insight into the successful adoption and diffusion of DE programs. Previous research is presented in two primary areas: (a) benefits of DE, (b) barriers to DE, and (c) diffusion of the innovation.

Diffusing an Innovation

The theoretical framework for this study was based on Rogers' (2003) theory of the diffusion of innovations and bound by Christensen's (1997) disruptive innovation theory. Rogers (2003) defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 12). Innovations typically have their own rate of adoption, described as "the relative speed with which an innovation is adopted by members of a social system" (p. 221). Rates of adoption can be affected by many things, but the most significant is attributed to five attributes; relative advantage, compatibility, complexity, observability, and trialability. "Innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, and observability and less complexity will be adopted more rapidly than other innovations" (p. 16).

Rogers (2003) defined relative advantage as “the degree to which an innovation is perceived as better than the idea it supersedes” (p. 15). According to Rogers, those who perceive an innovation as having a relative advantage will usually make the decision to adopt that innovation. When adopters perceive an innovation as having a high degree of relative advantage, it is more likely that innovation will have a rapid rate of adoption.

Compatibility is defined as “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (p. 240). A high degree of perceived compatibility is associated with a more rapid rate of adoption. Innovations that appear to fulfill the needs of an individual will be more attractive than one that does not.

Trialability is “the degree to which an innovation may be experimented with on a limited basis” (p. 16). Some innovations are more trialable than others, therefore they will likely diffuse faster than those that not. Rogers suggests trialability is valued more highly by early adopters those who adopt later because they do not have the benefit of observing others with the innovation.

Observability is “the degree to which the results of an innovation are visible to others” (p. 16). The decision to adopt is influenced by the ability to observe others who have adopted the innovation. Individuals are more likely to adopt when they can see others who have adopted it first. Observability is positively associated with rate of adoption.

Complexity is defined as “the degree to which an innovation is perceived as difficult to understand and use” (p. 16). Of the five attributes of an innovation, complexity is the only one negatively associated with the rate of adoption. Individuals may be discouraged from adopting innovations which are perceived to be too complex. Perceptions of complexity can lead individuals to believe the cost of adopting will be greater than the benefits.

Of these five attributes, relative advantage and compatibility have the most influence on the rate of adoption (Rogers, 2003). Innovations perceived to have low complexity, with high relative advantage, compatibility, observability, and trialability, will diffuse more quickly. However, barriers can negatively affect any of the five attributes as well as the speed in which it is adopted.

Harder and Lindner (2008) utilized Rogers' (2003) theory of the diffusion of innovations as a theoretical framework to describe the perceptions of an online Extension resource, eXtension, held by county Extension agents. The researchers found that agents had positive perceptions of the relative advantage, compatibility, complexity, and trialability characteristics, having the most positive perception of complexity. Participants did not perceive eXtension as having a high degree of observability. Based on their findings, the researchers recommended agents should be educated to incorporate eXtension into their daily responsibilities in order to save time and effort. Additionally, agents should be provided with temporary access to eXtension to improve their perceptions of observability as well as increase marketing for eXtension to increase its' visibility to agents (Harder & Lindner, 2008).

In a study by Jones, Lindner, Murphy, and Dooley (2002), researchers recognized the need to identify potential barriers to faculty acceptance and adoption of distance education. Therefore, they sought to describe faculty perceptions of distance education with respect towards competence, value, and information technology support as it relates to philosophical position. The researchers determined only value was significantly related to philosophical position towards distance education. Those participants that were not philosophically opposed had a higher perceived value of distance education compared to participants that were opposed. Researchers recommended that the value of distance education be communicated more

effectively and clearly in order to have an impact on any faculty who may be opposed to distance education.

Li and Lindner (2007) conducted a study in which to determine faculty adoption behavior concerning distance education at China Agricultural University. Utilizing Rogers' (2003) model of the innovation-decision process, the researchers added a sixth stage, "no knowledge" based on the assumption that in some instances, adopters lack knowledge of an innovations' existence. Researchers found that 70% of faculty remained in the early stages of the innovation-decision process (no knowledge, knowledge, or persuasion) and 30% were in the later stages (decision, implementation, and confirmation). Faculty's stages differed significantly by professional area, level of education, teaching experience, and distance education experience. Researchers also discovered that gender, age, and academic rank had no significant influence on faculty's stage in the innovation-decision process. Based on these findings, the researchers recommended future studies explore the value of faculty development programs, improved technological support, faculty involvement in pilot programs, and faculty undertaking of discipline-specific research into access, methodologies, and uses of distance education technology (Li & Lindner, 2002).

Murphrey and Dooley (2000) used Rogers' diffusion of innovation research as a basis for their research. These researchers sought to describe the perspectives of administrators, faculty, and support units and provide insight into those perspectives by examining the strengths, weaknesses, opportunities and threats associated with using DE technologies. In addition to their findings, the researchers surmised that the participants perceived DE as having relative advantage, as it would reach new audiences and enhance teaching and learning. However, compatibility came into question as they did not perceive the technology as having sufficient incentives, or was conducive to their current situations. The respondents also found the

technology to be too complex and the trialability to be limited as it required too much time and effort to convert courses into a DE format.

Disruptive Innovations

Christensen's (1997) disruptive innovation theory describes a disruptive innovation as one that creates a new market and value network, eventually disrupts an existing market and value network and displaces established market leading firms, products and alliances. Not all innovations are disruptive, even if they are revolutionary. Disruptive innovations will usually conflict with the current way of operating and must provide new value through affordability, accessibility, capacity, responsiveness, simplicity, or customization of a process or product. Disruptive innovation theory can be used to assess whether technology is perceived to have the attributes (affordability, accessibility, capability, responsiveness, simplicity, and customization) necessary to create new value (Christensen, 1997).

Christensen, Horn, and Johnson (2008), believe disruptive innovations interfere with the natural trajectory of traditional improvements and suggest disruptive innovations address root causes by concentrating on one or two underlying problems. Disruptive innovations proceed in two stages. The first stage is the introduction of computer based learning in which the instructional method will largely mirror the learning style in each subject. However, the software may allow students to choose different ways of learning the material and computer based learning will disrupt teacher led instruction. The second stage contains the deployment of student centric technology. This technology can help students learn each subject in a manner that is consistent with their intelligence and learning style (p. 3). Furthermore, a disruptive innovation

succeeds by focusing on affordability, accessibility, capability and responsiveness. These researchers posit that IT can help teach students in customized ways.

One study utilizing Christensen's (1997) theory is that of Franz and Cox (2012). These researchers state that disruptive innovations are rare within the realm of Extension often failing to create or embrace these innovations altogether. Some reasons for this failure was cited as being the result of (1) an organizational culture that supports the status quo and discourages innovation, (2) a funding entitlement mentality that has created over dependence on past sources of funding and lack of urgency to innovate, (3) a lack of diversity in customer base and staffing, (4) strong linkage to academia, known for its bureaucracy and historic slowness to react to change rather than operating with a business mindset, (5) a 100-year history of operating in an expert model paradigm rather than collaborative paradigms with clients, (6) over reliance on rural customers, and (7) a lack of customer management/tracking over time. The researchers state that the following recommendations can assist others in incorporating disruptive innovations: (1) start the disruption movement with early adopters and don't waste time on other types of adopters as it takes too long to bring them along, (2) support, protect, and provide resources for groups to operate outside mainstream work to enhance innovation, (3) choose organizational leaders who can bridge innovation and mainstream operations, (4) hire employees with a history of innovation and the ability to navigate within the current organizational context, (5) watch what other organizations are doing on the fringe to learn and adapt to change, and (6) address the root causes behind the need for organizational change rather than just addressing symptoms of the causes.

Another study utilizing Christensen's (1997) model is that of Taylor and Miller (2016). These researchers sought to determine extension and outreach professionals' stages of adoption

and perceptions of eXtension and discovered that 25% of the participants had no knowledge of eXtension and 25% had used eXtension before. Taylor and Miller (2016) also discovered that participants perceived eXtension as exhibiting a degree of relative advantage. Furthermore, participants indicated that the attributes of accessibility and capability needed to become a disruptive innovation. These researchers suggest that future studies look into (1) understanding why extension professionals lack awareness of eXtension and why many have not surpassed that decision stage of adoption, (2) assessing other learning technologies to determine whether the rate of adoption and perceptions are similar, (3) understanding the use and acceptance of eXtension among professionals in other extension systems, and (4) examining the applicability of disruptive innovation theory in extension and higher education environments.

Benefits of Distance Education

Guthrie (2009) described how technology is used in teaching leadership instruction through situated learning and reports students' perceptions of using technology extending beyond the objective of developing personal definitions of leadership and offering new perspectives for utilizing other technologies. The researcher found that students showed an appreciation for the video production process as it helped them to listen to other's definitions of leadership and to develop their own definitions and that the students enjoyed all aspects of completing the assignment. Students indicated that by completing the project, they developed knowledge and skills different from those used to complete a paper and that they viewed the use of video production as a positive learning tool. Specifically, students appreciated the ability to use diverse ideas that challenged them in ways not commonly seen in traditional teaching

methods and it taught them skills that could be used in leadership positions in the future (Guthrie, 2009).

A 2002 study by Kelsey, Lindner, and Dooley sought to describe students' satisfaction with a joint DE program, Doc-at-a-Distance. They found that all students enrolled in the program were satisfied with the program from convenience, instructional design, faculty, and cohort group. Students, however, were not satisfied with the isolation associated with their DE courses, as well as inaccessible resources and educational materials, lack of an agricultural communications curriculum, registration and technology problems, and the amount of time it required to complete their course work. The student participants recommended the program make improvements by making the technology more user friendly and increasing any necessary training needed for managing the technology.

Koch, Townsend, and Dooley (2005) investigated the possibility of teaching leadership education via distance education technology. They examined both web-based and traditional instruction methods in a graduate level leadership course. There were no significant differences found between the traditional students and the web-based students' scores on any of the five LSI scales, the Leadership Learning Scale, the Leadership Use Scale, or Leadership Remember Scale. Their findings suggest that leadership educators have an option when it comes to selecting a delivery method for graduate level leadership courses and that students can be confident leadership concepts can be taught through distance education.

Mink and Moore (2005) evaluated the DE degree program available to students enrolled in the COA at a land-grant university. They found that their student participants were satisfied with the off-campus degree program, particularly with the aspects of academic preparation, class transferability, academic advising, and overall quality of their education. The participants

recommended that there be more emphasis placed in the curriculum in the areas of production agriculture, agricultural marketing, and decision making and critical thinking in the areas of sciences and mathematics. The leading factors influencing the participants' decisions to complete the DE program was place bound due to family, flexibility of classes, and place bound due to job.

Murphy (2000) evaluated a DE soils science course, with consideration towards educational effectiveness and learner satisfaction. Taking measures to control for prior knowledge, age, gender, class standing, and laboratory experience, the researcher found no significant differences in academic achievement with regards to where and how students took the class. Also, there were no differences in student achievement between students enrolled in an optional laboratory section of the course. Overall, students from the on-campus and DE sections of the Soils Science class gave positive reviews of the class.

Sampson, Leonard, Ballenger, and Coleman (2010) set out to determine students' satisfaction with online courses in a certificate program within an education leadership department. In particular, the researchers explored students' satisfaction with instruction, communication, assessment, leadership, teamwork, professionalism, and respect/diversity. The first cohort of students and more recent group of students both showed an overall positive satisfaction with the program. Both groups' lowest area of satisfaction was in teamwork, however, the cohort's highest area of satisfaction was in assessment, while the more recent group's highest area of satisfaction was in instruction.

There have also been a multitude of studies examining the characteristics and behavioral benefits of DE students. One such study by Qureshi, Morton, and Antosz (2002) examined four models (Demographic, Experiential, Motivational, and Inhibitory) of descriptive characteristics

for DE and on-campus students. Researchers found that a lower classification rate was discovered using the Demographic model (62%), higher classification rates were obtained utilizing the Experiential model (74%), Motivational model (72%), and Inhibitory model (84%). In a comparison of DE students and on-campus students, DE students were found to be more mature, more experienced, and more likely to be facing barriers. DE students were also found to be less motivated, which is contradictory to other studies.

Roberts and Dyer (2005a) sought to describe the student characteristics, such as motivation, self-efficacy, and critical thinking dispositions that influence student achievement and attitudes when an illustrated web lecture, such as PowerPoint, is used. The researchers discovered that motivation and computer proficiency influenced student attitudes. Additionally, they found that motivation and prior knowledge influenced student achievement. It was concluded that when an illustrated web lecture is used to deliver course content, students that have higher levels of motivation will tend to exhibit higher achievement and more favorable attitudes.

Shih and Gamon (2001), analyzed the relationships between student achievement and four variables: attitude, motivation, learning styles, and selected demographics. While two-thirds of the students tested were field-independent, there were no significant differences in achievement between the field-independent and field-dependent students. Students with different learning styles and backgrounds also learned equally well in the web-based courses. Web-based students indicated they enjoyed the convenience and self-controlled learning pace of web-based learning and were motivated by competition and high expectations. Motivation was found to be the only significant factor that explained more than one-fourth of student achievement measured by class grade.

Barriers to Distance Education

But for every study citing the various benefits there are just as many studies cautioning the utilization of DE in course offerings. Born and Miller (1999) investigated the perceptions Iowa State University Department of Agronomy faculty had about web-based DE particularly the M.S. in Agronomy Distance Education Degree Program. After analyzing the relationships between student achievement and student attitude, motivation, learning style, and demographics, the researchers found that the population studied was mostly undecided about the use of web-based DE and the M.S. in Agronomy Degree Program with no correlation between faculty rank or position responsibility and the perception of web-based DE program or the M.S. in Agronomy Degree Program being found.

Born and Miller (1999) also cited that the perceptions of web-based DE were significantly higher for faculty who were involved in the M.S. in Agronomy Degree Program or other forms of DE, and that the perceptions of the M.S. in Agronomy Degree Program were significantly higher when the faculty were involved in the M.S. in Agronomy Degree Program. Lastly, faculty agreed that web-based DE can be as challenging as on-campus courses. Faculty expressed concerns about the effectiveness of student/professor interactions and the overall quality of a web-based degree.

A 2000 study by Miller and Pilcher described the perceptions of students enrolled in on-campus and off-campus courses in a COA. Faculty with teaching responsibilities and experience within the COA were asked to participate as well. Both faculty and students provided positive assessments for both, the on-campus and off-campus courses. Positive assessments were also given by students and faculty alike for the manufacturing-based, user-based, value-based, and transcendent-based quality factors. But despite the positive assessments provided by the faculty

and students, they still perceived the off-campus courses to be lower in quality than the on-campus courses with the greatest difference found in the transcendent quality factor.

Moore and Wilson (2005) examined some factors related to graduates students' decisions to enroll in on-line agricultural and extension education courses to determine if there were any differences in the perceptions related to the seven principles of good practice in an on-line and on-campus courses in a graduate program. The researchers found that a major factor in the students' decisions to enroll in on-line courses was convenience. It was also discovered that despite the students' decision to enroll in the on-line courses, those courses still did not compare favorably with the on-campus courses, particularly in the area of interaction between students and interaction between students and professors. Students enrolled in the on-line courses also did not perceive their courses to be any easier than on-campus courses.

Many studies have focused on the factors affecting the successful adoption of DE programs. One such study by Dooley and Murphy (2001), the researchers sought to provide a baseline for COA faculty perceptions of the utilization of electronic technologies in teaching. Faculty agreed that the electronic technologies could make a valuable contribution to the learning process and that it should be used in all classes. While half of the participants reported having a course website, most of them lacked experience in teaching distance courses and that they were much more confident in their technical competence than they were in their methodological ability to use modern technologies. All the respondents perceived training and assistance in the use of instructional technologies to be less available than equipment and facilities.

Gammill and Newman (2005) surveyed faculty at Mississippi State University to determine what factors influenced their decision to teach, or not teach, online courses.

Researchers found that most faculty did not teach web-based courses but were open to its use in the future and those few who did, preferred to use WebCT as their platform and had only been using it for a very short period of time. These researchers suggest that administrators provide more support to faculty who use web based instruction and be aware of any implementation issues that deter faculty from wanting to use it. Overall, administrators need to be more supportive of DE in order to make it successful.

Murphrey and Dooley (2000) sought to describe the perspectives of administrators, faculty, and support units and provide insight into those perspectives by examining the strengths, weaknesses, opportunities and threats associated with using DE technologies. The researchers found that the participants recognized the opportunity to utilize DE to improve instruction and reach new audiences through collaboration and new courses and programs, however, the respondents expressed the need to have policies and procedures in place to address critical issues such as incentives, support, training, quality control, careers, and communication channels.

Murphy and Terry conducted a 1998 study surveying the faculty in a COA at a land-grant university in order to provide a baseline for improving the instruction of electronic teaching technologies. The researchers found that while the faculty believed using electronic technologies could enhance their teaching, they lacked competence in using electronic technologies as well as confidence in their ability to use the appropriate DE methodologies to deliver courses. Additionally, faculty reported a lack of access to the equipment and facilities and the training and assistance they needed to develop to effectively develop and use electronic technologies. Faculty also did not believe the time and effort put into developing multimedia course material was valued appropriately. Participants believed substantial support would be required in order for the effective adoption.

Murphy and Terry (1998) sought to provide consensus, focus and direction for future research on the adoption of electronic technologies for instructional use in agricultural education settings. The panelists in the study recommended twenty one ways electronic technologies could improve instruction focused in four areas; increased availability of educational opportunities, improved informational resources, more effective instructional materials, and more convenient delivery methods. Panelists also achieved consensus on thirteen obstacles clustered around time constraints, lack of formalized faculty reward system, lack of technical support, equipment costs, and inadequately designed facilities. Lastly, panelists found little difference between technologies identified as being most promising, clustering these technologies in four areas; distributed information, computer-based information, computer-assisted telecommunications, and graphical image production and display.

Nelson and Thompson (2005) surveyed faculty and administrators to determine what barriers prevented faculty from starting or expanding DE programs. These researchers identified 13 primary barriers educators most frequently cited as being the main causes inhibiting them from starting or expanding DE offerings. These barriers were (1) lack of adequate compensation for faculty's time, efforts, etc., (2) lack of faculty rewards or incentives, (3) program development costs, (4) lack of ability to teach skills requiring hands on instruction, (5) concerns about faculty workload, (6) lack of administratively provided time/support to develop course and materials, (7) lack of administratively provided time/support to learn technologies, (8) lack of personal contact between instructor and student, (9) lack of face-to-face contact, (10) concerns about course quality, (11) equipment failures/costs of maintaining equipment, (12) lack of faculty commitment to spend time to master the use of technologies, and (13) lack of nonverbal communication between instructor and student. Furthermore, Nelson and Thompson stated that

there were significant differences found between those faculty deciding on whether or not to implement DE (Decision) and those faculty who were already using DE technologies in the classroom (Implementation), specifically in internet or on-line courses and telecourses. Lastly, Decision faculty showed more agreement to the list of barriers than the Implementation faculty with the exception of Expense. Implementation faculty cited the expense barrier factor as more of a deterrent than any of the other factors.

Roberts and Dyer (2005b) developed a study in order to gain consensus from agricultural education programs to determine the use of DE in agricultural education departments. Researchers found that administrators' attitudes towards DE have a considerable impact on the DE courses offered within a department. Despite having a high demand for DE courses, support in the form of access to training, assistants, compensation for teaching and developing courses, staff support and funding for courses and programs, was lower. Administrators cited several barriers present to the DE courses offered such as time constraints of faculty, costs or lack of funding, equipment limitations, technical knowledge and support, demand for DE, pedagogical concerns, and administrative issues. As time demands, lack of faculty expertise, and insufficient knowledge about DE are recognized as common barriers, it was concluded that if adequate time and training are not made available, then there is a greater resistance by departments to provide DE courses.

In this particular study, the question of what potential barriers COA face when developing DE courses is compounded by the question of whether or not COA can see past those barriers to the possible benefits associated with having DE programs. Are the benefits of having a DE program in the COA enough to override the risks associated with DE? To answer this question, it is important to focus on how one perceives the idea of DE. If the benefits of having a

DE program outweigh the risks associated with starting and maintaining it, then COA should be willing to adopt DE for themselves. In this study, focus will be placed on the perceived attributes of innovations in order to categorize the existing barriers into constructs based on these five attributes to determine which construct(s) COA think they have the most trouble with adopting a DE format.

CHAPTER III

METHODS

Research Design

A mixed-method design was used for this study. According to Creswell (2009), a mixed-method study is a combination of quantitative and qualitative approaches used together for their strengths and ability to address the complex problems found within social and health science. Johnson, Onwuegbuzie, and Turner (2007) stated that "...there might not be a perfect or essentialist definition..." (p. 112) but offer up a definition of mixed-methods research as "...an intellectual and practical synthesis based on qualitative and quantitative research" (p. 129). The combination of both of these definitions (Creswell, 2009; Johnson et al., 2007) shaped the nature of this study.

The target population was colleges, departments, or programs of agriculture in our nation. According to the Association of Public and Land-Grant Universities (APLU, 2012), National Association of Agricultural Educators (NAAE, 2012), and Food and Agricultural Education Information System (FAEIS, 2012) databases, there are approximately 131 institutions that have a college, department, or program of agriculture. Of these institutions, 77 are listed by the FAEIS as being historically 1862 or 1890 Land-Grant institutions (FAEIS, 2012). Furthermore, these institutions span each of the 50 states, 7 U.S. territories, as well as our Nation's capital.

Selection of Participants

All of the identified institutions were included in the population for this study, with a goal of having at least 83 participants respond to the survey in order to obtain a 60% response rate. The persons selected from each institutions' COA varied in profession from administrators, to teaching faculty, academic advisors, department heads, and distance learning coordinators. They were selected for their potential knowledge of their COA's DE programs and course offerings.

Instrumentation

An online questionnaire and phone interviews were utilized to collect data. The online survey was researcher designed, influenced by questions and data obtained in various studies of DE barriers (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphy & Terry, 1998a; Murphrey & Dooley, 2000; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005a). In addition to the nineteen barriers discussed within these studies, ten additional barriers were added by the researcher. In all, there were nineteen items on the survey arranged into four sections examining (a) demographics, (b) DE within the COA, (c) distribution of DE tuition, (d) DE barriers in the COA.

The survey was reviewed for content validity by a panel of experts composed of faculty members within the College of Agriculture and College of Education at Auburn University. The wording of several statements were modified and additional statements were included to enhance the validity and reliability of the results. Based upon feedback from the expert panel, Section C of the instrument was included in the study in order to obtain information concerning DE tuition distribution within teach COA. No other revisions were necessary.

Due to the need to survey human subjects, a request for exemption was submitted and

approved by the Auburn University Internal Review Board January 2014. An additional request for modification of the protocol was submitted and approved in November 2015.

Measures

Section A of the online survey, containing four survey items, was designed to obtain descriptive information concerning each institution's demographics. The first item asked participants to respond with which state and institution their COA was affiliated with. Response options included all 50 states in addition to 7 U.S. territories and all 131 institutions. The second item asked participants to describe their institution as either (a) 1862, (b) 1890, or (c) Public. The third item inquired as to what the participants' overall student enrollment for their institution was. Response options included (a) less than 5,000, (b) 5,000-15,000, (c) 15,000-25,000, (d) 25,000-35,000, (e) 35,000-50,000, (f) more than 50,000. The fourth item asked participants to describe the student enrollment for their respective COA. Responses included (a) less than 300, (b) 300-600, (c) 600-900, (d) 900-1,200, (e) 1,200-1,500, (f) 1,500-1,800, (g) 1,800-2,100, (h) more than 2,100.

Section B of the survey contained eight items and was designed to obtain descriptive information concerning DE practices within participants' COA. The first item asked participants whether DE courses were offered in their COA. Response option included (a) yes, and (b) no. Respondents that replied (a) yes were directed to continue on with the survey while respondents that replied (b) no were directed to the last section of the survey, Section D, to rate statements concerning DE barriers on a Likert scale (1 = *Not a Barrier*; 2 = *A Minor Barrier*; 3 = *A Moderate Barrier*; 4 = *A Major Barrier*). The second item asked participants if their institutions employ a DE Coordinator. Response options were (a) yes, and (b) no. The third item inquired as

to how long DE courses had been offered. Responses included (a) less than a year, (b) 1-3 years, (c) 3-5 years, (d) 5-7 years, (e) 8-10 years, and (f) more than 10 years. The fourth item asked about student enrollment in DE courses in the COA. Responses included (a) less than 50, (b) 50-75, (c), 75-100, and (d) more than 100.

The fifth item asked participants to select all departments in which their COA provided DE courses. Responses included (a) Agricultural Economics and Rural Sociology, (b) Agricultural Leadership, Education and Communication, (c) Animal and Dairy Science, (d) Biosystems Engineering, (e) Crop, Soil and Environmental Science, (f) Entomology and Plant Pathology, (g) Fish, Aquaculture and Aquatic Science, (h) Food Science, (i) Horticulture, (j) Poultry Science, and (k) Other, in which respondents were given the opportunity to provide a COA department if one was not listed in the provided responses.

The sixth item inquired about the type of DE courses offered in the COA. Responses included (a) undergraduate, (b) graduate, and (c) both. The seventh item inquired about which forms of DE was provided to undergraduates. Responses included (a) online campus course, (b) hybrid, (c) off campus DE course, and (d) undergraduate courses not offered. The eighth item inquired about which forms of DE were provided to graduate students. Responses included (a) online campus course, (b) hybrid, (c) off campus DE course, and (d) graduate courses not offered.

Section C contained six items designed to obtain information concerning DE tuition distribution within the COAs. The first item asked respondents to describe the distribution of DE tuition in their COA. Responses included (a) same as traditional classes and (b) differently than traditional classes. The second item asked what percentage of undergraduate tuition was returned to the departments providing those courses. Responses included (a) none, (b) less than 20%, (c)

20-40%, (d) 40-60%, (e) 60-80%, and (f) more than 80%. The third item asked what percentage of graduate tuition was returned to the departments providing those courses. Responses included (a) none, (b) less than 20%, (c) 20-40%, (d) 40-60%, (e) 60-80%, and (f) more than 80%. The fourth item inquired about what percentage of undergraduate tuition was returned to the instructor teaching that course. Responses included (a) none, (b) less than 20%, (c) 20-40%, (d) 40-60%, (e) 60-80%, and (f) more than 80%. The fifth item asked about what percentage of graduate tuition was returned to the instructor teaching that course. Responses were (a) none, (b) less than 20%, (c) 20-40%, (d) 40-60%, (e) 60-80%, and (f) more than 80%. The sixth item inquired about what percentage of tuition was used to support DE. Responses included (a) none, (b) less than 20%, (c) 20-40%, (d) 40-60%, (e) 60-80%, and (f) more than 80%.

Section D of the survey asked participants to rate the 29 barrier statements based upon a four-point Likert scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*). These statements were heavily influenced by questions and data obtained in other studies of DE barriers in COA (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphy & Terry, 1998a; Murphrey & Dooley, 2000; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005a). These 29 barriers were organized into five constructs, modeled after Rogers' (2003) five attributes of an innovation: (a) Relative Advantage, (b) Compatibility, (c) Complexity, (d) Trialability, and (e) Observability. Table 1 includes a sample of the barrier statements from Section D. Respondents were provided a comment box in which to provide additional barriers if one was not listed in the provided statements. Data obtained from the comment box was not treated as a variable for analysis in this study.

Table 1

Sample Statements from Each Construct

Statement	Construct
Inadequate Compensation/Recognition for Faculty	Relative Advantage
Time Constraints	Compatibility
Lack of Technical Knowledge	Complexity
Conducting Unsuccessful DE Courses	Trialability
Poor Experience/Inability to Work with a DE Coordinator	Observability

Qualitative Analysis

To obtain qualitative data concerning the DE practices within COA, a secondary inquiry was made to 17 purposively selected participants in order to illicit descriptive and thematic information. These participants were invited by email to participate in a brief phone interview in which two open ended questions were presented: (a) Do you think DE course development and/or expansion is a viable option for your COA?, and (b) How can your COA expedite the development of existing and future DE courses?. Participants were given the option to respond by email if they were unable to schedule a convenient time to call.

Procedures

Formal data collection with the finalized instrument began in February 2014. Participants were sent an introductory recruitment email on February 19, 2014 explaining the purpose of the survey in which they are invited to participate. A copy of the information letter and a link to the online survey was provided in the email for those who wanted to participate. Of the original 138 emails sent, 7 respondents indicated their institutions did not have a college, department or program of agriculture and 10 emails were returned as invalid. An attempt was made to correct the faulty emails by searching for those participants on their associated institutions' faculty

pages. This effort resulted in an accessible population of 131. Six reminder emails were sent (March 5, March 25, April 24, May 13, June 4, and July 7) to increase response rate as recommended by Dillman, Smyth, and Christian (2009). The online survey was closed at 8:00 p.m., August, 1 2014.

Following the data collection for the online survey, the first participant selected for the phone interviews was emailed a copy of the information sheet and interview questions on December 14, 2015. In all, 15 interviews were recorded from the 17 identified participants over the course of seven months. Once all of the qualitative data had been received, the final data collection was closed at 12:00 p.m. August 3, 2016.

Data Analysis

Data from the online survey were analyzed using descriptive and inferential statistics in the Statistical Package for Social Sciences (SPSS 23). The alpha level for data analysis was set *a priori* at .05. The independent variables for this study were (a) institutional classification, (b) institutional student enrollment, (c) COA student enrollment, (d) DE availability (e) DE coordinator, (f) DE years offered, and (g) DE student enrollment. The dependent variables for this study were (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability. Logistical regression was used to determine whether or not the dependent variables have any influence on a COA's decision to adopt or not adopt DE as a method of course delivery. Correlations were identified using the Pearson Correlation Coefficient (Mertler & Vannatta, 2010).

Objective One

Frequencies and percentages were calculated to describe the selected personal characteristics (land-grant classification, institutional student enrollment, and COA student enrollment) of participating institutions. The use of frequencies and percentages is appropriate to describe categorical data (Gall, Gall, & Borg, 2007).

Objective Two

Participants' perceptions of DE barriers in COA amongst adopter and non-adopters were described for individual items within each construct for each participant. The overall mean scores were calculated for each participant as well as the mean and standard deviation for each construct overall. The constructs were consistent with the attributes of an innovation: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability (Rogers, 2003). According to Boone and Boone (2012) the composite score for Likert scales should be analyzed at the interval measurement scale. Additionally, the descriptive statistics recommended for interval scale items are mean for central tendency and standard deviations for variability.

Objective Three

Field (2009) states that running multiple *t*-tests increases the risk of Type I errors. He further states that one-way analysis of variance (ANOVA) can be used to determine whether three or more means are the same and test for an overall experimental effect. As such, ANOVA and *t*-tests were conducted to determine if significant differences existed between institutional characteristics (institutional classification, institutional student enrollment, COA student enrollment, DE availability, DE coordinator, DE years offered, DE student enrollment, and DE

tuition distribution) and institutions' perceptions of DE barriers based upon Rogers' (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability). When appropriate, post hoc tests were conducted to identify the source of significant differences between groups. Field (2009) states that *post hoc* tests compare all different combinations of the treatment groups. They are performed when there is no specific hypotheses and if there is an interest in exploring data for between-group differences between means that exist.

Objective Four

Backward regression were run to determine if any relationships existed between DE barriers and DE availability as well as DE barriers and DE coordinator. According to Field (2009), backward regression places all predictors in the model and then calculates the contribution of each by looking at the significance value of the t-test. Field further states that backward regression is preferable to the forward method because of "suppressor effects, which occur when a predictor has a significant effect but only when another variable is held constant" (p. 213). Additionally, forward selection is more likely to exclude predictors involved in suppressor effects than backward elimination therefore forwards has a higher risk of missing a predictor that does in fact predict an outcome, known as a Type II error.

Objective Five and Objective Six

Following the example of Walker, Lindner, Murphrey, and Dooley (2016), objectives five and six were analyzed using a qualitative research paradigm with a content analysis of written comments. Objective five addressed the question, "Do you think DE course development

and/or expansion is a viable option for your COA?” Objective six addressed the question, “How can your COA expedite the development of existing and future DE courses?” Patton (2002) stated the purpose of qualitative responses as being “longer, more detailed, and variable in content; analysis is difficult because responses are neither systematic nor standardized” (pp. 20–21). However, those responses also allow us to “understand and capture the points of view of other people without predetermining those points of view” (p. 21). Dooley (2007) stated that “through qualitative approaches, the researcher is able to contribute theory grounded in practice to enhance the conceptual framework of the discipline” (p. 40).

Response Rate

The target population ($N = 131$) for this study was colleges, departments, or programs of agriculture in our nation. According to the Association of Public and Land-Grant Universities (APLU, 2012), National Association of Agricultural Educators (NAAE, 2012), and Food and Agricultural Education Information System (FAEIS, 2012) databases, there are approximately 131 institutions that have a college, department, or program of agriculture spanning each of the 50 states, 7 U.S. territories, as well as our Nation’s capital. All of these institutions were included in the population for this study. An initial response rate of 4.5% ($n = 6$) was received for the online survey. Efforts were made to increase the rate of response through the use of six reminder emails. A response rate of 37.5% ($n = 49$) was obtained for the online survey. There were 17 participants selected for the phone interviews. A response rate of 89% ($n = 15$) was obtained from the phone interviews. A final response rate of 49% ($n = 64$) was obtained.

CHAPTER IV

FINDINGS

This chapter provides the response rate and the findings listed by study objective.

Objective One: Findings

The purpose of objective one was to describe participating institutions by selected personal characteristics. Data for the participating institutions' selected personal characteristics are reported in this section. Institutions were described by (a) institutional characteristics and (b) departmental characteristics.

Institutional Characteristics

Table 2 describes the institutional characteristics as reported by participants ($n = 49$). The majority of participants were affiliated with an 1862 Land Grant institution ($f = 26$) with an institutional student enrollment of 5,000 – 15,000 ($f = 17$) and a COA student enrollment of less than 300 ($f = 14$). There were fewer participants associated with 1890 Land Grant institutions ($f = 5$) with institutional enrollments of less than 5000 ($f = 10$) and more than 25,001 ($f = 10$) and COA enrollment of 1,201 – 2,100 ($f = 10$).

Table 2

Number of Respondents by Institutional Characteristics (n = 49)

Variable	<i>f</i>	%
1862 Land Grant	26	53.1
1890 Land Grant	5	10.2
Public, Non-Land Grant	17	34.7
Institutional Enrollment		
Less than 5000	10	20.4
5,001 – 15,000	17	34.7
15,001 – 25,000	12	24.5
More than 25,001	10	20.4
COA Enrollment		
Less than 300	14	28.6
301 – 1,200	14	28.5
1,201 – 2,100	10	20.5
More than 2101	11	22.4

Note. 1 participant did not indicate institutional type

Departmental Characteristics

Table 3 describes departmental characteristics of participants ($n = 49$). Participants mostly identified themselves as being affiliated with departments of Agricultural Economics and Rural Sociology ($f = 26$), however, several identified an affiliation with Agricultural Leadership, Education and Communication, Crop and Soil Science, and Food Science ($f = 19$), Horticulture ($f = 18$), and Animal and Dairy Science ($f = 17$) as well. Respondents reported affiliations with the departments of Poultry Science ($f = 4$), Biosystems Engineering ($f = 6$), and Fish, Aquaculture, and Aquatic Science ($f = 7$) the least.

Table 3

Number of Respondents by Department (n = 49)

Department	<i>f</i>	%
Agricultural Economy and Rural Sociology	26	53.1
Agricultural Leadership, Education and Communication	19	38.8
Animal and Dairy Science	17	34.7
Biosystems Engineering	6	12.2
Crop, Soil and Environmental Science	19	38.8
Entomology and Plant Pathology	13	26.5
Fish, Aquaculture and Aquatic Science	7	14.3
Food Science	19	38.8
Horticulture	18	36.7
Poultry Science	4	8.2
Other	19	38.8

Objective Two: Findings

The purpose of objective two was to describe the perceived barriers that affect COA from providing DE courses to their students amongst adopters and non-adopters. Data for the participants' perceptions of DE barriers in COA, amongst adopters and non-adopters is reported in this section. Barriers were interpreted based on the following ranges: 1 – 1.50 = Not a Barrier; 1.51 – 2.5 = A Minor Barrier; 2.51 – 3.5 = A Moderate Barrier; and 3.51 – 4 = A Major Barrier. Table 4 presents the reliability levels of each construct. Cronbach's alpha coefficient was calculated for each internal scale (Cronbach, 1951). Cronbach's alpha coefficients measure the internal consistency of items within a scale and can be used to indicate reliability. A reliability level of .80 or higher is considered acceptable (Gall, Gall, & Borg, 2007). Recommendations for improving reliability for the compatibility scale are provided.

Table 4

Reliability Coefficients of Each Construct

Construct	α Level	Number of Items
Relative Advantage	.82	8
Compatibility	.68	5
Complexity	.91	6
Trialability	.87	5
Observability	.90	5

Table 5 summarizes the means and standard deviations of respondents' ($n = 49$) perceptions of DE barriers by construct, based on Rogers (2003) attributes of an innovation. These constructs were organized as relative advantage, compatibility, complexity, trialability, and observability. On a four-point scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*), respondents indicated that compatibility ($M = 2.77$, $SD = .64$) was a moderate barrier to their COA's ability to provide DE courses. Respondents indicated that complexity ($M = 2.37$, $SD = .79$), relative advantage ($M = 2.19$, $SD = .64$), trialability ($M = 1.86$, $SD = .72$), and observability ($M = 1.86$, $SD = .75$) were minor barriers to their COA's ability to provide DE courses.

Table 5

Respondents' Perceptions of Attributes by Construct

Construct	M	SD
Compatibility	2.77	.64
Complexity	2.37	.80
Relative Advantage	2.19	.65
Trialability	1.86	.72
Observability	1.86	.77

Note. Response: 1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*

Relative Advantage

Responses for the eight relative advantage items ranged from “Not a Barrier” to “A Major Barrier” on a four-point scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*). Table 6 displays the means and standard deviations for each item. Respondents ($n = 49$) disagreed about whether “Faculty Workload Concerns” ($M = 2.98$, $SD = 1.07$) was a moderate barrier. There was also disagreement on whether “Restrictive Costs or Funding for the Institution” ($M = 2.43$, $SD = 1.06$), “Inadequate Compensation or Recognition for Faculty” ($M = 2.39$, $SD = 1.11$), “Lack of Institutional Incentives and Advantages” ($M = 2.31$, $SD = .96$), “Prohibitive Equipment Costs and Maintenance” ($M = 2.08$, $SD = .95$), and “Little or No Administrative Support” ($M = 2.00$, $SD = 1.04$), “Equipment Failure/Cost of Maintaining Equipment” ($M = 1.82$, $SD = .83$) and “Demand for DE Does Not Exist” ($M = 1.53$, $SD = .68$) were minor barriers to COA’s ability to provide DE courses.

Table 6

Respondents’ Perceptions of the Relative Advantage of DE Adoption by Individual Response Item (n =49)

Relative Advantage Items	<i>M</i>	<i>SD</i>
Faculty Workload Concerns	2.98	1.07
Restrictive Costs or Funding for the Institution	2.43	1.06
Inadequate Compensation or Recognition for Faculty	2.39	1.11
Lack of Institutional Incentives and Advantages	2.31	.96
Prohibitive Equipment Costs and Maintenance	2.08	.95
Little or No Administrative Support	2.00	1.04
Equipment Failure/Cost of Maintaining Equipment	1.82	.83
Demand for DE Does Not Exist	1.53	.68
Overall Mean	2.19	.65

Note. Response: 1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*

Compatibility

Responses for the five compatibility items ranged from “Not a Barrier” to “A Major Barrier” on a four-point scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*). Table 7 displays the means and standard deviations for each item.

Respondents ($n = 49$) were in disagreement about whether “Inability to Deliver Duplicate Courses via DE” ($M = 2.04$, $SD = 1.02$) was a minor barrier. There was also disagreement on whether “Pedagogical Concerns” ($M = 2.71$, $SD = 1.04$), “Inability to Teach Skills Requiring Hands-On Instruction” ($M = 3.22$, $SD = .91$), and “Time Constraints” ($M = 3.06$, $SD = 1.04$) were moderate barriers to their COA’s ability to provide DE courses. Respondents were also in disagreement on whether “Resistance from Faculty” ($M = 3.86$, $SD = .81$) was a major barrier.

Table 7

Respondents’ Perceptions of the Compatibility of DE Adoption by Individual Response Item (n = 49)

Compatibility Items	<i>M</i>	<i>SD</i>
Resistance from Faculty	3.86	.81
Inability to Teach Skills Requiring Hands-On Instruction	3.22	.91
Time Constraints	3.06	1.04
Pedagogical Concerns	2.71	1.04
Inability to Deliver Duplicate Courses via DE	2.04	1.02
Overall Mean	2.78	.64

Note. Response: 1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*

Complexity

Responses for the six complexity items ranged from “Not a Barrier” to “A Major Barrier” on a four-point scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*). Table 8 displays the means and standard deviations for each item. Respondents

($n = 49$) were in disagreement about whether “Lack of Time to Learn New Technologies” ($M = 2.71, SD = 1.09$), “Lack of Faculty Commitment of Time to Learn the Technologies Used” ($M = 2.65, SD = 1.03$), were moderate barriers. “Lack of Faculty Confidence to Create Successful DE Courses” ($M = 2.49, SD = .89$), “Lack of Familiarity with Equipment” ($M = 2.29, SD = .91$), “Administrative Complexities” ($M = 1.96, SD = .88$) and “Lack of Technical Knowledge” ($M = 2.12, SD = .88$) were perceived as minor barriers to COA’s ability to provide DE courses, although there was disagreement amongst the respondents.

Table 8

Respondents’ Perceptions of the Complexity of DE Adoption by Individual Response Item ($n = 49$)

Complexity Items	<i>M</i>	<i>SD</i>
Lack of Time to Learn New Technologies	2.71	1.09
Lack of Faculty Commitment of Time to Learn the Technologies Used	2.65	1.03
Lack of Faculty Confidence to Create Successful DE Courses	2.49	.89
Lack of Familiarity with Equipment	2.29	.91
Lack of Technical Knowledge	2.12	.88
Administrative Complexities	1.96	.88
Overall Mean	2.37	.80

Note. Response: 1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*

Trialability

Responses for the five trialability items ranged from “Not a Barrier” to “A Major Barrier” on a four-point scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*). Table 9 displays the means and standard deviations for each item. Respondents ($n = 49$) were in disagreement on whether “Lack of Personal Participation in DE Courses” ($M = 2.20, SD = .91$), “Lack of Attendance at DE Workshops Where the Technology could be Tested”

($M = 1.92, SD = .95$), “Lack of Use of Social Media” ($M = 1.86, SD = .95$), “A Poor Experience Participating in a Conference via DE Technology” ($M = 1.71, SD = .84$), and “Having Conducted Unsuccessful DE Courses” ($M = 1.61, SD = .75$) were minor barriers to COA’s ability to provide DE courses.

Table 9

Respondents’ Perceptions of the Trialability of DE Adoption by Individual Response Item (n = 49)

Trialability Items	<i>M</i>	<i>SD</i>
Lack of Personal Participation in DE Courses	2.20	.91
Lack of Attendance at DE Workshops Where the Technology Could be Tested	1.92	.95
Lack of Use of Social Media	1.86	.95
A Poor Experience Participating in a Conference via DE Technology	1.71	.84
Having Conducted Unsuccessful DE Courses	1.61	.75
Overall Mean	1.86	.72

Note. Response: 1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*

Observability

Responses for the five observability items ranged from “Not a Barrier” to “A Major Barrier” on a four-point scale (1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*). Table 10 displays the means and standard deviations for each item.

Respondents ($n = 49$) were in disagreement about “A Lack or Poor Interaction with DE Students” ($M = 2.16, SD = 1.00$), “No Experience/Poor Experience Watching Someone Else Teach a DE Course” ($M = 1.94, SD = .89$), “A Poor Experience/Inability to Work Closely with a DE Coordinator” ($M = 1.82, SD = .88$), “The Inability to Speak with a DE Instructor” ($M = 1.76, SD = .85$), and “Lack of Opportunity/Poor Experience Working as a Teaching Assistant,

etc. in a DE Course” ($M = 1.63, SD = .85$) were considered minor barriers to COA’s ability to provide DE courses.

Table 10

Respondents’ Perceptions of the Observability of DE Adoption by Individual Response Item (n = 49)

Observability Items	<i>M</i>	<i>SD</i>
A Lack of or Poor Interaction with DE Students	2.16	1.00
No Experience/Poor Experience Watching Someone Else Teach a DE Course	1.94	.89
A Poor Experience/Inability to Work Closely with a DE Coordinator	1.82	.88
The Inability to Speak with a DE Instructor	1.76	.85
Lack of Opportunity/Poor Experience Working as a Teaching Assistant, etc. in a DE Course	1.63	.85
Overall Mean	1.86	.76

Note. Response: 1 = *Not a Barrier*, 2 = *A Minor Barrier*, 3 = *A Moderate Barrier*, 4 = *A Major Barrier*

Objective Three: Findings

The purpose of objective three was to determine if significant differences existed between institutional characteristics (institutional classification, institutional student enrollment, COA student enrollment, DE availability, DE coordinator, DE years offered, DE student enrollment, and DE tuition distribution) and institutions’ perceptions of DE barriers based upon Rogers’ (2003) characteristics of an innovation (relative advantage, compatibility, complexity, trialability, and observability).

Institutional Classification

Participants significantly differed in their perceptions of DE barriers by institutional classification (Table 11). Perceptions of relative advantage of DE barriers were statistically

different by institutional characteristics, $F(2, 45) = 4.69, p < .05$. A Tukey B post hoc analysis showed 1890 institutions perceived relative advantage ($M = 2.93, SD = .64$) as a moderate barrier while 1862 institutions ($M = 2.21, SD = .56$) and Public institutions ($M = 2.0, SD = .61$) perceived relative advantage as a minor barrier. Perceptions of compatibility of DE barriers were not statistically different by institutional characteristics, $F(2, 45) = 2.73, p \geq .05$. Perceptions of complexity of DE barriers were not statistically different by institutional characteristics, $F(2, 45) = .84, p > .05$. Perceptions of trialability of DE barriers were not significantly different by institutional characteristics, $F(2, 45) = .49, p > .05$. Perceptions of observability of DE barriers were not significantly different by institutional characteristics, $F(2, 45) = 1.19, p > .05$.

Table 11

Analysis of Variance for Participants' Perceptions of DE Barriers by Institutional Classification (n = 48)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Relative Advantage					
1862	26	2.21	.56	4.69	.01
1890	5	2.93	.64		
Public	17	2.00	.64		
Compatibility					
1862	26	2.80	.62	2.73	.08
1890	5	2.20	.60		
Public	17	2.94	.64		
Complexity					
1862	26	2.53	.73	.84	.44
1890	5	2.20	.89		
Public	17	2.24	.86		
Trialability					
1862	26	1.97	.64	.49	.62
1890	5	1.68	.58		
Public	17	1.80	.87		
Observability					
1862	26	2.00	.74	1.19	.31
1890	5	1.48	.66		
Public	17	1.79	.81		

Note. 1 participant did not indicate institutional type.

Institutional Student Enrollment

Participants were not statistically different in their perceptions of DE barriers by institutional student enrollment (Table 12). Perceptions of relative advantage of DE barriers were not statistically different by institutional student enrollment, $F(3, 45) = .14, p > .05$. Perceptions of compatibility of DE barriers were not statistically different by institutional student enrollment, $F(3, 45) = .23, p > .05$. Perceptions of complexity of DE barriers were not statistically different by institutional student enrollment, $F(3, 45) = 1.12, p > .05$. Perceptions of trialability of DE barriers were not statistically different by institutional student enrollment, $F(3, 45) = 1.71, p > .05$. Perceptions of observability of DE barriers were not statistically different by institutional student enrollment, $F(3, 45) = 1.16, p > .05$.

Table 12

Analysis of Variance for Participants' Perceptions of DE Barriers by Institutional Student Enrollment (n = 49)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Relative Advantage					
Less than 5,000	10	2.14	.91	.14	.94
5,000 – 15,000	17	2.24	.58		
15,000 – 25,000	12	2.24	.54		
More than 25,000	10	2.10	.65		
Compatibility					
Less than 5,000	10	2.72	.87	.23	.87
5,000 – 15,000	17	2.82	.64		
15,000 – 25,000	12	2.87	.53		
More than 25,000	10	2.66	.59		
Complexity					
Less than 5,000	10	1.98	1.02	1.12	.35
5,000 – 15,000	17	2.43	.75		
15,000 – 25,000	12	2.42	.72		
More than 25,000	10	2.60	.70		
Trialability					
Less than 5,000	10	1.54	.86	1.71	.18
5,000 – 15,000	17	1.74	.63		
15,000 – 25,000	12	2.07	.58		
More than 25,000	10	2.14	.80		
Observability					
Less than 5,000	10	1.70	.87	1.16	.34
5,000 – 15,000	17	1.69	.63		
15,000 – 25,000	12	1.95	.85		
More than 25,000	10	2.20	.72		

COA Student Enrollment

Participants were significantly different in their perceptions of DE barriers by COA student enrollment (Table 13). Perceptions of compatibility of DE barriers were statistically different by COA student enrollment, $F(3, 45) = 2.92, p < .05$. Perceptions of complexity of DE barriers were statistically different by COA student enrollment, $F(3, 45) = 3.16, p < .05$.

Perceptions of observability of DE barriers were statistically different by COA student

enrollment, $F(3, 45) = 2.82, p < .05$. Perceptions of relative advantage, $F(3, 45) = 1.86, p > .05$, and trialability, $F(3, 45) = 2.48, p = .05$, were not statistically different by COA student enrollment.

Table 13

Analysis of Variance for Participants' Perceptions of DE Barriers by COA Student Enrollment (n = 49)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Relative Advantage					
Less than 300	14	1.99	.67	1.86	.15
300 – 1,200	14	2.49	.65		
1,200 – 2,100	10	2.25	.62		
More than 2,100	11	2.01	.56		
Compatibility					
Less than 300	14	2.53	.65	2.92	.04
300 – 1,200	14	3.16	.42		
1,200 – 2,100	10	2.80	.57		
More than 2,100	11	2.60	.77		
Complexity					
Less than 300	14	1.92	.75	3.18	.03
300 – 1,200	14	2.79	.75		
1,200 – 2,100	10	2.40	.69		
More than 2,100	11	2.39	.79		
Trialability					
Less than 300	14	1.47	.59	2.48	.07
300 – 1,200	14	2.17	.71		
1,200 – 2,100	10	1.94	.63		
More than 2,100	11	1.89	.83		
Observability					
Less than 300	14	1.49	.52	2.82	.05
300 – 1,200	14	2.24	.93		
1,200 – 2,100	10	1.72	.68		
More than 2,100	11	1.98	.67		

DE Availability

As shown in Table 14, no statistical differences existed between respondents' perceptions of DE barriers by COA DE availability. Perceptions of the trialability of DE barriers were statistically different by DE availability, $t(47) = 2.57, p < .05$. Participants who indicated they offered DE courses indicated trialability was a minor barrier while those who indicated they did not offer DE courses showed trialability was not a barrier. Perceptions of the observability, $t(47) = 2.90, p > .05$, relative advantage, $t(47) = .69, p > .05$, compatibility, $t(47) = 2.02, p > .05$, and complexity, $t(47) = 1.33, p > .05$, of DE barriers were not statistically different by DE availability.

Table 14

Comparison of Participants' Perceptions of DE Barriers by DE Availability (n = 49)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Relative Advantage					
Yes	40	2.22	.63	.69	.57
No	9	2.06	.74		
Compatibility					
Yes	40	2.87	.64	2.02	.38
No	9	2.40	.51		
Complexity					
Yes	40	2.44	.79	1.33	.87
No	9	2.06	.78		
Trialability					
Yes	40	1.98	.73	2.57	.02
No	9	1.33	.37		
Observability					
Yes	40	2.00	.75	2.90	.08
No	9	1.24	.41		

DE Coordinator

As shown in Table 15, no statistical differences existed between respondents' perceptions of DE barriers by DE coordinator availability. Perceptions of the relative advantage of DE barriers were not statistically different by DE coordinator availability, $t(46) = 1.77, p > .05$. Perceptions of the compatibility of DE barriers were not statistically different by DE coordinator availability, $t(46) = .88, p > .05$. Perceptions of the complexity of DE barriers were not statistically different by DE coordinator availability, $t(46) = 1.10, p > .05$. Perceptions of the trialability of DE barriers were not statistically different by DE coordinator availability, $t(46) = .67, p > .05$. Perceptions of the observability of DE barriers were not statistically different by DE coordinator availability, $t(46) = 1.84, p > .05$.

Table 15

Comparison of Participants' Perceptions of DE Barriers by DE Coordinator Availability (n = 49)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Relative Advantage					
Yes	38	2.08	.60	1.77	.97
No	10	2.45	.56		
Compatibility					
Yes	38	2.74	.64	.88	.91
No	10	2.94	.71		
Complexity					
Yes	38	2.32	.75	1.10	.63
No	10	2.63	.95		
Trialability					
Yes	38	1.83	.71	.67	.78
No	10	2.00	.83		
Observability					
Yes	38	1.75	.68	1.84	.45
No	10	2.24	.97		

DE Years Offered

Participants were not statistically different in their perceptions of DE barriers by DE years offered (Table 16). Perceptions of relative advantage of DE barriers were not statistically different by DE years offered, $F(2, 37) = 1.61, p > .05$. Perceptions of compatibility of DE barriers were not statistically different by DE years offered, $F(2, 37) = .07, p > .05$. Perceptions of complexity of DE barriers were not statistically different by DE years offered, $F(2, 37) = .38, p > .05$. Perceptions of trialability of DE barriers were not statistically different by DE years offered, $F(2, 37) = .23, p > .05$. Perceptions of observability of DE barriers were not statistically different by DE years offered, $F(2, 37) = .21, p > .05$.

Table 16

Analysis of Variance for Participants' Perceptions of DE Barriers by DE Years Offered (n = 40)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Relative Advantage					
1 – 5	12	2.49	.66	1.61	.21
5 – 10	13	2.09	.63		
More than 10	15	2.13	.58		
Compatibility					
1 – 5	12	2.90	.54	.07	.93
5 – 10	13	2.89	.59		
More than 10	15	2.81	.79		
Complexity					
1 – 5	12	2.51	.83	.38	.69
5 – 10	13	2.28	.74		
More than 10	15	2.52	.84		
Trialability					
1 – 5	12	2.02	.59	.23	.80
5 – 10	13	2.06	.77		
More than 10	15	1.88	.83		
Observability					
1 – 5	12	2.12	.79	.21	.81
5 – 10	13	1.92	.66		
More than 10	15	1.97	.84		

Note. *n* = 40 due to subpopulation offering DE was 40.

DE Student Enrollment

Participants were not statistically different in their perceptions of barriers by DE student enrollment (Table 17). Perceptions of relative advantage of barriers were not statistically different by DE years offered, $F(2, 36) = 2.52, p > .05$. Perceptions of compatibility of barriers were not statistically different by DE student enrollment, $F(2, 36) = .94, p > .05$. Perceptions of complexity of DE barriers were not statistically different by DE student enrollment, $F(2, 36) = 1.08, p > .05$. Perceptions of trialability of DE barriers were not statistically different by DE student enrollment, $F(2, 36) = 1.19, p > .05$. Perceptions of observability of DE barriers were

not statistically different by DE student enrollment, $F(2, 36) = 1.30, p > .05$.

Table 17

Analysis of Variance for Participants' Perceptions of DE Barriers by DE Student Enrollment (n = 39)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Relative Advantage					
Less than 50	9	2.47	.82	2.52	.10
50 – 100	5	2.60	.55		
More than 100	25	2.07	.54		
Compatibility					
Less than 50	9	2.93	.71	.94	.40
50 – 100	5	3.20	.51		
More than 100	25	2.78	.65		
Complexity					
Less than 50	9	2.33	.92	1.08	.35
50 – 100	5	2.93	1.13		
More than 100	25	2.39	.68		
Trialability					
Less than 50	9	2.02	.89	1.19	.32
50 – 100	5	2.44	.89		
More than 100	25	1.89	.64		
Observability					
Less than 50	9	2.04	.84	1.30	.29
50 – 100	5	2.48	.97		
More than 100	25	1.89	.68		

Note. 1 participant did not respond.

DE Tuition Distribution

As shown in Table 18, no statistical differences existed between respondents' perceptions of DE barriers by DE tuition distribution. Perceptions of the relative advantage of DE barriers were not statistically different by DE tuition distribution, $t(36) = .06, p > .05$. Perceptions of the compatibility of DE barriers were not statistically different by DE tuition distribution, $t(36) = 1.80, p > .05$. Perceptions of the complexity of DE barriers were not statistically different by DE tuition distribution, $t(36) = .07, p > .05$. Perceptions of the trialability of DE barriers were not

statistically different by DE tuition distribution, $t(36) = .68, p > .05$. Perceptions of the observability of DE barriers were not significantly different by DE tuition distribution, $t(36) = .44, p > .05$.

Table 18

Comparison of Participants' Perceptions of DE Barriers by DE Tuition Distribution (n = 38)

Construct	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Relative Advantage					
Same	20	2.20	.68	.06	.44
Different	18	2.19	.59		
Compatibility					
Same	20	3.06	.58	1.80	.46
Different	18	2.69	.69		
Complexity					
Same	20	2.42	.82	.07	.96
Different	18	2.40	.79		
Trialability					
Same	20	2.03	.77	.68	.84
Different	18	1.87	.71		
Observability					
Same	20	2.02	.75	.44	.81
Different	18	1.91	.78		

Note. 2 participants did not indicate how DE tuition distribution was handled.

Objective Four: Findings

The purpose of objective four was to describe the relationship between DE barriers to DE availability and DE coordinator. A backward regression model was used to predict DE availability based on the constructs relative advantage, compatibility, complexity, trialability, and observability. Table 19 shows the backward regression models. All models were statistically significant. Model 1 showed that observability, trialability, complexity, compatibility, and relative advantage accounted for 22% of the variation in DE availability; $F(5, 43) = 2.48, p < .05$. Model 2 accounted for the same amount of variation in DE availability but did not include

the variable, relative advantage; $F(4, 44) = 3.06, p < .05$. Model 3 showed that observability, trialability, and complexity accounted for 20% of the variation in DE availability; $F(3, 45) = 3.72, p < .05$. Model 4 showed that observability and trialability accounted for 16% of the variation in DE availability; $F(2, 46) = 4.47, p < .05$. Model 5 showed that observability accounted for 15% of the variation in DE availability; $F(1, 47) = 8.42, p < .05$.

Table 19

Linear Regression of DE Barriers from DE Availability (n = 49)

Institutional Characteristic		<i>R</i>	<i>R</i> ²	<i>B</i>	<i>Beta</i>	<i>t</i>	<i>p</i>
DE Availability	Model 1	.47	.22	Observability	-.33	-1.67	.10
	Trialability			-.34	-1.42	.16	
	Complexity			.33	1.43	.16	
	Compatibility			-.16	-1.02	.31	
	Relative Advantage			.09	.57	.57	
	(Constant)			1.61	6.16	.00	
Model 2	Observability	.47	.22	-.17	-.33	-1.66	.10
	Trialability			-.17	-.32	-1.35	.18
	Complexity			.18	.36	1.61	.12
	Compatibility			-.10	-.16	-1.03	.31
	(Constant)			1.68	7.10	.00	
Model 3	Observability	.45	.20	-.18	-.35	-1.80	.08
	Trialability			-.19	-.34	-1.46	.15
	Complexity			.15	.31	1.42	.16
	(Constant)			1.50	8.99	.00	
Model 4	Observability	.40	.16	-.15	-.28	-1.48	.15
	Trialability			-.08	-.15	-.77	.45
	(Constant)			1.61	10.50	.00	
Model 5	Observability	.39	.15	-.20	.39	-2.90	.01
	(Constant)			1.56		11.20	.00

A backward regression model to predict the presence of a DE coordinator based on the constructs relative advantage, compatibility, complexity, trialability, and observability. Table 20 shows the backward regression model indicating that there were not any statistically significant models.

Table 20

Linear Regression of DE Barriers from DE Coordinator (n = 49).

Institutional Characteristic			<i>R</i>	<i>R</i> ²	<i>B</i>	<i>Beta</i>	<i>t</i>	<i>p</i>
DE Coordinator	Model 1	Observability	.38	.14	.21	.39	1.80	.08
		Trialability			-.18	-.31	-1.21	.23
		Complexity			-.05	-.09	-.33	.74
		Compatibility			.03	.05	.31	.76
		Relative Advantage			.21	.31	1.58	.12
		(Constant)			.72		2.44	.02
	Model 2	Observability	.37	.14	.10	.19	1.18	.24
		Trialability			-.17	-.30	-1.20	.24
		Complexity			-.04	-.07	-.27	.79
		Relative Advantage			.21	.30	1.58	.12
		(Constant)			.78		3.49	.00
			Model 3	Observability	.37	.14	.20	.38
Trialability					-.19	-.34	-1.52	.14
Relative Advantage					.19	.28	1.63	.11
(Constant)					.77		3.52	.00
	Model 4	Observability	.30	.09	.10	.19	1.18	.24
		Relative Advantage			.12	.17	1.07	.29
		(Constant)			.77		3.47	.00
	Model 5	Observability	.26	.07	.14	.26	1.84	.07
		(Constant)			.95		6.20	.00

Objective Five: Findings

The purpose of objective five was to determine institutions' perceptions on the development or expansion of DE courses as a viable option for COA. All respondents ($n = 15$) indicated they perceived DE development as a viable option for their COA, with the exception of one institution. Of those institutions that stated DE is a viable option, several stated that DE is "...not only viable, but necessary" (17-1, 12-1). Additionally, several participants responded that the need for DE was driven by the students' need for convenient and accessible options (14-1, 43-2, 37-1, 17-2).

One respondent indicated that their institution's students and faculty value face-to-face interactions over DE course delivery. Additionally, many of the courses within that institution's COA "require hands-on lab experiences and [the] curricula are dominated by such" (29-1). This respondent was clear there was no interest in developing DE at that institution. Table 21 shows the differences in participants' responses.

Table 21

Respondents' Perceptions of DE Development as a Viable Option for COA

Response	<i>f</i>	%
Yes	14	93.8
No	1	6.2

Objective Six: Findings

The purpose of objective six was to determine institutions' perceptions on how COA can expedite the development of existing and future DE courses. Respondents ($n = 15$) most commonly indicated that COA can expedite the development of DE courses by focusing on

faculty incentives ($n = 10$), adequate resources for development and support ($n = 10$), funding ($n = 7$), faculty support ($n = 6$), cooperative programs focused on the sharing of course material ($n = 6$), and time concessions ($n = 5$).

There were some responses from participants that indicated younger, unseasoned faculty are more likely to have the desire to teach DE courses, but that the more seasoned, tenured faculty are often the ones with the ability to teach DE (43-2, 6-1, 10-2). Additionally, while there were many respondents who indicated a lack of support on behalf of faculty (17-1, 6-1, 10-2, 29-1, 1-1, 19-1, 43-2), there were also some respondents who indicated there was a lack of support on behalf of administration as well (6-1, 10-2). Table 22 summarizes respondents' perceptions of how COA can expedite the development of existing and future DE courses.

Table 22

Respondents' Perceptions of how COA can Expedite the Development of Existing and Future DE Courses

Response	<i>f</i>	%
Faculty Incentives	10	62.5
Resources for Development and Support	10	62.5
Funding	7	44.0
Faculty Support	7	44.0
Cooperative Programs	6	37.5
Time Concessions	5	31.3

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

A summary of the study's purpose, objectives, and methodology is presented in this chapter. Conclusions, implications, and recommendations derived from the findings follow the study's summary. The chapter concludes with a summary of recommendations for research and a summary of recommendations for future research.

Summary

While there are many benefits cited for DE and many students show a partiality towards DE (Guthrie, 2009; Kelsey, Lindner, & Moore, 2002; Koch, Townsend, & Dooley, 2005; Mink & Moore, 2005; Murphy, 2000; Sampson, Leonard, Ballenger, & Coleman, 2010), institutions still struggle with the decision to create or expand their DE course offerings as there are many barriers hindering the growth and development of DE programs (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphy & Terry, 1998a; Murphrey & Dooley, 2000; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005a).

Despite the criticism, researchers are still finding that faculty perceives DE as having significant value as a tool in the learning process (Dooley & Murphy, 2001; Gammill &

Newman, 2005; Murphrey & Dooley, 2000; Murphy & Terry, 1998a; Murphy & Terry, 1998b).

A study of the barriers affecting DE courses in COA is needed to improve the quality of existing DE programs and to facilitate the growth of new ones. Additionally, it is necessary to discover which factors have played a role in determining if DE is a viable option of course delivery for COA, and if it is, what accommodations are needed to expedite the growth DE course offerings.

Summary of Purpose and Objectives

The purpose of this study was to determine what barriers are present in the implementation and development of DE courses within COA. Rogers' (2003) theory of the diffusion of innovations and Christensen's (1997) disruptive innovations theory provided the framework for the study. The research objectives were to:

1. Describe participants by selected personal characteristics.
2. Describe the perceived barriers that affect COA from providing DE courses to their students amongst adopters and non-adopters.
3. Determine if significant differences existed between institutional characteristics and institutions' perceptions of DE barriers.
4. Describe and explore the relationship between DE barriers, DE availability and DE coordinator.
5. Determine institutions' perceptions on the development or expansion of DE courses as a viable option for COA.
6. Determine institutions' perceptions on how COA can expedite the development of existing and future DE courses.

Summary of Methods

The target population was colleges, departments, or programs of agriculture in our nation. According to the Association of Public and Land-Grant Universities (APLU, 2012), National Association of Agricultural Educators (NAAE, 2012), and Food and Agricultural Education Information System (FAEIS, 2012) databases, there are approximately 131 institutions that have a college, department, or program of agriculture. Of these institutions, 77 are listed by the FAEIS as being historically 1862 or 1890 Land-Grant institutions (FAEIS, 2012). Furthermore, these institutions span each of the 50 states, 7 U.S. territories, as well as our Nation's capital. Data was collected by an online questionnaire and phone interviews. The online survey was researcher designed, influenced by questions and data obtained in various studies of DE barriers (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphy & Terry, 1998a; Murphrey & Dooley, 2000; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005a).

Participants were sent an introductory recruitment email along with a copy of the information letter and a link to the online survey for those wanting to participate. Six reminder emails were sent out to increase response rate as recommended by Dillman, Smyth, and Christian (2009). A final response rate of 50.5% ($N = 66$) was achieved from the online survey and phone interviews.

Data from the online survey was analyzed using descriptive and inferential statistics in the Statistical Package for Social Sciences (SPSS 23). There were 49 usable responses. Objectives one and two were analyzed using descriptive methods. Objective three was analyzed using analyses of variance and t-tests. Objective four was analyzed using a backward regression model. Objectives five and six were analyzed as qualitative data and coded for similar themes. The independent variables for this study were (a) institutional classification, (b) institutional

student enrollment, (c) COA student enrollment, (d) DE availability (e) length of time DE has been offered, and (f) DE student enrollment. The dependent variables for this study were (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability.

Conclusions, Implications, and Recommendations

Objective One Conclusions

The first objective was to describe participating institutions by selected personal characteristics. Institutions were described by (a) institutional characteristics and (b) departmental characteristics. Three variables define institutional characteristics: (a) institutional classification, (b) institutional enrollment, and (c) COA enrollment.

The majority of participants were affiliated with an 1862 Land Grant institution which accounted for 53.1% ($n = 26$) of the responses. The fewest respondents were affiliated with 1890 Land Grant institutions, which only accounted for 10.2% ($f = 5$) of the responses. 36.7% of respondents ($f = 17$) reported an association with a public, non-Land Grant institution. One participant failed to respond to the survey item.

Most respondents 34.7% ($f = 17$) indicated an institutional student enrollment of 5,001 to 15,000. Respondents reported an institutional student enrollment of less than 5000 ($f = 10$, 20.4%) or more than 25,001 ($f = 10$, 20.4%) the least. There were a moderate number of respondents who indicated an institutional student enrollment of 15,001 to 25,000 ($f = 12$, 24.5%).

The majority of participants reported a COA student enrollment of less than 300 ($f = 14$, 28.6%) and 300 to 1,200 ($f = 14$, 28.6%). An additional 22.4% ($f = 11$) of respondents reported a

COA student enrollment of more than 2,100. The least number of respondents ($f = 10$, 20.5%) reported a COA student enrollment of 1,201 – 2,100.

A majority (53.1%) of respondents identified their DE programs as being in a department of Agricultural Economics and Rural Sociology ($f = 26$, 53.1%), however, DE programs were also identified within Ag Leadership, Education and Communication ($f = 19$, 38.8%), Crop and Soil Science ($f = 19$, 38.8%), and Food Science ($f = 19$, 38.8%) as well. Several respondents indicated programs within Horticulture ($f = 18$, 36.7%), and Animal and Dairy Science ($f = 17$, 34.7%), but fewer programs were reported within Entomology and Plant Pathology ($f = 13$, 26.5%). The least number of programs of DE were identified in Fish, Aquaculture and Aquatic Science ($f = 7$, 14.3%), Biosystems Engineering (6, 12.2%), and Poultry Science ($f = 4$, 8.2%).

Objective One Implications

In this study, there was a low response from 1890 institutions. 1994 and private institutions were not part factored in. As a result, it is unclear whether these findings hold true for all colleges and programs of agriculture, or just those included in this study.

Also, this study only targeted colleges and programs of agriculture. As such, it stands to reason that the respondents would be associated with agricultural departments such as Agricultural Economics and Rural Sociology, Agricultural Leadership, Crop and Soil Sciences, Food Science, Horticulture, and Animal and Dairy Science.

Additionally, the majority (91.9%) of the respondents in this study were affiliated with departments of Agricultural Economics and Rural Sociology and Ag Leadership, Education, and Communication, which are known for being social sciences, or “soft” sciences. It is logical that DE is more common in the soft sciences than in programs requiring hands-on instruction such as

Animal and Dairy Science, Poultry Science and Entomology.

Objective One Recommendations

To gain a clearer understanding on how barriers affect the adoption of DE in COA, a study of DE barriers in 1890, 1994, and private institutions would be necessary for a more comprehensive overview. Of particular interest are the questions of whether DE barriers are similar or different for private institutions and public institutions and whether or not minority institutions such as the 1890 and 1994 Land Grant institutions are inhibited by the same DE barriers as 1862 and 1890 institutions.

Objective Two Conclusions

Objective two was to describe the perceived barriers that affect COA from providing DE courses to their students amongst adopters and non-adopters. The constructs were consistent with Rogers' (2003) attributes of an innovation: (a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability. Participants identified the perceived barriers as minor, with restrictive costs being considered as slightly more significant (a moderate barrier). Additionally, participants reported that resistance from faculty members to be the only major barrier to DE.

Objective Two Implications

A low reliability score was noted for the compatibility construct (.68). This finding could be the result of a low *n* within the study. It is possible the reliability score could be improved by either eliminating some of the items within that construct or by rewriting the items so that

respondents had a clearer understanding of what was being asked.

One criticism of Rogers' (2003), is that of recall. Over time, adopters have a tendency to forget facts and specifics of their adoption process. As the majority of respondents (70%) indicated their respective institutions had implemented DE programs anywhere from 5 years to more than 10 years prior to this study, it is quite possible the respondents' recall of their institutions' adoption process and barriers associated therein was not accurate.

Previous studies concerning DE barriers (Gammill & Newman, 2005; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005b) suggest time and expense are the primary obstacles hindering DE, which is similar to this study's findings of restrictive costs as a moderate barrier. Additionally, this study identifies faculty resistance as a "major barrier". In contrast, Gammill and Newman (2005) found administrative support to be lacking, not faculty support. Only two respondents cited administrative support as an area of need (10-2, 6-1).

Objective Two Recommendations

Future research should focus on COA faculty to determine what factors lead them to be more resistant to DE courses. Additionally, a study focusing on defining the population of faculty in favor of DE and those who are not would help clarify what incentives should be offered to motivate these faculty accordingly.

Furthermore, as there seems to be some discrepancy in the literature and the findings of this study concerning whether administration or faculty are lacking the proper support for DE programs, future studies should look at comparing the two populations to see if there are any differences in their perceptions of DE and motivations for providing DE.

Lastly, a duplicated study on COA with newly adopted DE programs would satisfy the

question of whether the varying disagreements on whether barriers are minor or moderate as these institutions' recall would be more recent and, therefore, more accurate.

Objective Three Conclusions

The purpose of objective three was to determine if significant differences existed between institutional characteristics (institutional classification, institutional student enrollment, COA student enrollment, DE availability, DE coordinator, DE years offered, DE student enrollment, and DE tuition distribution) and institutions' perceptions of DE barriers (relative advantage, compatibility, complexity, trialability, and observability). The study indicated that respondents did not significantly differ in their perceptions of DE barriers based on the institutional characteristics.

Objective Three Implications

The institutional characteristics of institutional classification, institutional student enrollment, COA student enrollment, DE availability, DE coordinator, DE years offered, DE student enrollment, and DE tuition distribution were not related to perceptions of DE barriers. While respondents did not differ significantly in their perceptions of DE barriers, there was a small degree of disagreement amongst the population. It is quite possible that this disagreement can be attributed to some poorly written items within the DE barrier constructs. In order to eliminate any hint of uncertainty, there is a need for better responses for survey items. While the meaning and translation is clear to those who developed and worked with the instrument, it is not guaranteed others were able to discern what the questions being asked.

Objective Three Recommendations

Future research on DE barriers should provide a clear, defined explanation of each construct and/or barrier to participants so there is no room for misinterpretation of the survey items.

Objective Four Conclusions

The purpose of objective four was to describe the relationship between DE barriers, DE availability and DE coordinator. One regression model indicated that DE barriers were not a predictor of DE coordinator. Similarly, the other regression model indicated that DE barriers were not a predictor of DE availability. However, one model within the regression did indicate observability was a statistically significant predictor of DE availability $F(1, 47) = 8.42, (p < .05)$.

These findings are quite similar to those discovered in Harder and Lindner's (2008) study. These research likewise found that while respondents tended to have positive perceptions of relative advantage, compatibility, complexity, and trialability related to eXtension, they did not perceive eXtension to have a high degree of observability (Harder & Lindner, 2008). As a result, the researchers recommended agents be given temporary access to eXtension in order to familiarize themselves with the program.

Objective Four Implications

The Observability construct was presented as statements such as: (a) A Lack of or Poor Interaction with DE Students, (b) No Experience/Poor Experience Watching Someone Else Teach a DE Course, (c) A Poor Experience/Inability to Work Closely with a DE Coordinator, (d)

The Inability to Speak with a DE Instructor, and (e) Lack of Opportunity/Poor Experience Working as a Teaching Assistant, etc. in a DE Course. It can be assumed that participants perceived the inability to observe the use of DE technologies as having a negative impact on their decision to adopt DE technology.

In Born and Miller's study (1999), the researchers determined that faculty perceptions of DE are often much higher when they are involved in a DE course. This finding is very similar to the perceptions of the participants of this study who found the observability of DE to be a significant barrier. It is a practical assessment that faculty would want an opportunity to see DE being utilized successfully before adopting its use themselves. Rogers (2003) stated observability is positively related to an innovation's adoption. The negative perceptions respondents have of observability would be expected to affect the rate of DE adoption, and therefore should be considered a threat to DE adoption. In this study, faculty resistance is cited as a barrier to DE diffusion. Observability was also cited as being significant to the availability of DE. Therefore, it can be implied that faculty resistance, or the lack or inability to persuade faculty to adopt DE is related to their inability to observe DE prior to use.

Objective Four Recommendations

COA would benefit from adopting a "try before you buy" mentality when planning on adding DE to their course offerings. This would give faculty a chance to see DE in action before creating and implementing a DE course of their own. Research should focus on the effects of an observable DE course on new and developing DE programs versus DE programs that were created without the capacity to test them before implementing them.

Objective Five Conclusions

The purpose of objective five was to determine institutions' perceptions on the development or expansion of DE courses as a viable option for COA. Participants of the phone interview were asked, "Do you think DE course development and/or expansion is a viable option for your COA?" Responses were recorded by the researcher and analyzed for common themes. All respondents ($n = 15$) indicated they perceived DE development as a viable option for their COA, with the exception of one institution. Of those institutions that stated DE is a viable option, several stated that DE is "...not only viable, but necessary" (17-1, 12-1). Additionally, several participants responded that the need for DE was driven by the students' need for convenient and accessible options (14-1, 43-2, 37-1, 17-2).

One respondent indicated that their institution's students and faculty value face-to-face interactions over DE course delivery. Additionally, many of the courses within that institution's COA "require hands-on lab experiences and [the] curricula are dominated by such" (29-1). This respondent was clear there was no interest in developing DE at that institution.

Objective Five Implications

The respondents of this study were in agreement with previous studies' (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphrey & Dooley, 2000; Murphy & Terry, 1998a; Murphy & Terry, 1998b) findings which conclude that faculty generally have a positive perception of DE and see it as having significant value as a tool in the learning process. But despite claims that DE is a viable option, faculty resistance was still viewed as a "major barrier".

In a study by Roberts and Dyer (2005b), researchers state that when adequate time and training were not made readily available, there was greater resistance from faculty to provide DE

courses. While time was considered a “minor barrier” in this study, it stands to reason that faculty will not pursue DE courses if they have inadequate time for their current course loads. Several respondents stated that young faculty members are often eager to create new DE courses, but are limited by their educational and research obligations leaving those endeavors to the older, tenured faculty (10-2, 43-2). These tenured faculty are the ones who are most resistant to DE courses, due to a preference for traditional practices and face-to-face contact with students (10-2, 29-1, 6-1).

Objective Five Recommendations

Future studies should focus on determining why faculty would view DE as viable and necessary, but still resist its implementation. Are there additional factors besides time, such as training or incentives, which prevent faculty from adopting DE?

An additional area of interest should be in determining whether or not it is faculty who resist DE, or if it is administrators who are resistant and are placing the burden of non-adoption on faculty? In Gammill and Newman’s study (2005), it was determined that administrative support was lacking, not faculty support. While this study’s population was a mixed bag of administrators and faculty, it would have been beneficial to determine administrative responses from faculty responses and compare the two to see if it is a case of administrators and faculty placing blame upon each other.

Objective Six Conclusions

The purpose of objective five was to determine institutions’ perceptions on how COA can expedite the development of existing and future DE courses. Participants of the phone interview

were asked, “How can your COA expedite the development of existing and future DE courses?” Responses were recorded by the researcher and analyzed for common themes. Respondents ($n = 15$) most commonly indicated that COA can expedite the development of DE courses by focusing on faculty incentives ($n = 10$), adequate resources for development and support ($n = 10$), funding ($n = 7$), faculty support ($n = 6$), cooperative programs focused on the sharing of course material ($n = 6$), and time concessions ($n = 5$).

There were some responses from participants that indicated younger, unseasoned faculty are more likely to have the desire to teach DE courses, but that the more seasoned, tenured faculty are often the ones with the ability to teach DE (43-2, 6-1, 10-2). Additionally, while there were many respondents who indicated a lack of support on behalf of faculty (17-1, 6-1, 10-2, 29-1, 1-1, 19-1, 43-2), there were also some respondents who indicated there was a lack of support on behalf of administration as well (6-1, 10-2).

Objective Six Implications

The findings of this study are in agreement with other studies (Dooley & Murphy, 2001; Gammill & Newman, 2005; Murphrey & Dooley, 2000; Murphy & Terry, 1998a; Murphy & Terry, 1998b; Nelson & Thompson, 2005; Roberts & Dyer, 2005b) in citing cost, time constraints, and faculty resistance as obstacles in the provision of DE courses. These researchers additionally cited support and training as additional barriers, whereas this study did not find those to be significant barriers. However, participants did cite additional resources for development and support of DE programs (37-1, 14-1, 40-1, 12-1, 44-1, 17-2, 32-1, 19-1, 1-1, 6-1) as a mechanism for expediting DE growth within COA. Another mechanism that was commonly cited was a cooperative content sharing program (48-1, 44-1, 12-1, 40-1, 14-1, 10-2)

that would allow COA faculty from participating institutions to collaborate and share DE courses in order to amass quality content for blossoming DE courses. These requests for support is in agreement with the request for support from faculty in previous studies.

Objective Six Recommendations

Some respondents (17-1, 6-1) suggested the use of “virtual faculty” as a way to provide quality, experienced DE instructors without overloading faculty on campus. The idea is to employ a staff person as a DE instructor and they teach the DE course(s) from wherever they live, not from campus. Studies should look to see how many COAs currently employ “virtual” staff and whether the arrangement has been beneficial or not.

Several respondents also commented that while junior faculty, or those who are younger and not yet tenured, are often the ones most eager to assemble a DE course, they often have the least amount of time as they are still in the midst of obtaining tenure. Older faculty who have already obtained tenure have the time to dedicate to building a DE course. Studies should look to see what percentage of tenured and non-tenured COA faculty are interested in teaching a DE course and what obstacles prevent them from doing so.

Summary of Recommendations for Practice

Recommendations for the adoption and diffusion of DE amongst COA are:

1. To decrease or eliminate faculty concerns about DE barriers by providing adequate time, support, resources, funding, and incentives for DE course development.
2. To decrease or eliminate concerns about the Observability of DE by increasing the opportunities for faculty to observe or watch DE being used in similar courses.

3. To create opportunities for faculty to engage and utilize DE support, training and resources while developing DE courses.
4. To develop a cooperative program that would allow COA faculty from participating institutions to collaborate and share DE courses in order to amass quality content for new DE courses.
5. To decrease or eliminate the saturated course loads of faculty by exploring the use of virtual staff as a means of providing quality, experienced DE instructors.

Summary of Recommendations for Future Research

This study should be replicated within each COA due to the uniqueness of the educational systems within each institution. Recommendations for future research related to the adoption and diffusion of DE amongst COA are:

1. A study of just 1890, 1994, and private institutions for a more comprehensive overview of DE in all COA.
2. A study addressing whether DE barriers are similar or different for private institutions and public institutions.
3. A study addressing whether or not minority serving institutions such as the 1890 and 1994 Land Grant institutions are inhibited by the same DE barriers as 1862 and 1890 institutions.
4. Future research should focusing on COA faculty to determine what factors lead them to be more resistant to DE courses.
5. A study focusing on defining the population of faculty in favor of DE and those who are not to clarify what incentives should be offered to motivate these faculty accordingly.

6. Future studies to compare faculty and administrators to see if there are any differences in their perceptions of DE and motivations for providing DE.
7. A duplicated study on COA with newly adopted DE programs to determine if these institutions' recall would be more recent, more accurate, and in agreement.
8. Future research on DE barriers should provide a clear, defined explanation to participants so there is no room for misinterpretation of the survey items.
9. Research should focus on the effects of an observable DE course on new and developing DE programs versus DE programs that were created without the capacity to test them before implementing them.
10. Study focusing on why faculty would view DE as viable and necessary, but would still resist its implementation.
11. A study to determine whether or not it is faculty who resist DE, or if it is administrators who are resistant?
12. Studies should look to see how many COAs currently employ "virtual" staff and whether the arrangement has been beneficial or not.
13. Studies should look to see what percentage of tenured and non-tenured COA faculty are interested in teaching a DE course and what obstacles prevent them from doing so

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APPENDIX A

AN ANALYSIS OF DISTANCE EDUCATION ADOPTION BARRIERS WITHIN COLLEGES AND PROGRAMS OF AGRICULTURE

Please respond to the following questions regarding your respective institution.

1. What institution are you affiliated with?
 - State
 - Institution
2. Which best describes your institution?
 - 1862 Land-Grant Institution
 - 1890 Historically Black Land-Grant Institution
 - A Public Institution (Not Land-Grant)
3. Approximately how many students (distance and traditional) are enrolled at your institution?
 - Less than 5,000
 - 5,000 – 15,000
 - 15,000 – 25,000
 - 25,000 – 35,000
 - 35,000 – 50,000
 - More than 50,000
4. Approximately how many students (distance and traditional) are enrolled in your institution's College, Program, or Department of Agriculture (COA)?
 - Less than 300
 - 300 – 600
 - 600 – 900
 - 900 – 1,200
 - 1,200 – 1,500
 - 1,500 – 1,800
 - 1,800 – 2,100
 - More than 2,100
5. To your knowledge, does your institution currently offer undergraduate or graduate level distance education (DE) courses within the COA?
 - Yes
 - No
6. Does your institution currently employ a Distance Education Coordinator or other similar position to assist with DE courses?
 - Yes
 - No
7. How long have distance education courses been offered by your institution?
 - Less than a year
 - 1 – 3 years
 - 3 – 5 years
 - 5 – 7 years
 - 8 – 10 years
 - More than 10 years

Please respond to the following questions as they relate to Distance Education (DE) at your institution.

19. In your opinion, what are the most significant barriers your institution has encountered in its implementation or expansion of DE course offerings within the COA? For each barrier, you will indicate whether the barrier was Not A Barrier, A Minor Barrier, A Moderate Barrier, or if it was A Major Barrier.

Barrier	Not A Barrier	Minor Barrier	Moderate Barrier	Major Barrier
Restrictive Costs or Funding for the Institution				
Inadequate Compensation or Recognition for Faculty				
Faculty Workload Concerns				
Prohibitive Equipment Costs and Maintenance				
Little or No Administrative Support				
Lack of Institutional Incentives and Advantages				
Demand for DE Does Not Exist				
Equipment Failures/Cost of Maintaining Equipment				
Time Constraints				
Pedagogical Concerns (Lack of Student Contact, Course Quality, Etc.)				
Inability to Teach Skills Requiring Hands-On Instruction				
Resistance from Faculty				
Inability to Deliver Duplicate Courses via DE				
Lack of Technical Knowledge				
Lack of Time to Learn New Technologies				
Lack of Familiarity with Equipment				
Lack of Faculty Commitment of Time to Learn the Technologies Used				
Lack of Faculty Confidence to Create Successful DE Courses				
Administrative Complexities				
Lack of Personal Participation in DE Courses				
Having Conducted Unsuccessful DE Courses				
Lack of Attendance at DE Workshops Where the Technology Could be Tested				
A Poor Experience Participating in a Conference via DE Technology				
Lack of Use of Social Media				
The Inability to Speak with a DE Instructor				
No Experience or a Poor Experience Watching Someone Else Teach a DE Course				
Lack of or Poor Interaction with DE Students				
A Poor Experience or Inability to Work Closely with a DE Coordinator				
Lack of Opportunity or a Poor Experience Working as a Teaching Assistant, Etc. in a DE Course				
Other (Please write in your barrier in the space provided)				

APPENDIX B

From: IRB Administration <irbadmin@auburn.edu>
Date: February 3, 2014 at 3:15:52 PM CST
To: Kellis Boland <kib0013@auburn.edu>
Cc: Brian Parr <BP0007@auburn.edu>, Kimberly Walls <wallski@auburn.edu>
Subject: Approval, Exempt Protocol #13-420 EX 1401

Please note: Use IRBadmin@auburn.edu for questions and information; use IRBsubmit@auburn.edu for protocol/forms submissions.

Dear Kellis,

Your protocol entitled "An Analysis of Distance Education Adoption Barriers within College and Programs of Agriculture " has been approved by the IRB as "Exempt" under federal regulation 45 CFR 46.101(b)(2).

Official notice:

This e-mail serves as official notice that your protocol has been approved. A formal approval letter will not be sent unless you notify us that you need one. By accepting this approval, you also accept your responsibilities associated with this approval. Details of your responsibilities are attached. Please print and retain.

Information Letter:

Your letter(s) will soon be forwarded to you. However you still need to add the following IRB approval information to your information letter(s):

"The Auburn University Institutional Review Board has approved this document for use from January 27, 2014 to January 26, 2017. Protocol #13-420 EX 1401 "

You must use the updated document(s) to consent participants. Once you have made the update you may begin your study. *Please forward the actual electronic letter(s) with a live link so that we may print a final copy for our files.*

Expiration – Approval for three year period:

***Note that the new policy for Exempt approvals is a *three year approval*. Therefore, your protocol will expire on **January 26, 2017**. Put that date on your calendar now. About three weeks before that time you will need to submit a renewal request.

When you have completed all research activities, have no plans to collect additional data and have destroyed all identifiable information as approved by the IRB, please notify this office via e-mail. A final report is no longer required.

If you have any questions, please let us know.

Best wishes for success with your research!
Susan

IRB Administrator
Office of Research Compliance
115 Ramsay Hall (basement)
Auburn University, AL 36849

APPENDIX C

Appendix B

Department of Curriculum and Teaching
College of Education

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

INFORMATION LETTER

for a Research Study entitled

"An Analysis of Distance Education Adoption Barriers within Colleges and Programs of Agriculture"

You are invited to participate in a research study to determine what barriers are present in the implementation and development of distance education courses within Colleges of Agriculture. This study also examines whether or not any differences exist in barriers encountered between adopters and non-adopters of distance education within Colleges of Agriculture at institutions from across the nation.

The study is being conducted by Kellis Boland, under the direction of Dr. Brian Parr, Associate Professor in the Auburn University Department of Curriculum and Teaching. You were selected as a possible participant because you are a representative of your institution's College of Agriculture or agricultural program.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to respond to the survey in the provided link. Your total time commitment will be approximately 20 minutes.

Are there any risks or discomforts? The risks associated with participating in this study are Coercion and Breach of Confidentiality. To minimize these risks, follow the guidelines and examples for written documents provided by Auburn University's Office of Human Subject Research, so that participants assume no accusation of guilt to participate. Additionally, the researcher will make every effort to safeguard data by password protecting it on her personal computer and by locking all documents in a filing cabinet when not in use.

Are there any benefits to yourself or others? If you participate in this study, you can expect suggestions for strategies on how to address barriers to distance education as well as insight on the current climate of distance education within Colleges of Agriculture and other agriculture programs. We/I cannot promise you that you will receive any or all of the benefits described. Benefits to others may include the identification of existing distance education barriers and the provision of literature-based recommendations on how to overcome those barriers.

Please add this approval information in sentence form to this letter. Send your updated letter to the IRB with a live link to the survey.

The Auburn University Institutional Review Board has approved this document for use from 1/27/14 to 1/26/17 Protocol # 13 420 EX 14 ⁰¹

If you change your mind about participating, you can withdraw at any time by closing your browser window. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Once you've submitted confidential data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Curriculum and Teaching or the College of Agriculture and Environmental Sciences.

Any data obtained in connection with this study will remain confidential. We will protect your privacy and the data you provide by following the guidelines and provided by Auburn University's Office of Human Subject Research and through the safeguarding of data by password protection and by locking all documents in a filing cabinet when not in use. Information collected through your participation may be used to fulfill the educational requirements for the completion of the researcher's Dissertation, published in a professional journal, and/or presented at a professional meeting.

If you have questions about this study, please contact Kellis Boland at kib0013@auburn.edu or Dr. Brian Parr at bap0007@auburn.edu.

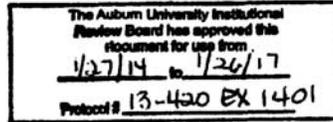
If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334) 844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION ABOVE, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, PLEASE CLICK ON THE LINK BELOW.

YOU MAY PRINT A COPY OF THIS LETTER TO KEEP.

Investigator Date

Co-Investigator Date



The Auburn University Institutional Review Board has approved this document for use from _____ to _____. Protocol # _____

[LINK TO SURVEY](#)

APPENDIX D

From: Kellis Boland [<mailto:noreply@qemaiiserver.com>]
Sent: Wednesday, February 19, 2014 2:01 PM
To: [REDACTED]
Subject: Invitation to Online Survey

Dear Esteemed Administrators of Agriculture,

I am a doctoral student in the Department of Curriculum and Teaching at Auburn University. I would like to invite you to participate in my research study, *An Analysis of Distance Education within Colleges and Programs of Agriculture*, to assist in the determination of what barriers are present in the implementation and development of distance education courses within Colleges of Agriculture. This study also examines whether or not any differences exist in barriers encountered between adopters and non-adopters of distance education within Colleges of Agriculture at institutions from across the nation.

You have been selected to participate because you are a representative of your institution's College of Agriculture or agricultural program.

Your participation is completely voluntary. Participants will be asked to respond to the survey in the provided link. Those who complete this survey will be asked to complete a second survey in order for the researcher to determine consensus on the barriers participants select in the first survey. Your total time commitment for both surveys will be approximately 40 minutes.

The risks associated with participating in this study are Coercion and Breach of Confidentiality. To minimize these risks, follow the guidelines and examples for written documents provided by Auburn University's Office of Human Subject Research, so that participants assume no accusation of guilt to participate. Additionally, the researcher will make every effort to safeguard data by password protecting it on her personal computer and by locking all documents in a filing cabinet when not in use.

If you participate in this study, you can expect suggestions for strategies on how to address barriers to distance education as well as insight on the current climate of distance education within Colleges of Agriculture and other agriculture programs. We/I cannot promise you that you will receive any or all of the benefits described. Benefits to others may include the identification of existing distance education barriers and the provision of literature-based recommendations on how to overcome those barriers.

If you have any questions, please contact me at kjb0013@auburn.edu or my advisor, Dr. Brian Parr, at bap0007@auburn.edu.

Thank you for your consideration,

Kellis Boland

[Information Letter](#)

Follow this link to the Survey:
https://auburn.qualtrics.com/SE/?SID=SV_6W3Fnp9i9qMkmGg

APPENDIX E

From: IRB Administration <irbadmin@auburn.edu>
Date: November 19, 2015 at 12:31:11 PM EST
To: "Kellis Boland (kjb0013@tigermail.auburn.edu)" <kjb0013@tigermail.auburn.edu>
Cc: Brian Parr <bap0007@auburn.edu>, Kimberly Walls <wallski@auburn.edu>
Subject: Modification request - approved, Exempt Protocol #13-420 EX 1401

Use IRBsubmit@auburn.edu for protocol-related submissions and IRBadmin@auburn.edu for questions and information.
The IRB only accepts forms posted at <https://cws.auburn.edu/vpr/compliance/humansubjects/?Forms> and submitted electronically.

Dear Ms. Boland,

Your request for modification of your protocol entitled "An Analysis of Distance Education Adoption Barriers within Colleges and Programs of Agriculture " has been approved. The review category continues as "Exempt" under federal regulation 45 CFR 46.101(b)(2). Attached is a copy of your approved request.

You are approved to include/invite other personnel involved in distance education; add information letter and additional research questions

Official notice:

This e-mail serves as official notice that your protocol has been modified. A formal approval letter will not be sent unless you notify us that you need one. By accepting this approval, you also acknowledge your responsibilities associated with this approval. Details of your responsibilities are attached. Please print and retain.

Use of Electronic Information Letter:

You must use the attached version that includes new approval information when you consent participants. *Please forward the actual electronic letter with a live link for our files.*

Expiration – Renewal:

Your protocol will still expire on January 26, 2017. About three weeks before that time you will need to submit a renewal request.

When you have completed all research activities, have no plans to collect additional data and have destroyed all identifiable information as approved by the IRB, please notify this office via e-mail. A final report is no longer required for Exempt protocols.

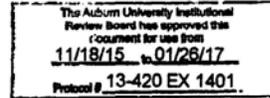
If you have any questions or concerns, please let us know.

Best wishes for success with your research!

Susan

Susan Anderson, IRB Administrator
Office of Research Compliance
115 Ramsay Hall, lower level
Auburn University, AL 36849
(334) 844-5966
irbadmin@auburn.edu (for general queries)

APPENDIX F



Department of Curriculum and Teaching College of Education

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

INFORMATION LETTER
for a Research Study entitled
"An Analysis of Distance Education Adoption Barriers within
Colleges and Programs of Agriculture"

You are invited to participate in a research study concerning the use of distance education courses within Colleges of Agriculture. The study is being conducted by Kellis Boland, under the direction of Dr. Brian Parr, Graduate Faculty for Auburn University. You were selected as a possible participant because you are a distance education representative of your institution.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to participate in a brief telephone interview, taking no more than 10 minutes, in which you are asked two questions. These questions are as follows:

1. Do you think DE course development and/or expansion is a viable option for COA? Please explain why.
2. How can COA expedite the development of existing and future DE courses?

Are there any risks or discomforts? One risk associated with participating in this study is Breach of Confidentiality. The researcher will make every effort to safeguard data by password protecting it on her personal computer and by locking all documents in a filing cabinet when not in use.

Are there any benefits to yourself or others? If you participate in this study, you can expect suggestions for whether DE courses are a viable option for COA as well as strategies on how to implement or expand these types of courses within Colleges of Agriculture and other agriculture programs. We/I cannot promise you that you will receive any or all of the benefits described. Benefits to others may include the identification of existing distance education barriers and the provision of literature-based recommendations on how to overcome those barriers.

APPENDIX G

Distance Education Research

Kellis Boland

Tue 6/14/2016 7:57 AM

To: [REDACTED];

1 attachments (15 KB)

DE Information Letter.docx;

Dear [REDACTED],

I am contacting you to request your participation in a national study of distance education barriers in Colleges of Agriculture.

Your participation would only require a very brief phone interview in which you answer two questions:

1. Do you think distance education course development and/or expansion is a viable option for your College of Agriculture?
2. How can Colleges of Agriculture (including your own) expedite the development of existing and future distance education courses?

I have attached an information sheet outlining the details of this study. Your participation would be a tremendous asset to this study. At your earliest convenience, please call me at (478)719-9338 to record your responses. If emailing your responses to me is more convenient, you are welcome to do so.

Thank you for your time and consideration.

Respectfully,
Kellis Boland