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Priority Research Areas

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Understanding the Food and Fiber System
(Agricultural Literacy)
Agricultural Leadership
Teacher Education and School-Based Agricultural Education

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Editor's Comments
From Conference Proceeding to Journal: The Evolution of the JSAER

As the newly appointed Editor of the Journal of Southern Agricultural Education Research (JSAER), I will be guiding this publication through a fairly dramatic change process over the next three years. To understand where we're headed with this publication, we should look back at where we've been.

The first Volume (51) of the JSAER was essentially the conference proceedings of the 2001 Southern Region Research Conference of the American Association of Agricultural Education. This conference was hosted by Texas A&M University, and Dr. Kim Dooley was the Editor of the Journal. All articles accepted through the refereed peer review process for presentation at the Southern Region meeting were published in the JSAER.

In the second Volume (52) of the JSAER, Dr. Rick Rudd elected to include in the JSAER only those articles ranking in the top 50% of papers accepted by the reviewers. This "second selection," also engendered a conversation about the status of the JSAER as a journal, requiring authors to view the JSAER as a "terminal publication," rather than as fugitive literature like a conference proceeding. For this reason, several articles accepted for publication in Volume 52 of the JSAER, were removed from consideration by their authors.

These first two Volumes of the JSAER are available online, each exists independently of the other, at a different location. The articles are in Adobe Acrobat format, but no provision is made to allow for searching across either articles or Volumes. As Editor, I plan to create a single location for the JSAER on the web, co-locate all the Volumes, and provide the ability to conduct full-text searching within and between Volumes.

Which brings us to this Volume, #53. This year authors indicated *a priori* whether or not they wanted their article to be considered for publication in the JSAER as well as in the Proceedings of the Southern Region AAAE Research Conference to my co-editors and Conference Chairs of the 2003 Southern Region Research Conference of the AAAE, Drs. Jacquelyn P. Deeds and Kirk Swortzel. All articles accepted for presentation at the conference, whose authors elected to publish in the JSAER, are included in these pages. The acceptance rate for the conference proceedings, and thus this Volume of the JSAER, was 58%.

Beginning with Volume 54 (2004) authors will elect to submit to a new JSAER review process articles already accepted for presentation at the Southern Region AAAE Conference. These articles will then be distributed to the four members of the JSAER Editorial Board for an additional refereed peer review. Articles included in the JSAER will be those that are accepted through both these peer review processes. The JSAER will be considered a terminal publication for research in agricultural education. The Editorial Review Board will apply for and ISSN for the JSAER, and begin the process of seeking inclusion in the social science indexes.

As Editor, I am honored to have been given the helm in these turbulent waters. I hope to prove worthy of the confidence expressed by the members of the Editorial Board.

A Qualitative Analysis of *Partners in Progress: Wheat Research at OSU*

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Abstract

This qualitative case study examined a new annual Oklahoma Agricultural Experiment Station (OAES) report, *Partners in Progress: Wheat Research at OSU.* Subjects were stakeholders in OAES wheat research efforts. The primary method of data collection was personal interviews. Findings were triangulated with data collected through field-administered surveys, field observations, and inspection of artifacts. Data analysis showed that stakeholders were unclear about the intended audience for the publication. Researchers/authors believed the audience to be both wheat producers and public policy/decision makers. Wheat producers thought the publication was targeted to a very broad audience including public policy/decision makers, producers, other wheat researchers, and even college students. Most producers recognized the publication as a marketing tool for OAES. Most agreed the primary purpose of the report was to communicate with members of the Oklahoma Wheat Commission. A small number of producers read the publication to glean practical information they could apply in their own wheat production operations. Overall, the new publication appeared to not be communicating effectively with producers other than those serving on commodity commission boards. One explanation for this communication failure was poor distribution of the reports. The reports were helpful in demonstrating public accountability to public policy decision-makers; however, because many producers never saw the reports, they were not an effective means of demonstrating accountability to producers.

Introduction and Theoretical Framework

Agricultural experiment station histories (Knoblauch, 1962; Gilmore, 1967; Kerr, 1987), document that state experiment stations have used progress reports for a variety of purposes, including sharing research findings among agricultural scientists, educating agricultural producers, and garnering public support for state experiment stations and their programs by demonstrating the value of their research. In 1997, administrators and communications specialists at the Oklahoma Agricultural Experiment Station (OAES) developed a new series of progress reports. The new series, called the *Partners in Progress*, included commodity-specific annual progress reports that chronicled OAES research progress related to wheat, beef, soybeans, and peanuts and that helped explain how commodity checkoff money earmarked for research was used.

Traditionally, OAES progress reports have attempted to share research results with a broad audience, ranging from researchers to producers. Obviously, such a broad audience would have widely diverse uses for the information, and communicating to such broad audiences could be problematic for agricultural communicators. This important pitfall of experiment station reports nationwide was identified early in experiment station history and has persisted over time. In 1909, A.C. True, Director of the Office of Experiment Stations, speaking at the annual meeting of the Experiment Station Committee on Organization and Policy (ESCOP), noted his awareness of agricultural research publications that failed to communicate clearly (Knoblauch, et al., 1962, p. 62):

> ...the scientific workers naturally want to present the matter so that it will be acceptable to scientific men. Thus they have in mind as they write these publications the necessities of the scientific presentation of the subject. The result is that they do neither one thing nor the other, and the material is not put in scientific form or in good popular form.

This ambiguous form, likely related to a number of publication characteristics such as writing style, level of technicality, and functionality of design, indicates a lack of audience analysis and the absence of a clearly defined purpose (Houp & Pearsall, 1984).

According to the OAES Associate Director, the purposes of the new type of publication were (1) to provide scientific information to agricultural producers who can apply it in their work, and (2) to show accountability and impacts to stakeholders (particularly members of commodity groups who make checkoff payments, legislators, and funding agencies such as commodity group boards (D.C. Coston, personal communication, September 14, 1998). The Oklahoma commodity groups targeted include the Oklahoma Wheat Commission, the Oklahoma Beef Industry Council, the Oklahoma Peanut Commission, and the Oklahoma Soybean Board, each of which provide research dollars from checkoff funds to the Experiment Station.

Previous agricultural publications research indicated that for the *Partners in Progress* publications to be most effective, the audiences needed to be characterized and categorized according to their needs and preferences in order for publications staff to develop the most usable publications possible (Tucker, et al., 1997). If the audience were to confirm that *Partners*

in Progress publications had merit, and if the audience preferences regarding this type of publication were known, this information could then be incorporated into a set of guidelines for the publications. Design changes would be based on data grounded in research and theory rather than on supposition. According to Risdon's (1990) six-stage model for developing agricultural publictions, basing design decisions upon research about audience and purpose rather than on supposition is central to the notion of good agricultural publication planning.

Additionally, this qualitative audience analysis and evaluation of the *Partners in Progress* series grew from the theoretical framework placing an importance on gathering stakeholder input for government-funded projects (Ayers, 1987; Bryk , Kelsey & Pense, 2001). The term stakeholder input, normally used in discussions of university research agendas, also has meaning in the agricultural communications realm. The idea that public monies, such as commodity checkoff funds, earmarked for research, should be allocated according to a democratic process also applies to determining how the results of publicly funded research should be communicated. Stakeholder input is equally valuable to the agricultural communications process as it is to the agricultural research agenda-setting process.

Because of the need for democratic input into the dissemination process, gathering stakeholder input may best be accomplished through qualitative research, which has an inextricable tie to democratic decision-making. Kelsey and Pense (2001), drawing upon the premises of qualitative research methodologists Guba and Lincoln (1989), proposed a methodology for collecting stakeholder input, one that included gathering information not only from agents (researchers/authors in this study) and beneficiaries of university programming (intended audience members who benefited from *Partners in Progress*, in this study), but also from underrepresented citizens who have not benefited from university programming (intended audience members who did not benefit from *Partners in Progress*, in this study).

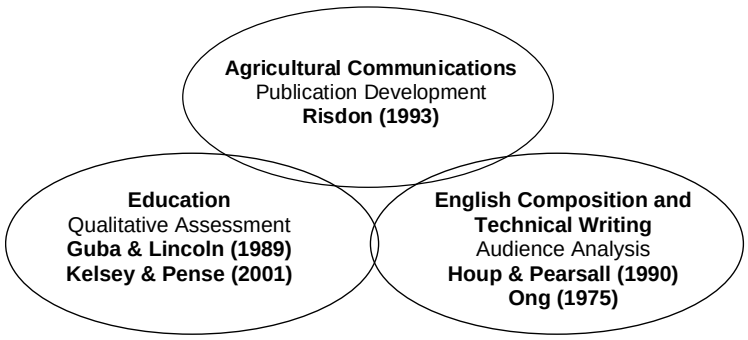

Figure 1. Qualitative audience analysis: A unique combination of theoretical frameworks for the *Partners in Progress* study.

In summary, this study draws its theoretical framework from paradigms in three unique academic fields: publication development in agricultural communications, qualitative assessment in education (and agricultural education), and audience analysis in English composition and technical writing (Figure 1). This theoretical framework operates well with the long-standing notion of the need for thorough audience analysis in communication situations. The qualitative methods employed in this study provided an excellent way to gather thick, rich data on various

types of audience members as well as detailed feedback on the communicative quality of the agricultural publications.

Purpose and Objectives

This investigation assessed the communicative effectiveness of one of the publications in the *Partners in Progress* series—*Wheat Research at OSU*. The conclusions of this study equipped OAES communicators and administrators with research-based information gathered from stakeholders about how to improve the *Partners in Progress* series of publications as a communications tool.

Specifically, analysis of qualitative data collected from wheat researchers/authors and from other stakeholders in OAES research provided answers to the following research questions:

1. What types of readers comprise the groups of people who use the Partners in Progress reports as information sources?
2. For what purposes do people read the reports?
3. What are the audiences' needs and expectations regarding writing style, level of technicality, and design?
4. Do these reports effectively attain the OAES's goal of disseminating research results to producers for the purposes of sharing practical research-based information for producers to use?
5. Do these reports effectively attain the OAES's goal of disseminating research results to stakeholders for the purpose of demonstrating accountability?

Methods and Procedures

As Tucker (1996) noted, data produced by survey methodology can be superficial and may be overused in agricultural communications research. Therefore, this study incorporated methods from the qualitative research genre and held to a constructivist approach (the belief that through communication about events, people, and their roles in society an explanation of reality can be constructed based on existing knowledge of social culture) (Littlejohn, 1992).

Sampling

Purposive sampling (Patton, 1990) and an emergent system of snowballing, which involved identifying subjects by recommendation of previously interviewed subjects (Stone et al., 1999), were used to select participants. Purposive sampling is an important part of qualitative case study research because of its power to provide an insider's view of the case.

The number of subjects participating in this case study was 34. Twenty participated in the survey portion of the study. Seventeen policy/decision makers (commodity group board members, all identified as beneficiaries) and three researchers/authors (OSU wheat researchers, all identified as agents) completed the 15-question survey, which was delivered face-to-face at various commodity group board meetings and in the university offices of the agents. Seventeen stakeholders—three researchers/authors who had participated in the survey, plus three other

researchers/authors and 11 producers—participated in the interview portion of the study. The interview process, which was the primary mode of investigation, began with researchers/authors (n=6) and resulted in the identification of additional stakeholders other than the wheat researchers/authors, namely wheat producers who fit into the categories of beneficiaries (n=5) and underrepresented citizens (n=6). Table 1 characterizes the stakeholders who participated in interviews. (Note: In the Tables 1 and 2, subjects are differentiated according to their statuses as a stakeholders (Guba and Lincoln, 1989). The stakeholder types included "agents"—researchers/authors; "beneficiaries"—producers and public policy decision makers who benefited from *reading Partners in Progress: Wheat Research at OSU*; and "underrepresented citizens"—producers who did not read the publication or who did not benefit from reading it.

Table 1
Stakeholders Participating in the Partners in Progress *Interviews*

Stakeholder No.	Type	Connection to the Wheat Industry
1	Agent	OSU Researcher/*Partners in Progress* Author
2	Agent	OSU Researcher/*Partners in Progress* Author
3	Agent	OSU Researcher/*Partners in Progress* Author
4	Agent	OSU Extension Professional/*Partners in Progress* Author
5	Agent	OSU Researcher/*Partners in Progress* Author
6	Agent	OSU Researcher/*Partners in Progress* Author
7	Beneficiary	Cattle and Wheat Producer / Ag Agency Employee
8	Beneficiary	Wheat Producer
9	Beneficiary	Wheat Producer / Ag Agency Employee
10	Beneficiary	Cattle and Wheat Producer / Accountant / Member of Growers' Association
11	Beneficiary	Wheat Producer / Director of Growers' Association
12	Underrepresented	Cattle and Wheat Producer
13	Underrepresented	Wheat Producer
14	Underrepresented	Wheat Producer
15	Underrepresented	Cattle/Wheat Producer
16	Underrepresented	Wheat Producer

Data Collection Procedures and Instrumentation

Data were collected through a variety of methods and instruments, allowing for appropriate triangulation of data. Data collection methods included interviews, surveys, collection of artifacts, and participant observation. Instruments used in conjunction with these methods included a questionnaire and an interview schedule, which served as a dynamic outline providing direction for the interviews. Data collection and analysis spanned 12 months and ended when the project had reached the point of data saturation (Lincoln & Guba, 1985).

The primary data collection method was stakeholder interviews, which were predominantly non-structured (Guba & Lincoln, 1989). Though each of the interviews began

with questions from a preliminary interview schedule based on the research questions of this study, new questions emerged during the interviews, as is often the case with qualitative methodology (Emerson, 1995). The final interview schedule took shape as the initial interviews were conducted. Operational interview questions evolved in the initial interviews that best elicited responses that answered the five basic research questions. The interviews were largely unstructured initially, with the interviewer eliciting the respondents' claims, concerns, and issues in their own terminology. As common themes emerged and became clearer, however, the interviewer was able to ask more and more pointed questions; and, this in turn, resulted in a revised outline for successive interviews.

Though surveys were not the primary method of data collection in this study, they served two important roles: they aided in triangulation of data, which added credibility to the study; and they were a good method of gathering data with a specific group of subjects, namely the beneficiaries. Surveys were provided to wheat producers who were public policy/decision makers—board members of the Oklahoma Wheat Commission Oklahoma Beef Industry Council, and the Oklahoma Wheat Research Foundation—at their monthly board meetings. Face validity of the survey was determined by a panel of experts (Dillman & Sallant, 1994), including an agricultural research administrator and three agricultural education researchers. Content validity and instrument reliability was verified logically through pilot-testing. The survey contained two open-ended questions related to the constructs of audience and purpose, and 13 Likert-type questions related to style, level of technicality, and design preferences. Responses to the open-ended survey questions were entered as qualitative data and were analyzed along with transcripts resulting from subsequent interviews of other stakeholders. Responses to the Likert-type questions were recorded and the raw data were presented as findings, demonstrating a representation of the group's response to questions related to style, level of technicality, and design preferences.

Throughout the period of time spent in the field process, the researcher collected artifacts, namely wheat-related publications used by stakeholders. These artifacts helped support and clarify the claims made by some stakeholders regarding their use of popular publications to educate themselves about wheat-related issues. Examples are OSU fact sheets made available to wheat producers at wheat field days, OSU Production Technology Reports that a wheat researcher said he likes to hand out at producer meetings, and publications that producers claimed they read to get information about wheat production and management practices, which included the *Oklahoma Farmer-Stockman* and *The High Plains Journal.*

Occasionally, the researcher made observations that constituted data not provided through interviews or surveys. Detailed field notes were taken at field days and producer meetings. These notes described the context and setting for the interviews and were entered as data and analyzed along with the transcripts of the personal interviews.

Data Analysis

Analysis of qualitative data followed Patton's (1980) suggestions for creating categories through marginal notes on transcripts. This process was simplified by the use of ATLAS.ti, software, which allows users to enter notes electronically into word processor documents, linking

the notes with the text to which they refer. This allowed the researcher to categorize specific excerpts from interview transcripts and other textual data and to identify emerging themes. It also allowed for the process of memoing (Emerson, 1995), which entailed electronically linking observational notes to specific interview excerpts. After verification through triangulation techniques, the emergent themes became the findings of this study. Logical conclusions and implications followed, resulting from what Patton (1980, p. 341) refers to as the researcher's "notions about causes and consequences." The implications were intended to aid in further development and improvement of the *Partners in Progress* series and similar publications.

Credibility, Transferability, Dependability, and Confirmability

Qualitative researchers, in an effort to differentiate the qualitative research lexicon from quantitative research terminology, coined new terms to describe "rigor" and "adequacy" in their research designs (Lincoln, 1999). Guba and Lincoln (1989) propose four criteria for judging rigor and adequacy: credibility, transferability, dependability, and confirmability.

Credibility of the study was enhanced by prolonged engagement, persistent observations, peer debriefings, and member checks.

As with any qualitative research, *transferability* of the results, conclusions, and recommendations of this case study are limited to very similar situations. Particularistic in nature, the transferability of this case study is explained by Merriam's (1988, p. 13) statements regarding qualitative case study research:

- It can suggest to the reader what to do or what not to do in a similar situation.
- It can examine a specific instance but illuminate a general problem.

Descriptive detail will allow others to decide if the findings are applicable to other cases. This study did not intend to generalize statistical results of a case study to other populations, but some analytical generalizations may be drawn, and the results are possibly applicable to other OAES publications and other external communications efforts.

The *dependability* of the study was enhanced through detailed records of the data collected and the data analysis procedures. Audio tape served as a verbatum account of the interviews conducted. This, in combination with the archived documents and field notes, served to strengthen the study's dependability. Additionally, this study's strategy for enhancing qualitative validity included five methods listed by Merriam (1998): triangulation, member checks, long-term observation, peer examination, and participatory research. Ultimately, as with any qualitative case study, readers of this study should consider closely the context of the case and the researcher's perspective as they attempt to understand it through their own schemas.

Confirmability was maintained by having made complete transcripts available to colleagues who reviewed the narrative. Unfortunately, because of space limitations in this paper, the display of exemplary excerpts from interview manuscripts was not possible. The are available in the unpublished doctoral dissertation resulting from this study (Miller, 2001).

Findings

Because the instruments (survey questionnaire and interview schedule) were developed based on the initial research questions, subjects' responses to the interview and survey questions, in aggregate, became thematic and therefore constituted the major findings of this study. In some cases, the themes that emerged did not independently answer the original research question, but with several themes emerging in relation to each research question, the collection of themes worked together to answer each question clearly. Space limitations of this paper prohibited inclusion of what are possibly the most convincing data supporting the findings, conclusions, and implications of this study—excerpts from interview transcripts. Normally, such excerpts would be presented in a narrative that tells the story of the case under observation. However, in this paper, findings (as well as conclusions and implications) are presented in the form of analytic summaries in text tables, which provided an efficient method of presenting 18 emergent themes and numerous conclusions and implications. For a more inclusive report on the findings, including exerpts from interview transcripts, see Miller's (2001) unpublished dissertation. This method of reporting is congruent with methods proposed by Rist (1982) and Merriam (1988).

Table 2 summarizes the major themes that emerged as they relate to the initial research questions.

Table 2.
Major Emergent Themes among Stakeholders in the Partners in Progress: Wheat Research at OSU *Communications Effort*

Research Questions	Emergent Themes
1. What types of readers comprise the groups of people who use the Partners in Progress reports as information sources?	• Many producers had never seen Partners in Progress: Wheat Research at OSU. • Agents (researchers/authors) believed the primary audience for Partners in Progress: Wheat Research at OSU was policy/decision makers. • Identification of the audience was unclear among beneficiaries and underrepresented citizens (the intended Partners in Progress audience). • A small faction of ardent readers existed.
2. For what purposes do people read the reports?	• Some read to keep up with OAES research progress. • Some read to gather information for use in making policy and public decisions. • Some progressive producers read to educate themselves about wheat production and management practices.
3. What are the audiences' needs and expectations regarding writing style, level of technicality, and design, and what is the order of importance of these needs?	• Audience needed less technical information and more visual information. • Publications needed to be shorter. • Short, bulleted statements were beneficial. • Audience desired applied research results. • Agents believed audience would benefit from electronic communication.
4. Do these reports effectively attain the Experiment Station goal of disseminating research results to producers for the purposes of sharing practical research-based information for producers to use?	• Agents thought the reports were effective for policy/decision makers. • Most producers were not served by the reports. • Producers preferred face-to-face communication. • Other publications provided more practical, applicable research results.

(table continues)

Research Questions	Emergent Themes
5. Do these reports effectively attain the Experiment Station's goal of disseminating research results to stakeholders for the purpose of demonstrating accountability?	• The reports helped persuade commodity group members that wheat checkoff money was spent wisely on research. • The reports might have persuaded producers not to request a checkoff refund.

Conclusions

The problems A.C. True noted in 1909 concerning agricultural research publications (Knoblauch, et al., 1962) persisted more than 90 years later in the *Partners in Progress* publications, which, ironically, strove to solve such problems. Ambiguity, especially in terms of audience and purpose negatively affected the *Partners in Progress: Wheat Research at OSU* effort, even though the publications were targeted to a commodity-specific audience. The ambiguity, combined with poor distribution of the publication, led to perceptions of limited benefits for some stakeholders, though researchers/authors and some policy/decision makers still valued the publication.

These conclusions are intrinsic in nature, providing insight into how communicators and administrators in the OAES might improve this particular communication effort. However, agricultural communications practitioners planning similar communications efforts might find value and applicability in the conclusions. Table 3 summarizes the specific conclusions resulting from the themes that emerged in this study.

Table 3.
Summary of Conclusions Resulting from Emergent Themes

Themes	Conclusions
• Many producers had never seen Partners in Progress: Wheat Research at OSU. • Agents (researchers/authors) believed the primary audience for Partners in Progress: Wheat Research at OSU was policy/decision makers. • Identification of the audience was unclear among beneficiaries and underrepresented citizens (the intended Partners in Progress audience). • A small faction of ardent readers existed.	The audience for *Partners in Progress: Wheat Research at OSU* was unclear to stakeholders and had been misidentified by agents.

(table continues)

Themes	Conclusions
• Some read to keep up with OAES research progress. • Some read to gather information for use in making policy and public decisions. • Some progressive producers read to educate themselves about wheat production and management practices.	*Partners in Progress: Wheat Research at OSU* served three main purposes according to stakeholders: 1. Marketing the OAES by informing stakeholders of research progress; 2. Informing public policy/decision makers about research progress to help them make policy decisions (e.g., how to allocate Oklahoma Wheat checkoff funds earmarked for research); 3. Educating a small group of progressive producers who actively seek research-based information regarding wheat production and management practices.
• Audience needed less technical information and more visual information. • Publications needed to be shorter. • Short, bulleted statements were beneficial. • Audience desired applied research results. • Agents believed audience would benefit from electronic communication.	Three conclusions emerged relating to audience needs and expectations: 1. The reports must be short and should contain graphics and graphical elements that are simple and easy-to-read; 2. The reports must focus heavily on applied research; 3. Though agents would like to begin relying on the World Wide Web more heavily as a communications medium, only a few producers are ready to embrace this medium.
• Agents thought the reports were effective for policy/decision makers. • Most producers were not served by the reports. • Producers preferred face-to-face communication. • Other publications provided more practical, applicable research results.	The reports did not fully achieve the goal of disseminating practical research results to producers because producers are not receiving the reports. This conclusion points back to problems with clear identification of audience and purpose and to a problem with distribution.

(table continues)

Themes	Conclusions
• The reports helped persuade commodity group members that wheat checkoff money was spent wisely on research. • The reports might have persuaded producers not to request a checkoff refund.	The reports, had they been distributed to more stakeholders, might have been effective at persuading stakeholders had they been distributed more widely. Because they were distributed effectively to public policy/decision makers, agents believed, the reports served their purpose with that audience.

Implications and Recommendations

The above conclusions imply that improvements can be made in the *Partners in Progress: Wheat Research at OSU* communications effort as well as with other communications efforts between OAES researchers and stakeholders. The following seven recommendations for practice and research resulted from this qualitative analysis.

Recommendations for Practice and Research

1. OAES administrators and communications professionals should decide definitively on a specific audience (either policy/decision makers or wheat producers) and focus on communicating well with that audience through *Partners in Progress: Wheat Research at OSU.* Risdon's (1990) model for publication development is a good model to follow because it calls for careful audience analysis and planning before any writing ever occurs. Once the audience is chosen, audience members should be made aware that the publication targets them specifically and that they should read it for a certain purpose. It is now more important than ever that Experiment Station publications be marketed to a specific target audience. A basic prerequisite for all writing, development of a target audience—the fictional audience described by Ong (1975—that authors can envision as they write will aid in communication effectiveness.

2. Whether the chosen audience is policy/decision makers or wheat producers, the publication should be shortened in terms of overall length and in terms of length of individual articles. Little, if any, research exists on the time agricultural producers spend reading publications, but participants in this study indicated the need for short, easily readable publications and articles. The lack of research-based information on this subject indicates the need for more investigation on the reading habits of agricultural producers.

3. OAES administrators and communications professionals should consider marketing its shorter, more practical publications to wheat producers. Publications like Production Technology reports and Extension fact sheets contain the short, more visual information that producers indicated they need. These recommendations are congruent with previous recommendations based on findings by Wanjohi (1993), Boone and Smith (1996), and McGinley (1993) that lay readers of agricultural research publications generally desire more visual information, especially photographs.

4. The OAES could benefit from an increased emphasis on placing wheat-related news releases in regional farm magazines. This communication method is a long-standing tradition among agricultural communicators at land-grant institutions. However, the findings of this study, which show that many of the participants received national and regional farm publications at no cost, demonstrate that communicators can solve some problems with distribution of research-based information by getting the information into these magazines in the form of news stories.

5. An emphasis on face-to-face communications with stakeholders is necessary. Stakeholders participating in this study agreed that face-to-face communication is the method most preferred by both the audience and by the communicators. This supports Tilley and Crowley's (1998) findings that social relationships are important to wheat producers as they consider whether to request a checkoff refund. The cost-effectiveness of face-to-face communications should be studied carefully; however, some stakeholder claims in this study indicate that though face-to-face contact is relatively expensive in terms of time and money, it is also a highly effective form of communication with producers.

6. Communication efforts employing the World Wide Web should continue to be developed, although it was not yet acceptable as a primary medium for wheat producers in Oklahoma. The finding that many producers participating in this study did not use the World Wide Web as a primary information source is important. Though the Web may be the wave of the future, communicators still must choose media that are most effective at the time in terms of reach and impact. More research on the agriculture industry's use of the World Wide Web is necessary and will continue to be necessary as agricultural communicators continue to track the needs and preferences of their audience members.

7. Qualitative research methodology is sometimes overlooked as a tool for communicators to use in evaluating communications situations. Its theoretical base, however, fits well with the concepts of audience analysis and stakeholder input. More qualitative case studies focused on agricultural publications such as this will add to the database of what communicators know about agricultural publications and their effectiveness. Also, because of the potential intrinsic value of qualitative data to agricultural communicators, they should consider using qualitative methods as a tool for evaluating publications and analyzing audiences.

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A Quasi-Experiment of a Residential Learning Community for College of Agriculture Freshmen

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Abstract

A learning community was established to assist freshmen transition to college life. Students participated in activities designed to impact academic achievement, persistence, and psychosocial development. A quasi-experimental study found participants had significantly lower GPAs than equivalent cohorts, persisted at higher rates, and students' psychosocial development was not impacted.

Introduction and Theoretical Framework

The primary mission of universities is to promote student learning and personal development. Previous research has demonstrated that a large part of learning takes place outside the classroom. In an effort to create an environment supportive of learning in a holistic manner, many institutions have turned to residence-based programs to promote learning, both in and out of the classroom (Schroeder, Mable, & Associates, 1994).

A learning community is a reorganization of curriculum to link together course work in order to increase interaction with faculty and other students (Gabelnick, MacGregor, Matthews, & Smith, 1990). Residential learning communities consist of academic (the curriculum content), physical (the place where the community lives), and social (the interpersonal relations among students and faculty) components. Integrating these components was thought to promote the development of students' professional, ethical, and civic responsibilities (Bower & Dettinger, 1998).

Although there are several different models of learning communities, they all emphasize common themes of community, social learning theory, and collaborative learning. The definitions and forms of modern learning communities promote the idea of *connected knowledge* through the creation of curriculum that supports learning as an integration of social factors (Shapiro & Levine, 1999). A residential learning community is an adaptation of the learning community model. It is a living space, with intentional academic programming and services, provided to students within residence with the goal of incorporating activities that strive toward continuous improvement, establishing campus community, and enhanced learning (Shapiro & Levine, 1999).

Some advantages of residential learning communities include opportunities for interaction among a diverse group of students, assisting undecided students choose a major, and offering freshmen integration and consistency that they lack during their first year away from home (Schroeder, Mable, & Associates, 1994). MacGregor, Linndblad, and Tinto (2000) conducted a meta analysis of 70 assessment studies covering several different types of learning communities and concluded that students who participated in learning communities achieved academic success at higher rates than non-learning community students.

Learning communities have also been found to have a positive effect on student persistence. In a study conducted by Gabelnick, et al., (1990) 41% of all students dropped out of the university before graduation, with the highest drop out rate reported for freshmen during their first term. Pike, Schroeder, and Berry (1997) found that learning community students had more interactions with faculty and peers and were retained at significantly higher levels than commuter students. Tinto (1987) reported that student involvement, both academic and social, was a critical factor for persistence.

Learning communities have the potential to create a setting that encourages the transition from high school to college, as Gabelnick, et al., (1990) found when comparing learning communities to less structured situations. Retention rates averaged ten to twenty percent higher for learning communities. Pascarella and Terenzini (1981) found similar results when studying

freshmen in a learning community. The program had a significantly positive effect on participants' academic achievement, retention to sophomore year, and attitudes toward the curriculum.

In line with the recent movement to encourage student learning and personal development, a major land-grant university agricultural college created a residential learning community Fall 2000 and named the program *Freshmen In Transition* (FIT). An evaluation study was designed to determine the impact of the program on participants' academic achievement, retention, and psychosocial development.

This study was situated in the work of Chickering (1969), who identified a unique developmental stage among 18- to 24-year old American college students known as the *young adult*. Young adulthood should be examined separately as the developmental tasks were found to be different from those of adolescence and adulthood. Chickering and Reisser (1993) proposed seven developmental factors for the young adult: developing competence, managing emotions, moving through autonomy toward interdependence, developing mature interpersonal relationships, establishing identity, developing purpose, and developing identity.

A Description of the *Freshmen in Transition* Program

The FIT program was designed to encourage freshmen with agricultural majors to live together in a residential community for one academic year. Volunteer Student Academic Mentors (SAMs) also resided in the residence hall and provided support to the freshmen. The SAMs were all sophomores and were responsible for holding weekly small group meetings (8 students per group) with participants, for collecting data regarding involvement in the required activities, and for assisting students on an individual basis as needed.

The FIT students were required to participate in activities sponsored by the university such as allied arts, health and wellness programs, clubs and organizations, intramural sports, faculty discussions, socials, community service, leadership activities, and career development presentations. Students were also required to attend in-house tutoring sessions and to report their grades to their SAMs periodically. The FIT program was supported with a web site to inform students of upcoming activities. Additional guidance and support came from an advisory council and a judiciary board, which also provided formative evaluation feedback to the program director.

Two faculty members were assigned as liaisons to the program. They frequently ate lunch with students in the residence hall cafeterias and meet informally with students in the residence hall. The faculty did not present formal lessons to the FIT students as the interaction was designed to be informal and supportive in nature.

Treatment for the FIT students began on July 21, 2000, at a 3-day camp devoted to introduce first time freshmen to university traditions and provided students opportunities to interact with each other. During the first eight weeks of fall 2000, all agricultural college freshmen participated in an orientation course. Some of the students in the control groups

attended the camp as well as participated in the orientation course. Once the orientation course was over, the control groups did not receive any further interventions.

A program coordinator managed the program and served as the primary data collection agent. The unique position of the program coordinator allowed her to participate in most of the FIT activities. Objectivity within the study was maintained through peer debriefing with faculty members and the use of quantitative measures for psychosocial development, academic achievement, and persistence.

Purpose and Objectives

The purpose of the study was to determine the impact of the Freshmen In Transition program on the participants' academic achievement, retention, and psychosocial development. The following hypotheses guided this study:

- Ho_1: FIT participants' academic achievement will be significantly greater than non-participants' academic achievement.
- Ho_2: FIT participants' retention will be significantly greater than non-participants' retention.
- Ho_3: FIT participants' psychosocial development will be significantly greater than non-participants' psychosocial development.

Methods and Procedures

The study used a quasi-experimental pre-test-posttest non-equivalent group design to determine the effects of the program on participants' academic achievement, persistence, and psychosocial development during the 2000-2001 academic year (Figure 1). This design allowed the researchers to compare three groups, FIT students, traditional residence freshmen, and freshmen who applied to the program, but were not selected and who chose to live on campus.

G_1	O_1	X	O_2
G_2	O_1		O_2
G_3	O_1		O_2

Where: G_1= FIT participants; G_2= Non-selected FIT students; G_3= Traditional Residence students; O_1= SDTLA Pretest; O_2= SDTLA Posttest; X= FIT Program

Figure 1. Study design.

The population for the study included all agricultural college freshmen admitted for the 2000-2001 academic year who lived on campus and graduated from high school in 2000 (*N*=285). Sampling was done in two phases for the treatment group. In the first phase all freshmen admitted into the college were sent information about the FIT program and were asked to indicate their preference for participating in the program. Of the 120 students who agreed to participate in the program, 72 were assigned to the program (FIT students, treatment group, *n*=72). The remaining students were sent a letter informing them they had not been chosen for

the program. Of the 48 students who initially chose to participate in the program but who were not selected, three enrolled in another college within the university and 10 students did not attend the university. The remaining individuals comprised the not selected FIT freshmen control group (*n*= 30). Traditional residence freshmen who opted not to participate in the program served as an additional control group for the study (*n*=165).

The Student Developmental Task and Lifestyle Assessment (SDTLA) instrument was adopted for the pre-test and posttest to assess students' psychosocial development. Winston, Miller, and Cooper (1999) developed the instrument to assess the level of psychosocial development of college students between the ages of 17 and 25. Internal consistency was estimated by collecting data from 1,822 students in 32 colleges during the fall and spring of 1994-1995 and spring 1996. Alpha coefficients ranged from .88 to .62.

The SDTLA was comprised of three developmental tasks, 10 subtasks, and two scales. A task is an "interrelated set of behaviors and attitudes that the culture specifies should be exhibited at approximately the same time by a given age cohort in a designated context" (Winston, Miller, and Cooper, 1999, p. 10). A subtask is "a more specific component or a part of a larger developmental task" (p. 10). A scale is "the measure of the degree to which students report processing certain behavioral characteristics, attitudes, or feelings, but may not be directly affected by the higher education environment" (p. 10).

The Establishing and Clarifying Purposes Task scores revealed the extent in which students had thoroughly explored their career and lifestyle goals and plans as well as showed an interest and active participation in culturally diverse activities. This task consisted of four subtasks: Educational Involvement, Career Planning, Lifestyle Planning, and Cultural Participation.

The Developing Autonomy task measures students' ability to make decisions academically and emotionally without continuous reassurance or extensive help from others and realize there is a reciprocal relationship between the individual and his/her community. This task is comprised of four subtasks: Emotional Autonomy, Interdependence, Academic Autonomy, and Instrumental Autonomy.

The Mature Interpersonal Relationship Task measures the degree to which students have developed trusting, open, and honest relationships with peers and show acceptance and respect for different cultures, races, backgrounds, beliefs, lifestyles, and appearances. This task is comprised of two subtasks: Peer Relationships and Tolerance.

The two scales are the Salubrious Lifestyle Scale (health and wellness) and the Response Bias scale. A high score on the response bias scale means that the student may not have told the complete truth about himself or herself; thus, instruments with a score of four on the response bias scale were not included in the study (Winston, Miller, & Cooper, 1999).

The researchers administered the SDTLA to participants in August 2000 (pre-test) and again in April-May 2001 (posttest). The pre-test was administered to the FIT students prior to the summer camp and the remaining CASNR freshmen during the college freshmen orientation

class. The posttest was administered to all FIT students in their residence hall. Several course instructors were contacted and asked permission by the researchers to solicit participation from control group students after they had completed their final exams. Twenty-five students completed the SDTLA using this process. To gather additional data, the Associate Dean of Academic Affairs for CASNR sent a letter to the remaining 170 students in the control groups asking them to take the SDTLA in a set meeting room the week before finals. The researchers waited in the room from 8:00 am until 5:00 p.m. for 5 days. Eight students came to take the SDTLA during the week.

Students' high school grade point averages, ACT composite scores, retention records, and fall and spring 2000-2001 grade point averages earned while attending the university were collected from the registrar's office.

The quantitative data were analyzed using Microsoft Excel® (1997) for Windows. An alpha level of .05 was established a priori to determine statistical significance. Descriptive statistics and one-tailed independent samples t-tests were used to describe the SDTLA data, academic achievement, and retention.

Findings

Academic Achievement. The three groups were compared for differences in cumulative high school grade point averages, composite ACT scores, and university grade point averages using one-tailed t-tests. The traditional residence students had significantly higher spring 2001 grade point averages than the FIT students. All other variables were not significantly different from each other (Table 1).

Table 1: *Comparison of Academic Factors of FIT Students versus Traditional Residence Students*

Group	n	m	t
Cumulative high school GPA			
FIT	70	3.62	0.49
Traditional residence	158	3.64	
Composite ACT score			
FIT	72	24	1.20
Traditional residence	158	25	
Fall 2000 GPA			
FIT	72	2.81	-0.25
Traditional residence	165	2.77	
Spring 2001 GPA			
FIT	65	2.77	1.93*
Traditional residence	141	3.02	

*Note: *p<.05, one-tailed. t = Independent samples t-test between academic factors of FIT students and Not Selected FIT students.*

The not selected FIT students had significantly higher high school cumulative grade point averages, composite ACT scores, and fall and spring grade point averages than the FIT students. (Table 2).

Table 2: *Comparison of Academic Factors of FIT Students versus Not Selected FIT Students*

Group	n	m	t
Cumulative high school GPA			
FIT	70	3.62	3.50*
Not Selected FIT	29	3.83	
Composite ACT score			
FIT	72	24	2.10*
Not Selected FIT	30	26	
Fall 2000 GPA			
FIT	72	2.81	1.94*
Not Selected FIT	30	3.17	
Spring 2001 GPA			
FIT	65	2.77	2.38*
Not Selected FIT	26	3.23	

*Note: *p<.05, one-tailed. t= Independent samples t-test between high school grade point averages, composite ACT scores, and fall 2000 and spring 2001 grade point averages of FIT Students and Not Selected FIT Students.*

Persistence. Of the 165 traditional residence freshmen who enrolled Fall 2000 four withdrew from the university during the fall semester, six transferred to another college within the university spring 2001 and 14 students did not return to the university after completing fall semester. Therefore, 141 students were retained in the college (85%) and 147 traditional residence students were retained within the university (89%) for the 2000-2001 academic year.

Of the 48 students who applied for the FIT program but were not selected, 10 did not enroll in the university and three enrolled in another college at the university fall 2000. The remaining 35 not selected FIT freshmen did enroll in the agricultural college fall 2000. Five of the 35 lived off campus; thus, they did not fit the criteria for inclusion in the study. Therefore, 30 not selected FIT students lived in traditional residence halls and were enrolled in the college fall 2000. Two of the 30 students transferred to another college within the university and two students did not come back to the university spring 2001. Therefore, 26 of the not selected FIT freshmen (87%) were retained in the college and 28 students were retained within the university (93%) for the 2000-2001 academic year.

The FIT students persisted at higher rates than both control groups. Of the 72 FIT students who enrolled in the college fall 2000, three transferred to another university spring 2001 semester, one transferred to the honors residence at the university but was retained in the college. One transferred to another college within the university spring 2001. Two male students were removed from the program but were retained in the college for spring 2001. Therefore, 65 students were retained in the FIT program (90%), 68 were retained in the college (94%), and 69 were retained within the university (96%) for the 2000-2001 academic year.

Psychosocial Development. The FIT program did not have a positive effect on the students' psychosocial development. When comparing FIT students to traditional residence students there were significant differences in the Mature Interpersonal Relationships Task and Salubrious Lifestyle Scale. All other factors were not statistically significant. The pre-test and the posttest means showed that the FIT students scores' decreased over time in seven of the 14 areas, although not significantly (Table 3).

When comparing FIT students and not selected FIT students, none of the factors were statistically significant. However, when comparing the pre-test and posttest means, the FIT students' scores decreased in seven of the 14 areas, and the not selected FIT students decreased in four of the 14 areas although none of the decreases were statistically significant (Table 4).

Table 3: *Comparison of Pretest and Posttest Differences of the SDTLA of FIT Students versus Traditional Residence Students*

		m		
Group	n	Pretest	Posttest	t
Career planning subtask				
FIT	62	2.82	3.06	-0.08
Traditional residence	25	2.80	3.03	
Lifestyle planning subtask				
FIT	62	3.34	3.38	0.28
Traditional residence	25	3.39	3.48	
Cultural participation subtask				
FIT	62	2.91	3.34	-0.56
Traditional residence	25	2.54	2.85	
Educational involvement subtask				
FIT	62	2.95	3.44	-0.77
Traditional residence	25	2.88	3.24	
Establishing and clarifying purpose task				
FIT	62	3.02	3.30	-0.36
Traditional residence	25	2.93	3.17	
Instrumental autonomy subtask				
FIT	62	3.37	3.47	-0.27
Traditional residence	25	3.41	3.46	
Emotional autonomy subtask				
FIT	62	3.71	3.54	1.26
Traditional residence	25	3.56	3.56	
Academic autonomy subtask				
FIT	62	3.83	3.52	0.90
Traditional residence	25	3.91	3.74	
Interdependence subtask				
FIT	62	3.33	3.36	0.10
Traditional Residence	25	3.12	3.16	
Developing autonomy task				
FIT	62	3.58	3.47	1.37
Traditional residence	25	3.43	3.47	

Table 3: *Continued*

Group	n	m Pretest	Posttest	t
Peer relationships subtask				
FIT	62	3.75	3.73	0.93
Traditional residence	25	3.63	3.73	
Tolerance Subtask				
FIT	62	3.36	3.28	1.51
Traditional Residence	25	3.17	3.30	
Mature Interpersonal Relationships Task				
FIT	62	3.54	3.47	1.71*
Traditional Residence	25	3.37	3.48	
Salubrious Lifestyle Scale				
FIT	62	3.26	3.11	1.76*
Traditional Residence	25	3.22	3.32	

*Note: *p<.05, one-tailed; t= Independent samples t-test between gain scores of Freshmen In Transition Students and Traditional Residence Students*

Table 4: *Comparison of Pretest and Posttest Differences of the SDTLA of FIT Students versus Not Selected FIT Students*

Group	n	m Pretest	Posttest	t
Career planning subtask				
FIT	62	2.82	3.06	0.24
Not Selected FIT	8	2.63	2.91	
Lifestyle planning subtask				
FIT	62	3.34	3.38	0.42
Not Selected FIT	8	3.38	3.55	
Cultural participation subtask				
FIT	62	2.91	3.34	0.30
Not Selected FIT	8	2.31	2.85	
Educational involvement subtask				
FIT	62	2.95	3.44	1.07
Not Selected FIT	8	2.64	3.35	
Establishing and clarifying purpose task				
FIT	62	3.02	3.30	0.94
Not Selected FIT	8	2.78	3.18	
Instrumental autonomy subtask				
FIT	62	3.37	3.47	0.82
Not Selected FIT	8	3.35	3.60	
Emotional autonomy subtask				
FIT	62	3.71	3.54	0.77
Not Selected FIT	8	3.67	3.61	
Academic autonomy subtask				
FIT	62	3.83	3.52	0.29
Not Selected FIT	8	3.95	3.72	

Table 4: *Continued*

Group	n	m Pretest	Posttest	t
Interdependence subtask				
FIT	62	3.33	3.36	1.25
Not Selected FIT	8	2.83	3.14	
Developing autonomy task				
FIT	62	3.58	3.47	1.40
Not Selected FIT	8	3.37	3.51	
Peer relationships subtask				
FIT	62	3.75	3.73	0.06
Not Selected FIT	8	4.03	4.01	
Tolerance subtask				
FIT	62	3.36	3.28	0.52
Not Selected FIT	8	3.13	3.13	
Mature interpersonal relationships task				
FIT	62	3.54	3.47	0.26
Not Selected FIT	8	3.52	3.49	
Salubrious lifestyle scale				
FIT	62	3.26	3.11	1.47
Not Selected FIT	8	3.16	3.34	

Note: *p<.05, one-tailed. t= Independent samples t-test between gain scores of Freshmen In Transition Students and Not Selected Freshmen In Transition Students

Limitations

The findings of this study should only be applied to the situation at the university, as the research did not extend beyond this institution. Analytical generalizations can be applied to other major universities with residential populations of traditional students to the extent that other programs resemble the FIT program.

The results of this study must also be considered subject to selection bias as students self-selected into the FIT program. It should also be noted that the number of participants in the control groups was smaller than recommended for statistical analysis.

The long-term conclusions about the effects of the FIT program should be explored through longitudinal designs that can capture the complexities of causal relationships between a learning community intervention and academic success and psychosocial development.

Conclusions

Despite these limitations, the findings of this study support the literature on academic achievement and psychosocial development: that learning communities do not always promote learning or maturation among participants (Hood, 1984; MacGregor, Linndblad, & Tinto, 2000). There are several explanations for the lack of academic achievement and personal growth among

the FIT students despite the fact that several opportunities were made available to students for achieving these goals. The FIT program had mandatory tutoring sessions for the students enrolled in biology, chemistry, and math; however, many participants did not use the tutors effectively. Some students would sign-in and leave, while others were disruptive during the sessions.

Moreover, many students focused on meeting the required list of activities, which were designed to increase integration, as a *to do* item to be checked off without further reflection on the intent of the activities. Chickering (1975) argued that integration could be cultivated by providing students with opportunities for reflection where they are taught to see relationships among the required experiences and problem solving in other areas of their lives. It is unclear to what extent reflection was taught and practiced within the SAM small group meetings even though this would have been the ideal opportunity for such mentoring.

Equivalence was not established between the treatment (FIT students) and control (not selected FIT students) groups. There were significant differences in high school grade point averages and composite ACT scores, perhaps leading to the significantly lower collegiate grade point averages for both semesters. However, equivalence was established between the FIT students and the traditional residence students (no significant difference in high school grade point average or ACT composite scores), indicating that the FIT program negatively impacted participants' spring 2001 grade point averages; perhaps by requiring activities that were not related to academic achievement.

The significantly higher retention rate for FIT students can be accounted for by early and increased social activity within the program. FIT students were encouraged to interact with each other through the required activities and during the weekly SAM group meetings, which were not provided to the traditional residence hall students. The SAMs provided several opportunities for social engagement such as faculty discussions, group events, parties, and cookouts. The literature was consistent with this finding in that residence hall students were more likely to persist than other students (Chickering, 1975; Pike, Schroeder, & Berry, 1997).

FIT students appeared to regress psychosocially rather than advance when examining the mean scores of the SDTLA for the pre- and posttests in seven of the 14 factors (Table 3). This finding contradicts what was expected, as maturation over time should have indicated a positive gain in psychosocial development regardless of interventions. The FIT students; however, were significantly different in two areas of development: Mature Interpersonal Relationships tasks and Salubrious Lifestyles scale (health and wellness variable). FIT students were encouraged to rely on each other, to the exclusion of others outside the FIT program (note the decline in tolerance subtask means for FIT students from 3.36 to 3.28). Ethnic and cultural diversity were not strong suits of the program either. All participants were agricultural majors and 96% were white.

The FIT program implemented guidelines that may have counteracted developing autonomy among the students. They were required to externally document completion of weekly requirements by having an authority figure at the event sign a slip confirming attendance. These slips were then collected by the SAMs and given to the program coordinator. FIT students were also under contract to complete the requirements. If the contract was broken, then students risked

being evicted from the residence hall. The SAMs were often forced into a policing role rather than a mentoring role in tracking requirements and controlling undesirable behavior such as alcohol consumption among some students.

Recommendations

The findings and conclusions of this study serve as a basis for making the following recommendations for practice and research to improve the program's impact on students' grades and maturation. Students should not be required to participate in on-campus activities, but rather encouraged to get involved by community leaders. Small group leaders should focus on reflective activities during weekly meetings to encourage integration of experiences that will foster maturation among young adults (Chickering, 1975).

More emphasis should be placed on academic success than on completing activities. Students should be rewarded for achieving a GPA above the mean each semester. Academic success can be aided by tutoring, but requiring students to attend tutoring sessions proved to be ineffective. Students should be encouraged to seek out tutoring that addresses their specific needs. Workshops that focus on improving academic skills should be offered to students in residence.

Additional research should be conducted to examine the factors that contributed to the marginal academic achievement of the FIT students. This study should also be extended into a longitudinal study where the FIT students are tracked over their college careers to determine long-term impacts of the program. Qualitative data should also be collected to capture the depth and richness of the program from the students' perspective.

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AAAE Members' Computer Technology Assessment

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Abstract

The purpose was to identify AAAE members' computer anxiety levels, attitudes toward computers and perceptions of Web-based survey methods. A total of 389 AAAE members participated in this experimental study. Respondents were assigned randomly to Web- and paper-based data collection method subgroups. AAAE members perceived that they did not suffer from computer anxiety, held positive attitudes toward computers and perceived that Web-based survey methods provide valid, reliable, and secure methods of collecting data. Significant differences showed that Web-based respondents held significantly more positive attitudes for "computers eliminating tedious work and improving higher order thinking skills" and significantly stronger perceptions that Web-based surveys "are as reliable as paper surveys and researchers could feel confident in reporting data obtained in Web-based surveys." Females held significantly different attitudes toward computers (less favorable) and perceptions of Web-based survey methods (more favorable) than did males. Full professors had significantly higher computer anxiety levels, less favorable attitudes toward computers, and a more limited view of the usefulness of Web-based survey methods than did all other respondents. AAAE members are encouraged to used Web-based survey methods to collect research data and participate in computer workshops offered by their universities' faculty development programs.

Introduction

The anxieties caused by software glitches, computer breakdowns, lost data or files, and program errors have besieged most university students at some point during their academic careers. In the same manner, it is fair to state that similar anxieties have been experienced by agricultural education faculty members. Such anxious-filled moments may hamper university-level educators' enjoyment of and benefit from utilizing the true power of computing in their professional tasks.

If agricultural educators are experiencing computer-related anxieties, can we deduce that those same educators hold unfavorable attitudes toward computers or a disdain for the Internet? Since the mid 1990s, the Internet has grown into a multi-billion dollar industry that is present in many American homes. As the role of the Internet has increased in daily American life, it also has increased the role it plays in today's educational system. Over 90% of schools now have some type of access to the Internet, someplace in their building (Becker, 1999). The impact of the Internet in higher education is even greater (Gromov, 1995). Higher education institutions have been connected to the Internet from its start; it is only natural that educators and researchers would find new uses for the Internet. The latest is the use of the World Wide Web as a data collection method in social science research (Ladner, Wingenbach, & Raven, 2002).

Theoretical Framework

Much research has been conducted on computer usage in post-secondary agricultural education programs during the past 10 years. These studies have focused on students' attitudes towards computers, preferred learning styles, and levels of computer anxiety (Marrison & Frick, 1994; Raven, Newman, & Day, 1997; Day, Raven, & Newman, 1998; Wingenbach, 2000) and academic achievement, teaching method, and learning styles (Sexton, Raven, & Newman, 1998; Sexton, Newman, & Raven, 1998). However, studies concentrating on university faculty members' computer anxieties and/or attitudes toward computers are absent from the literature base in agricultural education.

In researching the educational technology skills and desires to learn additional skills in these technologies, Ladner and Wingenbach (2001) found that Mississippi State University faculty from the Colleges of Education and Agriculture and Life Science rated their skills higher in the traditional methods of instruction than they did in using new and emerging educational technologies. However, a strong level of interest was apparent in their desire to learn more about educational technologies. Faculty members from both colleges reported being discouraged from learning more about educational technologies because of a lack of administrative support and/or equipment. Compounding the problem was that most faculty members had not received formal training in the use of educational technologies in the classroom. Although specific anxieties were not measured in this study, respondents took opportunities to record their anxieties throughout the data collection instrument. Specifically, one respondent noted,

> *I care very much about my teaching and the quality of my teaching. I am frustrated by the "double speak" I hear from the upper administration. We get messages like we teach too much. In the next breath we are filling out surveys*

such as this and documenting retention of students while being given poor facilities, poor equipment, and no budget.

Future use of computer and information technologies is certain to bring about changes in education. The use of educational technologies such as computers and telecommunications offers great potential for improving the delivery of already high quality instructional programs (McCaslin & Torres, 1992; Day, Raven, & Newman, 1998). As noted in other land grant university studies (Kirby, Waldvogel, & Overton, 1998; Wardlow & Johnson, 1999), university faculty had much interest in learning about current educational technologies such as using multimedia, constructing Web pages, and incorporating computer-aided materials into their curricula. These studies assumed that interest in information technology alone could transform teachers into information technology users at all levels. If this is true, then what impact does computer anxiety or attitude toward computers have on university faculty members' computer and information technology uses in the classroom? Does computer anxiety or attitude toward computers affect an agricultural educator's perception of using the Internet as a research data collection tool?

A 1999 report from the U. S. Department of Education (CEO Forum, 2000) found that only 24% of new teachers felt "very well prepared" to integrate technology into their classroom. How do we ensure that future agriculture teachers will be prepared to use computer and information technologies in the classroom if teacher educators are not fully utilizing those same technologies because of anxiety and/or undesirable attitudes toward technology? What are the American Association for Agricultural Education (AAAE) members' computer anxiety levels, attitudes toward computers and perceptions of using the Internet as a research data collection tool? This study established evidence to support answers to these questions.

Purpose and Objectives

The purpose of this descriptive study was to identify AAAE members' computer anxiety levels, attitudes toward computers and perceptions of Web-based survey methods. The following research questions guided this study.

1. What are AAAE members' perceived levels of computer anxiety, and are there differences in the perceived levels when compared by survey data collection method subgroups?
2. What are AAAE members' attitudes toward computers, and are there differences in their attitudes when compared by survey data collection method subgroups?
3. What are AAAE members' perceptions of Web-based survey methods, and are there differences in their perceptions when compared by survey data collection method subgroups?
4. Are there differences in AAAE members' computer anxiety scores, attitudes toward computers, or perceptions of Web-based survey methods when compared by selected demographics?

Procedures

A control group post-test only design was used in this study (Campbell & Stanley, 1963). The study employed Web-based and traditional paper-based survey data collection methods. This

true experimental design allowed random assignments of individuals to treatments ensuring treatment groups were equivalent (Borg & Gall, 1989).

The population for this census study consisted of dues-paying members of the AAAE. The AAAE member database was obtained in February 2001 after all dues had been processed. A total of 424 subjects were selected from the database, using their valid email addresses. Subjects were divided randomly into two groups. After the first mailing, 35 subjects (21 in the Web-based group and 14 in the traditional group) were found to not be AAAE members, reducing the population to 389. Data collection began was completed in 35 days. The first reminder was sent 14 days after collection began; a second reminder was sent in the third week of collection. Upon conclusion of data collection, 98 (51.3%) Web-based group and 159 (80.3%) traditional group responses were collected for a total of 257 (66.1%).

The instrument used was developed by Chou (1997) and modified by Wingenbach (2000). The research instrument contained four sections measuring: 1) computer anxiety, 2) attitudes toward computers, 3) perceptions of using Web-based surveys, and 4) demographics. The first section contained a 12-item, four-point, Likert scale measuring responses to computer anxiety. Responses could range from Strongly Disagree (1) to Strongly Agree (4). Chou reported a Cronbach's alpha coefficient of .83 and Wingenbach achieved alpha coefficients of .86 and .89 in two rounds of testing. Cronbach's alpha was .89 for this study.

Section two also contained a Likert scale, but consisted of 26 items that measured attitudes toward computers. Chou's study had an alpha of .94 in this section; Wingenbach's alphas were .92 in the first test and .90 in the second test. The alpha was .90 for this study. The third section was developed by the researchers and was used to measure respondents' perceptions of Web-based surveying. This section contained 12 items based on a Likert scale similar to the ones used in the first two sections. Perceptions of Web-based surveying items were derived from the CASRO Web site (2000). This section also was modeled after the Attitudes toward Electronic Exams subscale developed by Wingenbach (2000). Wingenbach achieved Cronbach's coefficients of .78 and .82 in pilot tests, and a final alpha of .84 for the subscale. In this study, a Cronbach's alpha of .85 was achieved.

Respondents in the experimental group were contacted via email and regular mail at the beginning of the study. A short cover letter similar to that of the paper group was mailed to respondents to ensure that respondents knew the survey was an academic endeavor and not spam email. The email contained a link that directed respondents to a Web site on the Mississippi State University Agricultural Information Science and Education (AISE) server. When respondents accessed the AISE server, they were prompted for a password (code number). After submitting the code number, respondents could gain entry to the survey. The appearance of the Web-based survey was exactly the same as the paper-based survey. Once the survey had been completed, respondents submitted it, saving the data into a secure database. Follow-up emails were sent on the 14th and 23rd day of collection.

Those selected for the traditional paper-based group were sent an initial mailing that consisted of a cover letter, survey instrument, and a self-addressed stamped return envelope. Non-respondents were sent follow-up post cards 14 days after the initial mailing. Those still not

responding were mailed an additional cover letter, survey instrument, and self-addressed stamped return envelope 23 days after the initial mailing.

To measure for non-response error, researchers compared early to late respondents (responses received before and after the third mailing). ANOVA was conducted on the responses and showed that for each subscale there were no differences between the two groups; therefore the results may be generalized to the entire group of respondents. Descriptive statistics were derived for each section and the instrument as a whole. Demographic data were analyzed using percentages and frequencies. Alpha levels were set at .10 *a priori* due to the exploratory nature of this study.

Findings

Among the respondents were 190 males and 40 females. Males accounted for 73.9% of the respondents. It was noted that 10.5% of the respondents (n = 27) chose not to respond to the gender question. Data showed 81.6% of the respondents in the Web-based group and 69.2% in the paper-based survey group were male (Table 1). Ages ranged from under 29 to over 60 years of age. The 40 - 49 age range contained 35.0% (n = 90) of the respondents, closely followed by the 50 - 59 year age group with 30.7% (n = 79).

AAAE respondents were described on the basis of teaching appointment (Table 1). Full professors made up the largest percentage with 37.7% of the total (n = 97). The "Other" category accounted for 40 respondents (15.6%). Persons in the category of "Other" could be professor emeriti, visiting professors, staff, graduate students, and instructors. Years of teaching experience at the post-secondary level are shown in Table 1. A large percentage of the population (44.4%) had taught for 16 or more years. Those with the least experience recorded the second highest percentage with 41 respondents (16.0%) having taught from one to three years.

Respondents' level of experience with Internet protocols is illustrated in Table 1. When referring to Internet technologies, questions addressed use of the World Wide Web, email, search engines, ftp, and telnet. Internet technology experience ranging from 4 to 15 years was possessed by 59% of the respondents. The number of years respondents have been using computer technologies is shown in Table 1. Computer technologies referred to a general working knowledge of computers. The survey instrument used descriptors such as Word, PowerPoint, Excel, and Solitaire. The largest percentage (35%) of respondents had 16 or more years of computer technologies experience and the smallest percentage (1.9%) had one to three years experience.

Table 1

Demographic Frequencies of AAAE Respondents (N = 257)

	Paper		Web		Total	
Gender	*f*	%	*f*	%	*f*	%
Male	110	69.2	80	81.6	190	73.9
Female	22	13.8	18	18.4	40	15.6
No Response	27	17.0	0	0.0	27	10.5
Age						
29 and under	4	2.5	6	6.1	10	3.9
30-39	25	15.7	21	21.4	46	17.9
40-49	64	40.3	26	26.5	90	35.0
50-59	44	27.7	35	35.8	79	30.7
60 and over	21	13.2	10	10.2	31	12.1
Position						
Assistant Professor	38	23.9	21	21.4	59	23.0
Associate Professor	33	20.8	24	24.5	57	22.2
Full Professor	62	39.0	35	35.8	97	37.6
Other	25	58.1	18	41.9	43	16.7
Years Taught at the Post-Secondary Level						
1-3	22	13.8	19	19.4	41	16.0
4-6	20	12.6	8	8.2	28	10.9
7-9	9	5.7	11	11.2	20	7.8
10-12	19	12.0	9	9.2	28	10.9
13-15	17	10.7	6	6.1	23	8.9
16+	70	43.9	44	44.9	114	44.3
Internet Technology Experience (years)						
1-3	3	1.2	5	5.1	8	3.1
4-6	47	18.4	20	20.4	67	26.1
7-9	46	18.0	31	31.8	77	29.9
10-12	35	13.7	22	22.4	57	22.2
13-15	15	5.9	13	13.2	28	10.9
16+	13	5.1	6	6.1	19	7.4
Computer Technology Experience (years)						
1-3	4	2.5	1	1.0	5	1.9
4-6	12	7.5	5	5.1	17	6.6
7-9	17	10.7	11	11.2	28	10.9
10-12	31	19.5	27	27.6	58	22.6
13-15	38	23.9	21	21.4	59	23.0
16+	57	35.9	33	33.7	90	35.0

The first research question sought to determine AAAE members' perceived levels of computer anxiety, and to find out if differences existed in those levels when compared by survey data collection method sub-groups. As shown in Table 2, AAAE respondents perceived that they did not suffer from computer anxiety, regardless of the survey data collection method sub-group

to which they were assigned. Additionally, further analyses of the data revealed no other statistical differences between the sub-groups.

Table 2

Perceived Levels of Computer Anxiety by Data Collection Subgroups (N = 257)

	Paper (n = 159)		Web (n = 98)		Total (N = 257)		
Statements	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
I am confident using computers.	3.40	.63	3.35	.78	3.38	.69	.31
I understand the technical aspects of computers.	3.04	.77	3.00	.80	3.02	.78	.14
I am secure about my ability to interpret a computer manual.	2.96	.75	3.02	.83	2.98	.78	.42
I am confident teaching my peers about new software programs.	2.68	.84	2.85	.93	2.74	.88	2.45
I like walking into a room filled with computers.	2.61	.78	2.54	.79	2.59	.78	.47
I enjoy discussing computer programs with my colleagues.	2.61	.71	2.55	.82	2.59	.75	.37
Computers are too prominent in our society.	1.70	.67	1.82	.72	1.75	.69	2.01
It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key.	1.62	.74	1.66	.84	1.64	.77	.17
Working with computers makes me feel "cut off" from other people.	1.38	.58	1.42	.71	1.40	.63	.21
Computers make me feel uneasy and confused.	1.27	.50	1.25	.46	1.26	.48	.11
I dislike working with computers that are smarter than I am.	1.24	.51	1.24	.59	1.24	.54	.00
I have avoided computers because they are unfamiliar to me.	1.25	.57	1.21	.52	1.23	.55	.21
I hesitate to use a computer for fear of making mistakes that I cannot correct.	1.24	.50	1.21	.50	1.23	.50	.15
I am afraid that if I use computers, I will become dependent upon them and lose some of my reasoning ability.	1.24	.51	1.21	.50	1.23	.50	.25
I am hostile toward computers.	1.24	.49	1.22	.46	1.23	.48	.15

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.

The second question requested AAAE members' attitudes toward computers, and if differences existed in their attitudes when compared by survey method subgroups. Table 3 illustrates the descriptive statistics in answering this question. In general, AAAE respondents held positive attitudes toward using computer technologies. However, additional analyses revealed significant differences between subgroups for the statement, "*Computers can eliminate a lot of tedious work for people*," and "*Computers can improve learning of higher order thinking skills*." Respondents in the Web-based group held significantly more positive attitudes than did respondents in the paper-based group for both statements.

Table 3

Attitudes toward Computers by Data Collection Subgroups (N = 257)

	Paper (n = 159)		Web (n = 98)		Total (N = 257)		
Statements	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
I am comfortable using computers.	3.53	.58	3.48	.58	3.51	.58	.38
I could learn to use a new type of software I hadn't seen before.	3.38	.53	3.38	.55	3.38	.53	.00
Computers can eliminate a lot of tedious work for people.	3.31	.66	3.47	.61	3.37	.64	3.74*
I am confident learning terms relating to computer software (cut, copy, open, merge, etc.).	3.31	.59	3.34	.63	3.32	.60	.20
I am confident learning terms relating to computer hardware (CPU, disk, drive, processor, etc.).	3.21	.68	3.16	.73	3.19	.70	.26
Generally, I feel okay about trying a new computer software program.	3.13	.56	3.21	.54	3.16	.56	1.48
Educators should use computers for instruction.	3.12	.61	3.22	.55	3.16	.59	1.63
I think working with computers is enjoyable.	3.08	.62	3.07	.53	3.08	.59	.02
Teaching with a computer adds something to my regular instruction.	3.04	.65	3.09	.60	3.06	.63	.47
Computers improve education.	3.01	.55	3.02	.66	3.02	.59	.01
Using computers makes my job very interesting.	2.90	.72	3.04	.70	2.96	.71	2.26
Computers can improve learning of higher order thinking skills.	2.73	.77	2.95	.61	2.81	.72	5.55*
Computers motivate students to do better work.	2.64	.71	2.72	.63	2.67	.68	.70
When there is a problem with a computer that I can't immediately solve, I stick with it until I have the answer.	2.67	.76	2.65	.76	2.66	.76	.05
If I had a computer problem that I couldn't solve, I would continue to think about it afterward.	2.57	.76	2.68	.73	2.61	.75	1.27
I am confident in troubleshooting computer problems.	2.60	.81	2.49	.84	2.56	.82	.96
Teaching with a computer is more enjoyable than using teaching techniques.	2.37	.74	2.34	.74	2.36	.74	.05
I find it hard to stop once I start to work with a computer.	2.27	.70	2.43	.69	2.33	.70	2.96
The challenge of solving problems with computers does not appeal to me.	2.24	.80	2.19	.82	2.22	.80	.27
I am not sure I could learn a computer language.	1.91	.69	2.05	.66	1.96	.68	2.81

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.
*p<.10

The third research question asked for AAAE members' perceptions of Web-based survey methods, and sought to determine if differences existed in their perceptions when compared by survey method subgroups. AAAE respondents perceived that Web-based survey data collection

methods provide an equally valid, reliable, and secure method of collecting research data as do traditional paper-based research methods (Table 4). Statistical differences existed between the subgroups for the statements "*Web-based surveys are as reliable as paper surveys*" and "*I am confident in reporting data obtained in Web-based surveys*." In both instances, respondents in the Web-based group agreed significantly stronger with these statements than did respondents from the paper-based group.

Table 4

Perceptions of Web-based Survey Methods by Data Collection Subgroups (N = 257)

	Paper (n = 159)		Web (n = 98)		Total (N = 257)		
Statements	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Web-based surveys provide a valid means for conducting research.	3.11	.70	3.25	.58	3.16	.66	2.79
Web-based surveys are as reliable as paper surveys.	3.11	.72	3.32	.61	3.19	.69	5.86*
Using the Web for conducting surveys is a secure method of collecting data.	3.10	.71	3.24	.52	3.15	.64	2.97
I am confident in reporting data obtained in Web-based surveys.	3.02	.73	3.26	.53	3.11	.67	7.51*
Web-based surveying allows the researcher to collect a random sampling of Web users' perceptions.	2.81	.80	2.86	.76	2.83	.78	.21
Web-based surveying allows the researcher to gather a representative sample of Web users' perceptions.	2.87	.77	2.96	.69	2.90	.74	.78
Web knowledge is common enough for using Web-based surveys.	2.83	.64	2.84	.67	2.83	.65	.02
Web-based instruments are only useful for quantitative research.	1.96	.59	1.90	.59	1.94	.59	.55
Web-based instruments are applicable for all types of research.	3.07	.55	3.13	.53	3.09	.54	.57
Web-based instruments are only useful in researching Web users.	2.56	.79	2.48	.81	2.53	.80	.57
I am confident in constructing Web-based survey instruments.	2.38	.83	2.35	.89	2.37	.85	.06
Access to Web-based survey information cannot be controlled.	1.94	.63	1.87	.59	1.91	.62	.72

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.

*p<.10

The fourth question sought to determine if there were differences in AAAE members' computer anxiety scores, attitudes toward computers, or perceptions of Web-based survey methods when compared by selected demographics. Due to space limitations, only those statements where significant differences were found are reported. Table 5 shows that male and

female respondents differed significantly in their agreement levels for statements in all three subscales. Females held significantly less favorable attitudes toward computers, but more favorable perceptions of Web-based survey methods than did males.

Table 5

Levels of Computer Anxiety, Attitudes toward Computers, and Perceptions of Web-based Survey Methods by Gender (n = 230)

	Male (n = 190)		Female (n = 40)		Total (n = 230)		
Statements	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Computer Anxiety							
I have avoided computers because they are unfamiliar to me.	1.26	.58	1.08	.27	1.23	.54	3.91*
Attitudes Toward Computers							
Computers can improve learning of higher order thinking skills.	2.89	.68	2.56	.75	2.83	.70	6.93*
The challenge of solving problems with computers does not appeal to me.	2.19	.77	2.47	.89	2.24	.80	4.08*
Perceptions of Web-Based Survey Methods							
Web-based surveys provide a valid means for conducting research.	3.13	.65	3.38	.67	3.17	.66	4.83*
Web based instruments are only useful for quantitative research.	1.98	.60	1.72	.51	1.94	.60	6.58*

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.
*p<.10

Table 6 shows that respondents differed significantly in their agreement levels for statements in all three subscales when compared by current faculty status. In every case, full professors had significantly different scores than did their colleagues. Full professors had significantly higher computer anxiety levels, less favorable attitudes toward computers, and a more limited view of the usefulness of Web-based survey methods. To conserve space, only statements where significant differences existed are presented in Table 6.

Table 6

Levels of Computer Anxiety, Attitudes toward Computers, and Perceptions of Web-based Survey Methods by Current Faculty Position (n = 256)

Statements	Asst. Prof. (*n* = 59) *M*	Assc. Prof. (*n* = 57) *M*	Full Prof. (*n* = 97) *M*	Other[a] (*n* = 43) *M*	Total (*n* = 256) *M*	*F*
Computer Anxiety						
I understand the technical aspects of computers.	3.22	3.05	2.84	3.12	3.02	3.24*
I am confident using computers.	3.49	3.46	3.20	3.51	3.38	3.72*
Working with computers makes me feel "cut off" from other people.	1.31	1.34	1.54	1.28	1.40	2.75*
I am confident teaching my peers about new software programs.	2.95	2.75	2.50	2.98	2.74	4.73*
Attitudes Toward Computers						
Generally, I feel okay about trying a new computer software program.	3.21	3.16	3.05	3.33	3.16	2.71*
I am confident learning terms relating to computer software (cut, copy, open, merge, etc.).	3.30	3.44	3.20	3.44	3.32	2.74*
Perceptions of Web-Based Survey Methods						
Web-based instruments are only useful in researching Web users.	2.38	2.51	2.72	2.39	2.54	3.01*

Note. [a]Other includes professor emeriti, visiting professors, staff, graduate students, and instructors; Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.
*$p<.10$

Several comments were collected from respondents. The most common respondent statement was that there needed to be a neutral category on the four-point Likert-type scale. Respondents did not like being forced into a category, and some avoided choosing a category by not responding to some statements. Other comments included "*Some of the items (computer anxiety) may have been issues years ago, but may not matter now. Computer support personnel may have removed a lot of the anxiety about the technical side of the computer use.*" Two respondents were deemed to be anomalies. One respondent chose not to respond to the survey stating that he/she "*had no anxieties or time to complete another survey*." The other respondent stated that he/she "*would not even use a computer if it were not for email*."

Conclusions and Recommendations

AAAE respondents in this study were mostly male (73.9%) full professors (37.7%). The respondents had a wealth of experience in teaching at the postsecondary level with 44.4% having taught 16 or more years. These data are in contrast to that of using Internet technologies, where 59.2% of respondents had nine or less years of experience. However, respondents had high levels of computer technology usage with 80.6% of respondents recording ten or more years of experience. More than 75% of the respondents were over the age of 40. Significant differences among subgroups suggests that some respondents held unfavorable attitudes toward computers, but overall, they perceived the usefulness of Web-based data survey methods as an equally valid, reliable, and secure method of collecting and reporting social science research data.

AAAE researchers should be taking advantage of the Web in collecting survey research information. The results of this study suggest a possible interaction of testing and treatment, especially for the Web-based group. This result indicates that as more Web-based surveys are used, the Web will become more dependable as a collection medium in the eyes of the participants. In turn, this practice leads to cleaner data due to the lack of errors created by coding and entering data from paper surveys into computer analyses packages.

AAAE members who prefer the "old-fashioned" ways of using computers (MS-DOS, etc.) should learn about the advantages offered by the Internet, especially in terms of research capabilities. Powerful online databases can add much to the research process. If an AAAE member is unfamiliar or anxious about using the Internet, he/she should take computer technology in-service course offered by the information technology department at his/her university. Similarly, AAAE members who do not use Internet tools in their research studies could benefit from discussing the possibilities with members who do use the Web for collecting, analyzing, and sharing their research data. The data found in this study suggest that the AAAE provide regional and/or national pre- or post-conference workshops for those interested in using the Internet to conduct their future research studies in agricultural and extension education.

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Determining the Research, Education, and Extension Needs of Oklahoma Wheat Producers

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Abstract

The continuing trend toward greater accountability in research and education is driving a need for increasing civic engagement at the land-grant universities. This study collected stakeholders' needs for research, education, and extension programming for wheat research faculty at Oklahoma State University. A survey of a random sample of Oklahoma wheat producers was used to gather the data, which was used to assist the faculty in setting future research and educational priorities.

The findings of the study indicated that wheat producers are older and well educated. Ninety-three percent of the wheat producers were cattle producers that grazed their wheat in the winter months. The most significant wheat production problems were weeds and drought. Wheat farmers most often used family, friends, and other farmers or business associates to gain information about wheat. Few farmers had direct contact with on-campus faculty; however, 65% interacted with extension on a regular basis.

This study presents a model for a simple and cost effective method for collecting input from stakeholders. The process fully involved the program decision makers and provided a wealth of formative information regarding stakeholders' priorities and needs. The model should be tested in other academic units at land-grant universities.

Introduction/Theoretical Framework

It could be argued that the land-grant university's first century was an unqualified success. The land-grant university and farmers' institutes historically provided research-based education to students, a tradition that continues today. The agricultural experiment station published bulletins and reports on the progress of research and have presented their results to the public. The Cooperative Extension Service has provided grassroots level research based information and educational programming to the public since 1914 (Severs, Graham, Gammon, & Conklin, 1997). It is clear that all Americans benefit to some degree from the work conducted at land-grant universities. However the American public has become increasingly disconnected from agriculture and land-grant institutions in part because the majority of the American public has little or no direct connection to agriculture. Recently, the American public has demanded higher accountability from land-grant universities as evidenced by declining financial support for higher educational institutions where the majority of agricultural research is conducted (Altschuld & Zheng, 1995). This climate of greater accountability has created a need to gather input from stakeholders of publicly funded institutions to address their concerns.

The theoretical framework for this study was the stakeholder engagement model proposed by (Green, 1988). Gathering stakeholder input helps administrators and planners in making decisions about the direction of their organization, but this is not a cause and effect relationship. The literature on public involvement shows that the inclusion of stakeholder input in the decision making process increases stakeholder satisfaction with programs and outcomes. Stakeholder support of an organization is important in meeting societal goals (Babiuch & Farhar, 1994; Silag, et al., 1998). By incorporating social responsiveness through stakeholder input, universities can address the call for accountability and outcomes in relation to public expectations (Altschuld & Zheng, 1995).

The literature regarding the stakeholders' role in public institutions, such as land-grant universities, describes a process, which is inclusive, fair, balanced, transparent, comprehensive, and accountable (Dyer, Miller, & Leval, 1999). But deciding who is and who is not a stakeholder is often difficult. The term "stakeholder" has been a popular term used in academia in recent years, but has seldom been clearly defined for the purpose of assessing educational or research needs. Defining appropriate stakeholders for participation in priority setting should be based on (a) *legitimate stakeholders* (b) who have *sufficient program knowledge* to contribute to the process in meaningful ways, and (c) whose self-defined *stake in the university is also high* (Greene, 1988). Defining stakeholders is the first step in the process of assessing their priorities and integrating their input into the decision making process. The second step in the process is to engage stakeholders in meaningful participation.

Including stakeholders at all levels of the process is ideal; however, not always practical or possible. Gathering information from stakeholders regarding their research and educational needs is a practical solution to meeting this challenge. A cross-sectional survey approach allows inclusion of input from a much larger and more diverse group of stakeholders than the traditional approaches such as advisory boards or focus groups (Worthen, Sanders, & Fitzpatrick,1997). This study implemented a process for gathering stakeholder input using the cross-sectional

survey design method and presented results to faculty for setting future research and education goals.

Purpose and Objectives

The purpose of this study was to collect stakeholder input for the Oklahoma State University Plant and Soil Science Department. Wheat is the number one commodity crop in Oklahoma; therefore, wheat producers were targeted for this study. Specific objectives of the study were to:

1. Determine the demographic and operational characteristics of Oklahoma wheat producers.
2. Describe the agricultural problems, challenges, and concerns of Oklahoma wheat producers.
3. Identify what factors Oklahoma wheat producers consider when making production-related decisions.
4. Identify specific informational sources preferred by Oklahoma wheat producers.
5. Determine the most effective activities for the establishing ongoing communication between faculty and Oklahoma wheat producers.

Methods

The study was a descriptive design with data collection via a self-administered mail survey. The study was completed in six stages including population identification, development of objectives, survey development and testing, data collection, data analysis, and dissemination of the results to interested audiences. The design of the study employed mixed methods with qualitative methods being utilized in the first three stages and quantitative methods used in the remaining three stages.

The wheat research (WR) faculty participated in individual and group interviews with the authors to determine the focus and scope of the study. It was decided to target wheat producers as wheat is the number one commodity crop in Oklahoma. There were approximately 15,000 wheat producers in Oklahoma (Census of Agriculture, 1997); thus, a proportionally stratified random sample based on the population of wheat producers in each of Oklahoma's 77 counties was drawn (Ary, Jacobs, & Rasavieh, 1996). A sample of 375 would have been adequate (Krejcie & Morgan, 1970); however, it was decided to take a 100% over sample of the population, (n=750) to address a predicted low response rate of about 20%.

The sample frame for the pilot test and survey was provided by the Oklahoma Agricultural Statistics Service (OASS), which maintains a list of all agricultural producers in the state. The Oklahoma agricultural statistics services provided two independent samples, a pilot sample of 100, and a survey sample of 750 for a total of 850 individual wheat producers. In addition, OASS conducted the telephone follow-up calls with a random sample of 33 nonrespondents (Lindner, Murphy, & Briers, 2001).

Qualitative analysis and group techniques were employed in developing specific survey items. A first draft of the survey instrument was produced using the WR faculty interview transcripts as a guide for developing questions. The draft instrument was circulated among the

WR faculty, as well as to a panel of experts comprised of researchers experienced in surveying agricultural populations and extension educators and specialists who work extensively with Oklahoma wheat producers. Both the WR faculty and the panel of experts expressed satisfaction with the face and content validity of the instrument.

The instrument was pilot tested with a random sample of Oklahoma wheat producers (*n*=100). The data from the 20 returned surveys was analyzed and revisions were made to the instrument. The improved instrument was then mailed to the sample of 750 wheat producers. The reliability of the survey instrument was determined using the Cronbach's alpha test. The reliability coefficient was 0.94 for all scale items.

The mail survey used a modified Dillman (2000) approach including an initial mailing that contained a survey, cover letter, and postage-paid return envelope. A reminder postcard was mailed one week later. A second survey, cover letter and postage-paid return envelope followed one week later to nonrespondents. A second reminder postcard was mailed to all nonrespondents. A 29.2% (n=219) useable response rate was achieved with this procedure.

Control for nonresponse error was addressed through four separate procedures. First, the effort was made to achieve the highest response rate possible by using Dillman's (2000) multiple mailing approach. Second, several demographic characteristics of the respondents were compared to the characteristics of the population from the 1997 Census of Agriculture (Miller & Smith, 1983). No significant differences were found at the 95% confidence level. Third, a comparison was made between early and late respondents. The first 25% of the respondents were compared to the last 25% to respond (those who responded after one mailing and those who did not respond until they had been contacted four times) (Linder, Murphy, & Briers, 2001). Again, no significant differences were found between the groups. Fourth, a random sample of 10% of nonrespondents was drawn (*n*=50); of these, 33 were reached by telephone to complete a portion of the instrument (Linder, Murphy, & Briers, 2001). A comparison was made between the respondents and the nonrespondents age using an independent samples t-test. Respondents and nonrespondents were also compared based on their ethnicity and educational attainment using a chi square test. No significant differences were found between respondents and nonrespondents in either ethnicity or educational attainment at the 95% confidence level.

While this study was primarily a descriptive design, it was based on a sample of the population of wheat producers. Therefore, descriptive and inferential statistics were used extensively in calculating the confidence intervals for population means and for making comparisons between groups including nonrespondents. Other tests and procedures employed in the data analysis included the chi square test as well as Cronbach's alpha reliability coefficient. The alpha level of 0.05 was set *a priori* and was used for all statistical tests and procedures. The Statistical Package for the Social Sciences (SPSS) version 8.0, computer software, was used for all statistical analyses.

Findings

Wheat Producer Demographics

The first objective of the study was to determine the demographic and operational characteristics of Oklahoma wheat producers. The respondents were asked to complete 24 individual items regarding themselves and their wheat production operations.

Respondents' ages ranged from 18 to 89 years (mean=56; median=55; SD=13). The distribution of the age of respondents was positively skewed and rose sharply at age 45. Ninety-six percent were white males. Native Americans were the next largest group at 2%, followed by African-Americans 0.9%. The remaining respondents selected biracial and other ethnicity.

Sixty percent (*n*=128) of the respondents indicated that farming was their principle source of income. Respondents were also asked if they were employed in an off-farm occupation; the majority 64% (*n*=140) stated that they did not have off-farm jobs. Respondents reported spending from zero to 168 hours per week farming (mean=45; SD=27).

The majority of respondents 70% (*n*=151) had at least some post-secondary education. Some college was the mode and median education level for the respondents. Only 12% indicated that they had not earned a high school diploma or GED while 19% had graduated from high school. Four percent of the respondents had completed an associate's degree and 24% had earned a bachelor's degree. Nine percent of the respondents had completed a master's degree, and one percent had earned a doctoral degree.

The long-term plans of wheat producers were also addressed in the study. With regard to plans to expand their operations, 65.6% (*n*=139) indicated that they did not intend to expand in the next five years. Seventy-five percent of the producers (*n*=160) indicated that they had no plans to retire in the next five years.

Wheat Producers' Farm Characteristics

Most wheat producers (79%, *n*=170) operated their farms as sole proprietors. Partnerships were the second most common type of operation (11%, *n*=23). Corporations accounted for 4% (*n*=9) of the operations, and landlord only accounted for 3% (*n*=7) of the operations. Ninety percent of the producers (*n*=195) indicated that they collected government farm payments in a typical year. Fifty-two percent (*n*=112) indicated that they regularly took out short-term loans to cover operating expenses on their operations. Fifty-eight percent (*n*=128) of the producers took out long-term loans to make major purchases.

The majority of producers (58%, *n*=125) indicated that they always buy crop insurance on wheat, while 20.4% (*n*=44) said that they sometimes insured their wheat crop, and 22% (*n*=47) stated that they never buy crop insurance for wheat. Most respondents (88%, *n*=149) indicated that their principal reason for buying crop insurance was to reduce risk, while 12% (*n*=20) stated that their lender required crop insurance. A majority of producers (57%, *n*=115) had collected on a crop

insurance policy. In addition, Wheat Check-Off funds were considered a good investment by 56% of the producers.

Wheat producers planted between zero and 4,500 acres of wheat in 2001 (mean=652; SD=697). Wheat was the principal enterprise for 58% (*n*=123) of the respondents. Most respondents 58% (n=161) raised other crops in addition to wheat. Ninety-three percent (*n*=187) of the respondents were also cattle producers. Seventy-seven percent (*n*=154) of the wheat producers were cow-calf operations and 51% (*n*=102) raised yearlings/stockers.

Wheat Producers' Production Problems

Objective two was to describe the agricultural problems and challenges faced by Oklahoma wheat producers. Producers were asked to respond to a series of 41 summated scale items in seven categories including grazing, wheat diseases, insect pests, weeds, grain quality, soil fertility, and other. Each of the 41 potential production problems were identified by the WR faculty as having been a problem historically in Oklahoma. The summated scale included four levels of response including not a problem, less serious problem, serious problem, and very serious problem. The respondents were asked to select the response from the scale that best fit their operation. Table 1 lists the 30 items that were identified by the majority of respondents as wheat production problems. The majority of the wheat producers in the study considered three of the 30 problems serious. They were drought, cheat grass, and field bind weed. All of the other problems listed in Table 1 had a median response of "less serious problem".

Part of objective two was to describe the category of problems that concerned the respondents the most. Weeds were the most frequently cited concern (31%, *n*=65), followed by grazing (29%, *n*=60). The other categories were soil fertility (21%, *n*=43), wheat diseases (20%, *n*=42), insect pests (12%, *n*=24), and grain quality (10%, *n*=20). Many respondents selected two or more categories from the list and all responses were entered in the calculations.

The third objective of this study was to identify what factors Oklahoma wheat producers considered when making production-related decisions. Ten factors were identified by the WR faculty and included in the instrument. They were grain yield, long-term sustainability, cost of inputs, government farm payments, crop insurance, credit/interest rates, maximizing income, minimizing costs, commodity prices, and terms of lease agreements. The 10 scale items had three possible responses including not at all important, somewhat important, and very important. The respondents considered all ten factors to be at least somewhat important. However the respondents median responses indicate that, as a group, they considered maximizing income, commodity prices, minimizing costs, the cost of inputs, maximizing yield, and long-term sustainability to be very important factors in making decisions about wheat production (Table 2).

Table 1

Wheat Producers' Production Problems

Production problem	*n*	Response in percent: Not a problem	Less serious problem	Serious problem	Very serious problem
Weeds					
Cheat grass	182	9.3	17.0	40.1*	33.5
Field bindweed	163	18.4	29.4	31.9*	20.2
Wild oats	149	37.6	21.5*	24.8	16.1
Rye	154	37.0	27.3*	22.1	13.6
Ryegrass	146	39.7	31.5*	19.2	9.6
Jointed goat grass	150	46.0	26.7*	18.0	9.3
Mustards	153	30.1	35.3*	26.8	7.8
Wild buckwheat	148	47.3	32.4*	15.5	4.7
Other Production problems					
Drought	183	4.9	10.9	41.5*	42.6
Low grain yield	158	24.1	40.5*	27.2	8.2
Poor stand establishment	151	30.5	46.4*	17.9	5.3
Lodging	146	45.2	38.4*	8.2	4.1
Soil fertility					
Acid soil	154	28.6	27.9*	34.4	9.1
Nitrogen	176	21.6	36.9*	34.1	7.4
Phosphorus	162	26.5	51.2*	20.4	1.9
Potassium	152	46.7	42.8*	9.2	1.3
Wheat diseases					
Wheat rusts	159	22.0	34.6*	34.6	8.8
Soil born mosaic virus	146	40.4	32.2*	20.5	6.8
Root rot	141	39.0	38.3*	19.1	3.5
Wheat streak virus	143	47.6	31.5*	17.5	3.5
Insect pests					
Greenbugs	173	12.1	42.8*	36.4	8.7
Armyworms	163	19.6	43.6*	28.2	8.6
Fall armyworms	143	30.1	41.3*	21.7	7.0
Army cutworms	144	29.2	39.6*	25.0	6.3
Mites	137	48.2	40.1*	8.8	2.9
Grain quality					
High dockage	164	36.0	36.6*	18.9	8.5
Low test weight	165	33.3	41.8*	19.4	5.5
Low protein	157	48.4	34.4*	15.9	1.3
Grazing					
Grazing tolerance	169	40.8	39.1*	18.3	1.8
Forage production	164	42.1	30.5*	18.3	1.8

* indicates median response

Table 2

Important Factors Impacting Production Decisions

Wheat production decision making factor	*n*	Response in percent: Not at all important	Somewhat important	Very important
Maximizing income	172	1.2	16.3	80.8*
Commodity prices	178	2.8	17.8	78.3*
Minimizing costs	173	1.7	22.4	75.3*
Cost of inputs	187	2.1	23.0	74.9*
Maximizing yield	179	4.6	28.2	67.2*
Long term sustainability	159	9.4	38.4	52.2*
Government commodity program funds	165	12.7	40.0*	47.3
Credit/interest rates	161	32.3	33.5*	34.2
Crop insurance	162	30.9	41.4*	27.8
Terms of lease or agreements with landowners	160	43.1	35.6*	21.3

* indicates median response

Information Sources Most Frequently Used by Wheat Producers

The fourth objective was to identify specific informational sources and media preferred by Oklahoma wheat producers. Survey participants were asked to respond to three basic questions regarding the sources of information they use to solve wheat production problems. The first item was a four-point summated scale item with 16 potential sources of wheat production information. The respondents were also asked to list the three publications they most frequently used to find information on wheat production issues. Finally, respondents were asked to list the three sources of information other than publications that they used most frequently to find wheat production information.

Respondents were asked how frequently they used 16 common sources to find wheat production information. The four scale responses were labeled, not at all, sometimes, frequently, and always. Table 3 lists the ten sources of information that were used by the majority of the respondents. Based on the median responses of the participants, friends, family, and other farmers and businesses such as seed, chemical, and fertilizer dealers were cited as frequently used sources of wheat production information among the majority of the respondents.

Table 3

Frequently Used Sources of Wheat Production Information

Source of wheat production information	*n*	Response in percent: Frequency of use: Never	Sometimes	Frequently	Always
Friends/family/other farmers	175	2.3	30.9	47.4*	19.4
Businesses	171	5.3	39.2	36.3*	19.3
OSU publications	167	15.0	48.5*	25.7	10.8
OSU Extension	168	12.5	45.2*	32.1	10.1
Trade/technical journals/newsletters	156	9.6	47.4*	34.6	8.3
Newspapers	161	25.5	46.0*	21.1	7.5
Farm organizations	155	23.2	51.6*	20.6	4.5
Television/radio programs	157	28.7	47.1*	19.7	4.5
Government agencies	155	27.1	51.6*	18.1	3.2
Scientific journals	150	43.3	42.7*	12.0	2.0

* indicates median response

Respondents were asked to write in the three written sources of information they most often read to get wheat production information. One hundred and thirty two participants responded to the item listing 40 specific publications or types of publications they most often read for wheat information. *The High Plains Journal* was the most frequently read publication for finding wheat production information. Other frequently cited written sources of wheat production information were *The Oklahoma Farmer Stockman, The Progressive Farmer*, and Extension and other OSU publications.

Respondents were asked to list three sources of wheat information other than publications that they use to solve production problems. The respondents listed 24 nonwritten sources of wheat production information. The most frequently listed nonwritten source of wheat production information was friends, family, and other farmers. Other important sources of nonwritten information included grain coop or elevators, dealers of agricultural inputs, OSU Extension, and TV and radio programs.

Connection with the Land-Grant University

The fifth objective was to determine the most effective activities for the establishing ongoing communication between the department faculty and wheat producers. The respondents were asked a series of questions regarding their relationship with OSU. Respondents were also asked about their extension use, whether a weekly crop bulletin would be helpful or not, and ways that communication between OSU and producers could be improved.

Seventy-seven percent (*n*=166) indicated that they were not graduates of OSU. Most respondents (n=126, 51%) indicated that a close family member had not attended OSU. Most respondents (*n*=203, 94%) indicated that they did not serve on any boards or committees for

OSU. Few respondents (*n*=31, 14%) indicated that they had participated in OSU research projects. Finally, most of the respondents (*n*=184, 86%) indicated that they did not communicate directly with an OSU faculty member.

When asked to indicate weather they use OSU Extension services for wheat production information, the most frequently checked response (*n*=113, 65.3%) was "I do use OSU Extension to get wheat production information". The most commonly checked reasons for not using extension were *better information was available elsewhere* (*n*=24, 14%) and *did not know about extension services* (*n*=24, 14%). Respondents were asked if a weekly bulletin on crop production issues would be helpful. Sixty-six percent (*n*=129) indicated that a weekly bulletin would be helpful.

Respondents were asked *how could communication between you and OSU be improved*. Four useful themes emerged from the statements written by the respondents including communication is OK as is, OSU should provide information on a specific topic, OSU should disseminate in a particular way, and negative perceptions of OSU. Thirteen of the respondents felt that communication between themselves and OSU was adequate and either recommended no improvement or stated that no changes were needed. Nineteen respondents indicated a need for information from OSU. The information requested included applied production type information, information relating to trends in the wheat market, information about OSU faculty, services and research projects, information on programs and publications for wheat producers, and information on wheat research results.

Forty-five respondents commented about ways that OSU could better disseminate information to wheat producers. There were 13 comments regarding extension including more meetings, increased personal contact, updated fact sheets, more timely responses to questions, and praise for extension's work with producers. Most of the comments about ways to disseminate information focused on direct mailing of information. The respondents also suggested disseminating information via magazine and newspaper articles, TV and radio, and Internet web-sites or email. The last category of responses were negative perceptions about OSU. Three responses fell into this category. Two respondents stated that OSU was not interested in helping small operations and one respondent felt that OSU was unapproachable.

Conclusions, Recommendations, and Implications

The purpose of this study was to collect input from wheat producers for the Oklahoma State University Plant and Soil Science Department faculty, researchers, and extension educators for setting research, education, and extension priorities. The survey collected a wealth of information about the attributes and characteristics of Oklahoma wheat producers as well as the specific problems and challenges they face. This study also identified the sources of wheat information used most frequently by wheat producers to solve production problems, as well as the ways they communicate with Oklahoma State University.

The financial arrangements of wheat producers offer some insights into the decision-making processes of Oklahoma wheat producers. From a financial standpoint, Oklahoma wheat producers are dependent on resources outside their direct control. Researchers and educators

should continue to consider the costs and benefits of new production options and present their recommendations in economic terms. Given the heavy reliance on long and short-term loans among Oklahoma wheat producers found in this study, agricultural lenders have a significant impact on the adoption of new practices. Agricultural lenders should be targeted for dissemination of research findings.

Ninety-three percent of Oklahoma wheat operations are integrated beef-on-wheat systems. This practice is unique to this region and not much literature exits for farmers to best manage dual-purpose wheat. Researchers and educators should continue to refine the beef-on-wheat production system and consider cattle as an integral part of wheat production for most producers.

This study found that weeds were the greatest production problems among the respondents to the survey. The respondents consistently identified cheat grass and field bindweed as serious wheat production problems. The control of weeds in wheat, particularly cheat grass and field bindweed, should continue to be a research and education priority at OSU.

The findings of this study indicate that wheat producers are most often getting information about wheat production from other farmers, and businesses like grain elevators, seed suppliers, and chemical dealers. Based on the information-seeking behavior of the respondents as a group, it appears that Oklahoma wheat producers function as what Rogers and Beal (1958) refer to as the late majority in their model of adoption of innovations. The late majority are characterized as skeptical, localite, making little use of mass media, securing ideas from peers, slow to adopt, and influenced by public opinion. This group has little regular contact with change agents like extension field staff; usually, this group will not seek out information unless they are forced to by economic necessity. This group must see their peers using a new technology or practice before they will seriously consider adopting it. It has been suggested that the best way to get information to people is to put that information where people tend to look for it Pounds (1985). Knowing that this population prefers to receive information through personal contacts, researchers and educators should communicate research findings through farm-related businesses and opinion leaders who will implement innovations for others to observe.

This study was a relatively simple and cost effective method to collect input from a large cross section of stakeholders. In order to maintain prolonged engagement with stakeholders, the wheat research faculty should repeat the study at regular intervals. The basic model for collecting stakeholder input presented in this study should be implemented in other academic units at land-grant universities to continue the quest for stakeholder engagement at publicly funded institutions.

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The Effect of Instructional Delivery Methods on the Critical Thinking Disposition of Distance Learners and Traditional On-campus Learners

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Abstract

The development of critical thinking skills in agricultural audiences has been identified as an important need. While several studies have examined the effect of teacher delivery methods that foster higher order thinking, levels of cognition, and critical thinking in agricultural education, few studies have addressed delivery methods fostering critical thinking in agricultural distance education courses. The purpose of this casual comparative study was to determine students' disposition to think critically in a graduate research methods course, offered by the same instructor in both traditional classroom and distance learning settings. The course was specifically designed to implement strategies for improving critical thinking. To conduct the study, a series of null hypotheses were set up to determine the differences between distance learners and traditional learners with respect to: (1) their perception of course effectiveness, (2) their perceptions of opportunities to think critically in the course, (3) their actual critical thinking disposition, and (4) their critical thinking disposition change as a result of the implementation of critical thinking teaching strategies. Results generally supported the contention that distance learners were not significantly different than traditional learners with respect to perceptions of course effectiveness, opportunities to think critically and critical thinking disposition; however, traditional learners were significantly different from distance learners in terms of change in some critical thinking disposition subscale factors, including truth-seeking and inquisitiveness. Based on the above, practitioners need to continue to explore ways to develop technology-based teaching strategies that build critical thinking dispositions and skills in both distance and traditional learners.

Introduction

The development of critical thinking skills in agricultural audiences has been identified as an important need, based on findings which suggest potential deficiencies in terms of students' ability to think critically (Rudd, Baker, & Hoover, 2000). Several studies (Newcomb & Trefz, 1987; Rudd, Baker, & Hoover, 2000; Torres & Cano, 1995) have examined the effect of teacher delivery methods which foster higher order thinking, levels of cognition, and critical thinking in agricultural education, but few studies have addressed delivery methods fostering critical thinking in agricultural distance education courses. As higher education courses are increasingly being offered through distance education delivery methods, it becomes increasingly more important to determine whether the quality of instructional delivery with respect to fostering critical thinking among our students can be maintained in the distance setting.

Studies have shown that distance education is comparable to the on-campus classroom in terms of cognition levels (Miller & Pilcher, 2001; Verduin & Clark, 1998). Using the Newcomb and Trefz (1987) model, Miller (2001) addressed instructional methods via distance education delivery that influenced higher order thinking in post-secondary agricultural education. Results indicated that not only did instructors teach at the same levels of cognition in distance and traditional settings, but also that there was a positive relationship between cognitive level of instruction and delivery method. Even though cognitive level of instruction may be comparable, research has not yet addressed whether the distance education environment is analogous to the traditional classroom in terms of its ability to foster, stimulate and provide opportunities for the implementation of critical thinking teaching instructional methods. Miller (2001, p. 22) may have asked the question best. "Can instructors capitalize on this unique opportunity in the distance education environment?" Based on the above, this study sought to determine the effect of instructional delivery methods, specifically designed to improve critical thinking, on the critical thinking disposition of distance and traditional students in agricultural education.

Theoretical Framework

Critical thinking has been called one of the most important attributes for success in the 21st century (Huitt, 1998). Meyers (1986) argued that for students to reach their fullest potential in today's society, they must learn to think and reason critically. Paul (2002) contended "in a world of accelerating change, intensifying complexity and increasing interdependence, critical thinking is now a requirement for economic and social survival".

Researchers and theorists have defined critical thinking as a "set of intellectual standards" that can be used by individuals while thinking (Paul, 2002). However, critical thinking is somewhat different than higher order thinking or levels of cognition. "Critical thinking is a reasoned, purposive, and introspective approach to solving problems or addressing questions with incomplete evidence and information and for which an incontrovertible solution is unlikely"(Rudd, Baker, and Hoover, 2000, p. 5).

The theoretical framework for this study is based on an extensive Delphi study conducted by Facione (1990), who used the information to identify seven constructs, called dispositions, of critical thinking. These dispositions include analyticity, self-confidence, inquisitiveness,

maturity, open-mindedness, systematicity, and truth seeking (Facione, 1998), which can be defined as follows:

- *Analyticity* targets the disposition of being alert to potentially problematic situations, anticipating possible results or consequences, and prizing the application of reason and the use of evidence, even if the problem at hand turns out to be challenging or difficult. The analytically inclined person is alert to potential difficulties, either conceptual or behavioral, and consistently looks to anticipatory intervention, reason giving, and fact-finding as effective ways to resolve matters.
- *Self-confidence* refers to the level of trust one places in one's own reasoning process. Critically thinking self-confident persons trust themselves to make good judgments and believe that others trust them as well, since they believe that others look to them to resolve problems, decide what to do, and bring reasonable closure to inquiry.
- The *inquisitive* person is one who values being well informed, wants to know how things work, and values learning even if the immediate payoff is not directly evident. This person seeks knowledge without provocation for the intrinsic benefit of knowing.
- *Maturity* addresses cognitive maturity and epistemic development. Mature thinkers are disposed to approach problems, inquiry, and decision making with a sense that some problems are ill-structured, and that some situations have more than one plausible option. Mature thinkers also realize that judgments based on standards, contexts, and evidence often must be made without having the benefit of knowing all information about the situation.
- *Open-mindedness* is a construct that targets the disposition of being tolerant of divergent views with sensitivity to the possibility of one's own bias. The open-minded person respects the rights of others to differing opinions.
- *Systematicity* targets the disposition to being organized, orderly, focused, and diligent in inquiry. No particular kind of organization (i.e. linear or nonlinear) is given priority. The systematic person strives to approach specific issues, questions or problems in an orderly, focused, and diligent way.
- *Truth-seeking* thinkers are those eager to seek the truth, who are courageous about asking questions, and honest and objective about pursuing inquiry even if the findings do not support one's interests or one's preconceived opinions. The truth-seeker would rather pursue the truth than win the argument.

These constructs can function both as dispositions, which individuals can possess to a greater or lesser degree, as well as skills, which can be refined and developed as a result of educational experience. In fact, Facione (1995) hypothesized a link between the *disposition* to think critically and critical thinking *skills*. Subsequent research has consistently shown a high correlational relationship between critical thinking disposition and critical thinking skill (Claytor, 1997; Facione & Facione, 1997; Facione, 1998; Giancarlo & Facione, 1994). Based on the above, it could be assumed that the specificity of Facione's work could be used to design instructional delivery methods for the teaching of critical thinking to both traditional and distance learners. However, only a limited number of studies have demonstrated how critical thinking can be taught by utilizing appropriate instructional delivery methods (Gadzella, 1996; Angeli, 1999). Gadzella (1996) found that providing students with opportunities to analyze issues critically throughout the course improved their critical thinking skills, especially in interpretation and evaluation of arguments. Reed and Kromrey (2001) examined the infusion of

critical thinking into curriculum and found that critical thinking skills increased, and Angeli (1999) discovered that in-class methods of infusing critical thinking were a more effective way of developing critical thinking in students than teaching about critical thinking to a class *a priori*.

More specifically, within the context of distance education, the literature is replete with information which suggests that interaction is the key to fostering critical thinking opportunities for students (Moore, 1989; Anderson & Garrison, 1995; Hilgenberg & Tolone, 1999; Smith & Castle, 1992). According to Moore (1989), learner-instructor, learner-content, and learner-learner interactions are necessary for a successful distance education experience. Anderson and Garrison (1995) surveyed 160 students in distance education courses deliver via audio teleconferencing. The findings indicated that opportunities for dialogue and interaction occurred in audio-teleconferencing, despite the absence of face-to-face interaction, and that learner-instructor interaction was instrumental in fostering a community of learners. Hilgenberg and Tolone (1995) assessed students' perceptions of critical thinking opportunities in distance education courses using a two-way audio and video delivery system and found that interaction fostered two-way communication with instructors and students. Smith and Castle (1992) researched distance learning as a context to foster critical thinking opportunities in South African education and examined the ability of distance technologies to affect students' disposition to think critically. Technology utilized for this research study included an experiential learning activity delivered via simulated radio-phone system. Based on the research findings, researchers concluded that the degree and quality of the interaction provided evidence of critical thinking incorporated as a result of the distance learning environment.

Purpose and Objectives

The purpose of this research study was to determine students' disposition to think critically in a graduate research methods course offered through traditional classroom and distance learning settings. Specifically, the study examined the differences between traditional on-campus learners' and distance learners' dispositions to think critically in a research methods course which utilized instructional delivery methods specifically designed to foster critical thinking. To fulfill the purpose of this study, the following research questions were addressed:

1. How do traditional on-campus and distance learners differ in their perceptions of course effectiveness?

2. How do traditional on-campus learners and distance learners differ in their perceptions of opportunities to think critically?

3. Are there differences in the critical thinking dispositions of students choosing traditional on-campus instruction as opposed to those in distance instruction?

4. Are there differences in the change in critical thinking dispositions of traditional on-campus learners and distance learners as a result of teaching strategies aimed at developing critical thinking within each of the seven critical thinking constructs: analyticity, self-confidence, inquisitiveness, maturity, open-mindedness, systematicity, and truth-seeking?

For the purposes of statistical analysis, the research questions were posed as the following set of null hypotheses. Each hypothesis was tested at the .05 level of significance. Based on whether subjects were in the traditional or the distance classroom:

HO_1: There is no difference in the perceptions of traditional on-campus learners and distance learners concerning course effectiveness.

HO_2: There is no difference in the perceptions of traditional on-campus learners and distance learners concerning opportunities to think critically.

HO_3: There is no difference in critical thinking disposition score of traditional on-campus learners and distance learners.

HO_4: There is no change in critical thinking disposition score of traditional on-campus learners and distance learners.

Methods and Procedures

The population for this study consisted of all graduate students in the Department of Agricultural Education and Communication at the University of Florida who enrolled in a research methods course, which was offered by the same instructor in both distance (N = 20) and traditional classroom (N = 21) format. The distance class occurred in the Fall semester and the traditional class occurred in the Spring. The research design incorporated pretest-posttest comparisons and a casual comparative/*ex post facto* design, as outlined by Campbell and Stanley (1966).

Students in both classes were administered a pretest designed to measure their critical thinking disposition score prior to exposure to a specific set of instructional delivery methods. One class was delivered via distance education using a variety of delivery media, including teleconferencing, web, and digital video, as well as a set of distance education teaching strategies that were specifically designed to foster critical thinking. The second class was delivered in the traditional on-campus format, which also included teaching strategies for enhancing critical thinking. At the end of all instruction in the courses, the critical thinking dispositions inventory and an instrument analyzing students' perceptions of the course and perceived opportunities for critical thinking were administered to all of the participants.

The California Critical Thinking Disposition Inventory (CCTDI) was used in the pretest and the posttest to measure critical thinking disposition. The pretest consisted of the CCTDI, a 75-item Likert-type scale with seven sub scales. Alpha reliability for the CCTDI has been extensively tested and evaluated; for the seven sub scales, alpha reliability has been reported as ranging from r = .71 to r = .80. Alpha reliability for the overall instrument has been reported at r = .91. To calculate the CCTDI score, the seven subscales indexes are first summed, and then weighted and an overall score is calculated. Overall CCTDI test scores can range from zero to 420. Standardized item alpha for the CCTDI scale in the current study was r = .70 for the pretest and r = .86 for the posttest.

In addition to the CCTDI, the post-test survey included an adaptation of Biner's Teleconference Evaluation Questionnaire (TEQ), a 33-item questionnaire measuring instructor characteristics, course management skills, and technological skills in a distance education course. The TEQ, which was specifically developed for measuring student satisfaction in a classroom using interactive teleconference video, was tested by Biner (1993), and found to be very reliable. The traditional on-campus group received a version of the TEQ that did not include specific questions pertaining to distance education. Standardized item alpha for the scale used in the study was r = .96 for the distance version and r = .91 for the traditional version. In addition to the TEQ, the post-test survey also included a 22-item Likert scale designed to elicit students' perceptions of critical thinking opportunities in the distance education settings. Standardized item alpha for this scale was r = .74. Finally, the survey also included items measuring age, gender, and occupation, as well as two open-ended questions that allowed the students to reflect on the extent of critical thinking ability that was gained as a result of the course.

The last four digits of students' social security number was used as a means of coding, but the instruments were administered and scored in the absence of the instructor and the principle investigators so as to ensure privacy and validity in the study.

The instructional activities for the courses taken by the on-campus learners and the distance education students were specifically designed to foster critical thinking, and were based on the work of Facione (1990). Table 1 shows the specific instructional delivery methods that were used in each class.

Anderson and Garrison (1995) believed that instructional programs designed for interaction developed a "community of inquiry and critical thinking" (p. 19). In order to facilitate critical thinking, the distance course was therefore designed to include a combination of two-way videoconferencing and interactive asynchronous Web/CD-ROM delivery modalities that included digital video, audio-narrated PowerPoint and an online discussion forum. Each of these delivery media was utilized to stimulate critical reflection and interaction among students, instructor and graduate teaching assistant. For example, the digital video and discussion forums were used in tandem to provide a discussion mechanism for students, instructor and the course teaching assistant. In addition, the teaching assistant was specifically assigned to respond to students with questioning methodology designed to stimulate critical thinking and evaluate of their comments. The students were also encouraged to interact with each other, and electronic mail communication was encouraged as a way to support and sustain a sense of community and interaction. Students in the traditional setting were assumed to have that sense of community (Lave & Wenger, 1991, p. 59-84). Strategies for teaching critical thinking were also used in the traditional setting. Instead of technological interaction, the instructor used discussion, modeling, questioning, and debate to cultivate the dialogue that is so important to critical thinking (Anderson, Howe, Soden, Halliday, & Low, 2001). Finally, since there were two groups in the study and the mean differences between them were evaluated, the hypotheses were tested using independent samples t-tests and analysis of variance (ANOVA) procedures, which were calculated using the Statistical Package for the Social Sciences (SPSS) 10.0. Alpha was set at .05 for data analysis.

Table 1
Proposed Critical Thinking Cognitive Skills, Sub-Skills, and Instructional Delivery Methods for the Distance and Traditional Research Methods Course

Skill	Sub-skill	Instructional Component Distance Class	Instructional Component Traditional Class
Interpretation	Categorization	Digital video	Lecture
	Decoding Significance	Audio-narrated PowerPoint lecture	
	Clarifying Meaning	Online discussion forum	In-class discussion
Analysis	Examining Ideas	Research Proposal	Modeling
	Identifying Arguments	Grant Proposal	Research Proposal
	Analyzing Arguments	Case studies	Case studies
Evaluation	Assessing Claims	Article critiques	Article critiques
	Assessing Arguments	Email interaction with instructor	Socratic questioning
Inference	Querying Evidence	Guest speakers via Web-based digital video	Guest speakers
	Conjecturing Alternatives	Action learning	Action learning
	Drawing Conclusions	Research papers	Research Papers
Explanation	Stating Results	Two-way video conferencing interaction	Presentations
	Justifying Procedures		Debates
	Presenting Arguments		
Self-Regulation	Self-Examination	Final exam	Final exam
	Self Regulation		

Findings

A total of 40 subjects participated in the study; of these, 20 subjects were part of the research methods course taught by distance and 20 subjects were part of the course using the traditional classroom instruction. The same instructor using the same curriculum taught both courses. Results of the distance education research methods course showed that respondents' ages ranged from 23 to 56 years old. Thirty percent (n = 6) of the distance group was male and seventy percent (n = 14) were female. The traditional group included respondents with ages that ranged from 22 to 53. Twenty percent of the traditional subjects were male (n = 4), and 80 percent (n = 16) were female.

Hypothesis One

The first null hypothesis, which states there is no difference in the perceptions of traditional on-campus learners and distance learners concerning course effectiveness, was tested using independent samples t-tests for both the summed scale and the individual scale items. As in Biner's original instrumentation, the modified TEQ consisted of three subscales, which were (1) instructor characteristics (alpha =.88), (2) course management skills (alpha =.71), and (3)

technological skills (alpha =.90), needed in the distance course. The course management construct, which consisted of items pertaining to library access, computer access, conscientiousness of the site/class coordinator, accessibility of departmental personnel, and class enrollment and registration procedures was the only scale with significant differences between the distance and traditional learners. With alpha at .05, the summed TEQ scale scores indicated no difference t(34) = -.04, p = .97 (two-tailed) between the two groups. The t-tests yielded no differences for overall effectiveness of the instructor *t*(32) = .41, p = .15 (two-tailed) or course management *t*(28) = -1.48, p = .15 (two-tailed), however three individual variables under the course management construct yielded statistically significant differences between the two groups. Table 2 contains the summary of the independent samples t-tests for the items in the course management construct.

Using a 5-point Likert scale to determine course effectiveness with 1 = to very poor and 5 = very good, the traditional group's (*M* = 4.88, *SD* = .33) perception of their ability to access the library, as could be expected, was significantly higher than the distance group (*M* = 4.00, *SD* = 1.00), t(28) = -3.146, *p* = .002. The distance group (*M* = 5.0, *SD* = .00) felt more strongly about the general conscientiousness of the site/class coordinator, e.g., in delivering materials, unlocking room doors, tuning in broadcasts than the traditional group (M = 4.54, *SD* = .52), t(23) = 3.08, p = .005. The distance group (*M* = 5.0, *SD* = .00) also had a better perception about the accessibility of site and/or class coordinator than the traditional group (*M* = 4.67, *SD* = .49), t(21) = 2.24, p = .036. The null hypothesis was rejected and the research hypothesis was retained.

Table 2
Summary of t-tests for Course Management construct of TEQ

Variable	Mean Distance	Mean Traditional	df	*t*	Sig.
Library access	4.00	4.88	28	-3.15	.002
Computer access	4.62	4.76	28	-.75	.458
Conscientiousness of site/class coordinator	5.00	4.54	23	3.08	.005
Accessibility of site/class coordinator	5.00	4.67	21	2.24	.036
Accessibility of departmental personnel	4.23	4.67	26	-1.72	.097
Class enrollment and registration procedures	4.31	4.51	27	-.618	.542

Hypothesis Two

Both groups either agreed or strongly agreed that the instructional procedures employed in the class provided them with opportunities to think critically, but there were some differences between the groups. The second null hypothesis, which states there is no difference in the perceptions of traditional on-campus learners and distance learners concerning opportunities to think critically was tested using independent samples t-tests. Table 3 contains a summary of the analysis for the significantly different variables as well as the summed scale.

Although the summed scale indicated no difference between distance learners (*M* = 3.90, *SD* = .39) and traditional learners (*M* = 3.81, *SD* = .22), t(31) = .78, p = .44 (two-tailed), the traditional format students (*M* = 4.50, *SD* = .51) agreed more strongly than the distance students (*M* = 3.85, *SD* = .99), t(31) = -2.15, p = .018 (two-tailed) that class discussion was generated

through various instructional techniques. According to the data, the distance students (M = 4.46, SD = .52) reported that critically thinking about specialized knowledge happened more often in their course than in the traditional course (M = 3.73, SD = .59), t(26) = 3.46, p = .002 (two-tailed). The data also shows that the distance learners (M = 4.62, SD = .51) thought the meaningful explanations were more helpful to creating opportunities for critical thinking than the traditional students (M = 4.20, SD = .41), t(26) = 4.20, p = .024 (two-tailed). The null hypothesis was rejected and the research hypothesis was retained.

Table 3
T-tests and means for statistically different items and the summated scale for perceptions of opportunities for critical thinking

Variable	Mean Distance	Mean Traditional	*df*	*t*	Sig.
Class discussions	3.85	4.50	31	-2.15	.018
Development of specialized knowledge	4.46	3.73	26	3.46	.002
Meaningful explanations	4.62	4.20	26	2.39	.024
Summated scale	3.90	3.81	31	.784	.440

Hypothesis Three

To evaluate whether or not there were differences in critical thinking disposition among students who chose either the distance format or the traditional format, the hypothesis, which stated there is no difference in critical thinking disposition score of traditional on-campus learners and distance learners was tested using analysis of variance (ANOVA) procedures. The CCTDI pretest and posttest total scores indicated that there was no significant difference in critical thinking disposition between the individuals who chose either the traditional or distance education form of instruction (see Table 4). Although the sample size was rather small and the variability was rather large, the third null hypothesis was accepted and the research hypothesis was rejected.

Table 4
Total pretest-posttest CCTDI scores

	Pretest			Posttest		
	M	*SD*	*n*	*M*	*SD*	*n*
Distance learners	307.65	16.97	20	309.54	29.46	13
Traditional learners	309.95	32.01	20	306.20	33.01	20
Total	308.83	25.51	40	307.52	31.23	33

Hypothesis Four

Pretest and posttest scores on the CCTDI were analyzed to determine the effect the critical thinking teaching procedures had on each of the groups. The fourth hypothesis, which states that there is no difference in the *change* of critical thinking disposition score of traditional on-campus learners and distance learners also utilized ANOVA procedures. Significant differences were found among the subscale scores. Table 5 summarizes the ANOVA procedures and outlines the statistical change from the pretest to the posttest.

At the .05 alpha level, the overall difference (M = .070) between the two groups was not significant, but traditional learners (M = 2.45) showed significant (p = .031) difference from the distance learners (M = -1.46) regarding positive change of the truth-seeking critical thinking disposition. Traditional learners (M = 1.15, p = .022) were also more apt to improve on the inquisitiveness scale than the distance learners (M = -3.46). The fourth null hypothesis was rejected and the research hypothesis was retained.

Table 5
Mean change in critical thinking dispositions

CCTDI Construct	Distance Mean Change	Traditional Mean Change	*df*	F	Sig.
Truth-seeking	-1.46	2.45	1,31	5.090	.031
Open-mindedness	.38	.01	1,31	.039	.846
Analyticity	-1.23	1.20	1,31	2.960	.095
Systematicity	-1.46	2.10	1,31	3.897	.057
Self-confidence	-1.08	-.80	1,31	.021	.885
Inquisitiveness	-3.46	1.15	1,31	5.786	.022
Maturity	-1.62	1.15	1,31	3.411	.074
Total	-7.15	5.20	1,31	3.520	.070

Conclusions

It appears from the results of this study that distance education instruction can be comparable to traditional instruction in terms of perceived course effectiveness and perceptions of opportunities to think critically on the parts of students. The finding that distance students didn't feel like the library was accessible is not a surprise, and provides evidence to support the need to investigate opportunities to bring university student support services, like the library, to distance students more effectively. Interestingly, the distance learners also felt the instructor was more attentive and conscientious as to their needs. This could have influenced distance students in terms of their perceptions as to the opportunities for critical thinking. On the other hand, the only variable those traditional students perceived as more beneficial than distance students for the creation of critical thinking opportunities was discussion. This indirectly supports the literature (Moore, 1989; Anderson & Garrison, 1995; Hilgenberg & Tolone, 1999; Smith & Castle, 1992), which addresses the importance of, as well as the challenges, in creating interaction opportunities in distance education.

In terms of fostering critical thinking, however, it appears that most of the critical thinking disposition constructs decreased for distance students, although the overall disposition score was not significantly different. It may be the case that distance students, due to background, experience, demographics, etc. exhibit critical thinking dispositions differently than traditional students, and are thus less likely to respond differently to instruction designed to foster these specific critical thinking dispositional constructs. It could also be that traditional students still have an advantage in being able to enjoy the benefits of the on-campus graduate student environment, which is designed for and which presumably provides opportunities to more easily engage in many forms of intellectual growth and development.

Potential limitations of the study include the fact that the sample size was relatively small. A larger sample would have been more powerful in terms of effect size, but the small class sizes determined the number of subjects in the study. The study was also conducted at one institution with one type of course. For these reasons the results of this study can only be generalized to students taking that course at that institution. However, the research design and attempt to control for extraneous variation by using the same instructor and curriculum make it a very replicable study and generalizations to similar students should yield similar results.

Interestingly, the overall CCTDI scores did not change for either group of students. One reason for this may be due to the lack of content or discipline specific critical thinking evaluation. Although the CCTDI remains the standard instrument used by researchers to evaluate critical thinking disposition, researchers such as Ennis (1989) believed that critical thinking should be discipline-specific. Based on the above, directions for further research would include looking at both discipline specific dispositions as well as skills. To that end, the researchers are currently engaged in developing reliable and valid discipline specific critical thinking skills measures to provide a clearer picture of the influence of certain teaching methods on the critical thinking of our students.

Recommendations

Educators in distance and traditional settings should use strategies that promote and improve critical thinking in their students. However, teachers and educational researchers working with distance students need to increase strategies that improve the specific critical thinking dispositions of *truth seeking* and *inquisitiveness*. Additionally, the inability of distance students to engage in discussion and dialogue compared to traditional students should be addressed by researchers. Research with the newest videoconferencing technology (i.e. Polycom) and critical thinking development in distance students should be conducted to improve to the dialogical relationship that promotes critical thinking.

It is clear that more research is needed to determine why distance and traditional learners seemed to be affected differently by the same types of critical thinking teaching strategies. Practitioners need to continue to explore ways to develop technology-based teaching strategies that build critical thinking dispositions and skills. Further replicable research should build on this study by using more classes and institutions that control for factors such as GPA, time, and subject specificity. Lastly, it is recommended that agricultural educators continue to design distance education curriculum with critical thinking in mind.

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The Relationship of Selected Teacher and Program Characteristics to Technology Adoption in Agriscience Education Programs

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Abstract

This study addressed factors related to the adoption of technology in secondary agriscience education programs. Agriscience teachers have adopted technology at a substantial level, although they can still do more with technology. Several factors are related to their adoption of technology. Those teachers with Internet connections at home, interactive CDs, laser disc player or standalone CD players, and teacher e-mail accounts adopt technology at a higher level. Also, teachers who are self-taught, who have attended college courses, or who have received training from colleagues, adopt technology at a higher level. Several teacher related factors are relevant to the adoption of technology: 1) As teachers perceive increased barriers to implementing technology in their instruction, their adoption of technology decreases; 2) As teachers experience increased technology anxiety, they are less likely to adopt technology in the teaching/learning process; and 3) Technology adoption increases as teachers perceptions of their own teaching effectiveness increases.

Teachers cannot adopt technology if they don't have it available for their use. Agriscience teachers should work with their school administrators to obtain the technology they need for instruction. Also, school administrators can play a role in removing or alleviating barriers to the adoption of technology. The fact that completion of college courses on the use of technology in instruction is related to technology adoption appears to document college teacher educators' impact on the technology proficiency of agriscience teachers. However, this impact does not appear to be substantial, and college teacher educators may need to improve the effectiveness of technology courses that are designed to prepare teachers to use technology in instruction. Participation in workshops and conferences does not result in increased technology adoption. Workshops and conferences do not have the depth provided in college courses, however, it appears that an assessment of their effectiveness and value is warranted.

Introduction and Theoretical Base

We live in a time of intense technological change, where change seems to be the only stable factor. In the 1970s, Toffler (1970) labeled this rapid change as "Future Shock." As a result, new products are impacting classrooms, which in turn is ". . . . causing more and more confusion about the best way to use it in schools" (Bailey, 1997, p. 57). For example, LCD projectors, Global Positioning Systems, CAD programs, and computers programs such as SimFarm and the Breeding game allow teachers to simulate situations related to the agricultural industry (Peiter & Sexten, 2001). Students no longer rely completely on the teacher for their answers. "The teacher's communications shifts from giving the answers to asking questions– from giving data to providing guiding hints so the student can find the information" (Taylor & Jeffries, 1994, p. 6).

There is little doubt that technology has had an important role in agriscience education. The Internet alone has opened the door to a wealth of information. For example, a search for 'agriculture education' can result in 560,000 web pages in just 0.53 seconds (Shinn, 2001). With the vast information available today, Shinn stresses that learners must be able to critically assess the information they read, whether on the Internet, or in a textbook. He also said that "Teachers are no longer gatekeepers to information, but must be able to help learners interpret data, check for biased sources, and draw conclusions from mixed findings" (p. 4).

"Today's students need not only to know how to learn, but how to analyze and summarize data, make decisions, work in teams, plan solutions to complex problems and be capable of adapting to the unexpected" (Dwyer, 1999, p. 300). Dwyer points out that the traditional learning paradigm is still being used in which teachers lecture while students listen, take notes and demonstrate mastery on objective exams. This paradigm does not provide learners with the necessary knowledge, skills, and attitudes (KSA) for the modern work world. Dwyer stated that technology based learning environments can help students acquire the type of KSAs needed for success. "If the integration of technology in the classroom in the next ten years is to look any different from the last ten, we must focus time, money, and resources in the areas that can have the greatest impact for our students, our teachers" (Fabry & Higgs, 1997, p. 393).

Availability and Adoption of Technology

Schools have made significant progress in implementing technology in helping teachers to use basic technology tools, but they still struggle with integrating technology into the curriculum (Office of Technology Assessment, 1995). Glenn (1997) stated that public support for technology in schools is ". . . . strong and vocal, and there is an expectation that no school can prepare students for tomorrow's society if new technologies are not available for students" (p. 123). Glenn maintained that teacher training has focused on " . . . . word processing, test construction, automated transparency creation, and grading rather than creating a different learning environment" (p. 126). However, the National Center for Education Statistics (2000) studied the use of various technologies in the teaching/learning process. They reported the examples of how teachers had used technology, including computer applications, practice drills, research using the Internet, solving problems, analyzing data, research using CD-ROMs,

multimedia reports/projects, graphical presentations, demonstrations/simulations, and student correspondence with others over the Internet.

"Technology can play a vital role in helping students meet higher standards and perform at increased levels by promoting alternative, innovative approaches to teaching and learning" (George, 2000, p. 57). George emphasized that technology is not a substitute for quality teaching, but it can enhance teaching and learning.

In testimony to a joint committee hearing of the U.S. House of Representatives, Dede (1995) indicated that teachers must use technology in a new model of education he called distributed learning to develop and sustain knowledge webs, virtual communities, shared synthetic environments, and sensory immersion. Unfortunately, the focus of technology implementation efforts has been the ". . . . automating of marginally effective models of presentational teaching, rather than innovating via new models of learning through doing" (p.55). Dede indicated that the knowledge webs would incorporate shared investigations, authentic environments, experts and archival resources. These knowledge webs will be implemented over the next two decades.

Glenn (1997) maintained that teacher education efforts must " . . . . begin to integrate student learning, pedagogy, and technology into a wholistic approach" (p. 128). Glenn also indicated that professional development must provide the time and opportunity to participate in collaborative learning and develop creative innovative environments.

What should technology utilization in the teaching/learning process look like? According to George (2000), technology utilization requires 1) a long-term plan for using technology in all aspects of teaching and learning, 2) a technology resource specialist, 3) the incorporation of technology as an integral part of instruction, and 3) professional development for teachers. "Curriculum integration is central if technology is to become a truly effective educational resource, yet integration is a difficult, time consuming, and resource-intensive endeavor" (Office of Technology Assessment, 1995, p. 1).

Technology Training

A task force of the National Council for the Accreditation of Teacher Education (1997) concluded that colleges are not properly preparing teachers to use technology in their teaching. The report stated, "Bluntly, a majority of teacher education programs are falling far short of what needs to be done" (p. 6). Teachers will be less inclined to use technology in their classrooms if college teacher educators do not model the use of technology in their classrooms (Zehr, 1997). Smerdon, et al., 2000 cited several factors that were related to technology adoption, including sources of training–college, graduate work, professional development, and independent learning; availability of technology at school and at home; availability of time in the school schedule for student computer use; and technical support for technology.

Sandholtz, Ringstaff and Dwyer (1997) described an evolutionary process that teachers go through as they continue to increase their use of technology. They described five phases: 1) Entry – teachers adapt to changes in physical environment created by technology; 2) Adoption -

teachers use technology to support text-based instruction; 3) Adaptation – teachers integrate the use of word processing and databases into the teaching process; 4) Appropriation – teachers change their personal attitudes toward technology, and 5) Invention – teachers have mastered the technology and create novel learning environments. Sheingold and Hadley (1990) found that teachers needed five to six years of working with technology before they felt they had developed expertise, and that once they were at this level, they modified instructional strategies and dramatically changed the classroom environment.

Barriers to the Implementation of Technology

Kerr (1989) stated that " . . . . the teacher's world is substantially limited by powerful social and administrative pressures to teach in a particular way" (p. 5). In his 1997 article, Glenn supported Kerr by noting that the organizational structure of schools inhibits teachers' efforts to learn about new technologies and resists innovation.

Fabry and Higgs (1997) found that the major issues in the implementation of technology in the teaching/learning process were: resistance to change, teachers' attitudes, training, time, access, and cost. This is supported by a study by Smerdon, et al. (2000) in which they found that the barriers to the use of the Internet and computers for instruction included lack of computers, lack of release time for teachers to learn how to use technology, and lack of time in the school schedule for student computer use. This was also supported by George (2000) who indicated that the primary obstacle in incorporating technology in the teaching/learning process is the lack of expertise, time, and funds.

Zisow (2000) stated that "Technology is merely a tool. . . . . The key in adapting new technologies lies in teacher style, not technology" (p. 36). Zisow also claimed that whether technology was utilized in the teaching/learning process was dependent on the teaching style of the teacher.

Budin (1999) stated that, until recently, schools had their priorities backwards. They were more concerned with acquiring equipment and software rather than emphasizing staff development and planning for the use of technology. Budin questioned what will happen to support for technology utilization in the future if funding for technology results in test scores, student writing, and other measures that fail to live up to expectations. Budin indicated that curriculum, teacher training, and research have received minimal attention. He also indicated that the use of technology needs to be reconceptualized, in areas such as students and teachers' roles in using technology, how technology fits into the curriculum, what teachers should know and how teachers will learn about technology, and how we should assess the impact of technology. Bosch (1993) reported that teachers did not see computers as part of the normal classroom process and often used them for ancillary activities. He recommended that administrators look beyond the number of computers in schools and determine how computers are being used.

Teaching Effectiveness

"The mere presence of technology in a school or classroom is not guarantee that it will be used effectively. The teacher is the central figure who essentially decides whether to utilize computer technology in the classroom and therefore needs to be aware of or have a basic understanding of how the technology can be integrated and effectively used in the classroom" (Hardy, 1998, p.119).

A critical element in technology adoption is its relationship to teaching effectiveness. Lu and Molstad (1999) defined instruction as ". . . . the process including all the activities purported to influence learners toward some predetermined goal" (169). Lu and Molstad (1999) cited ways technology can improve instructional effectiveness, including 1) multimedia packages allow teachers to interact with large groups, lead discussions, individualize instruction, and direct student attention to key details in the presentation; 2) telecommunication tools allow teachers to communicate with students and other teachers, encouraging articulation of ideas and collaboration; 3) technology enhances students' problem-solving ability; and 4) technology motivates students to learn.

Byron (1995) listed several shortcomings related to teacher effectiveness when using technology in instruction. These shortcomings included the lack of faculty training on the use in instructional technology, classrooms that were not designed to support the use of technology, teachers' doubts about whether technology would improve their performance, and teachers' concerns about whether technology enhances or detracts from teaching and learning.

Technology Anxiety

Most of the research on technology related anxiety has been conducted in the area of computer anxiety and using computers as program or instructional management tools (grade books, databases, presentations, etc.) for teacher use. Fletcher and Deeds (1994) and Kotrlik and Smith (1989) both found that no difference existed in the computer anxiety of agriculture teachers and the norm for other professionals reported by Oetting (1983), and it was reported in both studies that level of computer skills was a significant explanatory variable of computer anxiety. In addition, Kotrlik and Smith found that no differences existed in computer anxiety among teachers from various vocational fields, namely, agriculture, home economics, business, and industrial arts, and that four variables explained a substantial proportion of the variance in computer anxiety, namely, principal's support of computer use, computer availability at school, perceived mathematical ability, and whether the teacher had received formal computer training.

Budin (1999) stated that the placement of technology into classrooms without teacher preparation and curriculum considerations has produced high levels of anxiety among teachers. This relationship may also exist for all types of technology. Russell (1995) identified six stages that naive users go through when learning to use technology: awareness, learning the process, understanding an application of the process, familiarity and competence, adaptation to other contexts, and creative application to new contexts. "Understanding the stages of learning to use the technology empowers the learner through the knowledge that the feelings of tension and

frustration will be overcome" (p. 173). Teachers understanding of these stages will assist them to reduce their anxiety level and pass through the stages more rapidly.

Statement of the Problem

The theoretical base has demonstrated the need for technology in instruction. Numerous studies have been conducted in an attempt to determine how agriscience teachers use technology; however, no studies have been conducted to determine factors that may be related to the adoption of technology in instructional delivery. For this study, technology has been defined as "Employing the Internet, computers, CD-ROMs, interactive media, satellites, teleconferencing, and other technological means to support, enhance, inspire and create learning."

Purpose

This study addressed the adoption of technology in the teaching/learning process by agriscience teachers. The objectives were to:

1. describe the adoption of technology;
2. determine if the availability of technology was related to the adoption of technology in the teaching/learning process;
3. determine if the sources of technology training were related to the adoption of technology in the teaching/learning process;
4. determine if perceptions of technology barriers were related to the adoption of technology in the teaching/learning process;
5. determine if technology anxiety was related to the adoption of technology in the teaching/learning process; and
6. determine if teachers' perceptions of their teaching effectiveness was related to the adoption of technology in the teaching/learning process.

Procedures

Data Source. The population included all secondary agriscience education teachers listed in the directory maintained by the Louisiana Vocational Agriculture Teachers Association. A random sample of 203 teachers was drawn based on Cochran's (1977) sample size formula. After two mailings and a telephone follow-up, 115 teachers returned their surveys for a response rate of 56.7%.

To determine if the sample was representative of the population, *t*-tests were used to compare the grand means of the technology adoption scale, the perceptions of technology barriers scale, and the perceptions of teaching effectiveness scale by response mode (mail or telephone) as recommended by Borg (1987) and Miller and Smith (1983) (See Table 1). These scales are described in the "Data Collection Instrument" discussion below. The grand means of these scales were selected for analysis because they were key variables of interest. No statistically significant differences were found between the means by response mode. It was concluded that the data were representative of the population and the data were combined for further analyses.

Data Collection Instrument. Data were collected using three Scales: Technology Adoption in the Teaching/Learning Process, Perceptions of Barriers to the Adoption of Technology in the Teaching/Learning Process, and Teachers' Perceptions of Their Own Teaching Effectiveness. In addition, information on demographic characteristics of the respondents, technology availability, and technology training was collected. The scales and all questions in the instrument were developed after a review of the literature guided by the theoretical base. The face and content validity of the instrument was evaluated by an expert panel of faculty and doctoral level graduate students. The instrument was pilot tested with agriscience education teachers and needed revisions identified during the pilot test were incorporated into the instrument. These revisions included wording of the instructions and questions. The standards for instrument reliability for Cronbach's alpha by Robinson, Shaver and Wrightsman (1991) were used to judge the quality of the three scales: .80 - 1.00 - exemplary reliability, .70 - .79 - extensive reliability, .60 - .69 - moderate reliability, and <.60 - minimal reliability. All three scales possessed exemplary reliability. Internal consistency coefficients using Cronbach's *alpha* were .97 for the Technology Adoption Scale, .82 for the Technology Barriers Scale, and .87 for the Teachers' Perceptions of Their Own Teaching Effectiveness Scale.

Table 1.
Comparison of Scale Means by Response Wave[a]

Scale	*M*	*SD*	Levene's Test for Equality of Variances		*t*-test for Equality of Means	
			F	*P*	*t*	*P*
Technology Adoption Scale	2.72	.92	.41	.52	.77	.445
Perceived Technology Barriers Scale	2.53	.57	.20	.66	.07	.943
Perceived Teaching Effectiveness Scale	3.57	.59	.17	.69	.07	.944

Note. $N = 115$. Levene's test for the equality of variances did not result in a significant F value, therefore, equality of variances was assumed.
[a]Two response waves: responded after one of the first two mailings, or responded after phone follow-up.

Analyses of Data. Descriptive statistics were used to describe the data. Pearson correlation coefficients and the set of descriptors proposed by Davis (1971) were used to analyze correlations between continuous variables. The descriptors are as follows: .70 or higher - very strong association, .50 to .69 - substantial association, .30 to .49 - moderate association, .10 to .29 - low association, and .01 to .09 - negligible association. Point bi-serial correlations and the set of descriptors proposed by Davis (1971) were used to analyze the correlations between nominal and continuous variables.

Results

Over two-thirds of the agriscience teachers (67.8%) had a computer in their office and two-thirds had an office computer connected to the Internet (66.1%). Many had computers and Internet connections at home even though they did not have them at school. Most of the teachers had a home computer (90.4%) and Internet access at home (84.3%). Almost three-fourths (73.0%) had e-mail accounts, while 39.1% had interactive CDs, 16.5% had laser disc players or standalone CD players, and 14.3% reported their students had e-mail accounts.

Most of the teachers (86.1%) used workshops and conferences as their source of technology training more than any other source. Other sources included self-taught (73.0%), colleagues (59.1%), and college courses (43.5%). Most of the teachers (84.3%) were male, their mean age was 43.58 (*SD* = 10.95), and their average years of teaching was 17.41 (*SD* = 10.82).

The Adoption of Technology. The teachers responded to the 15 statements in the adoption of technology in the teaching/learning process scale using a five-point Likert type scale that ranged from 1 (not like me at all) to 5 (just like me). The scale included items such as "I emphasize the use of technology as a learning tool in my classroom or laboratory" and "I assign students to use the computer to do content related activities on a regular basis." The scale was designed so that higher responses on the scale indicated a more substantial adoption of technology than was indicated by the lower responses. The adoption of technology scale grand mean was 2.73 (*SD* = .92), which indicated that the teachers perceived the items in the technology adoption scale were "some like me." Since higher grand means on this scale indicated higher technology adoption, this indicates that agriscience teachers had adopted technology at a moderate level.

Technology Barriers. The perceived technology barriers scale contained 11 items. The teachers responded using a four-point Likert type scale, that ranged from 1 (not a barrier) to 4 (major barrier). The scale included items such as "availability of technology for the number of students in my classes," "access to the Internet at my school," and "having enough time to develop lessons that utilize technology." The scale was designed so that higher responses on the scale indicated more substantial perceived barriers. The perceived technology barriers scale grand mean was 2.53 (*SD* = .57), which indicated that the agriscience teachers perceived moderate barriers existed.

Teaching Effectiveness. A researcher developed scale was used to determine the teachers' perceptions of their own teaching effectiveness. The teachers responded to seven items using the following Likert type scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, and 5 = Strongly Agree. All items in this scale were worded in superlative language– strongly agreeing with the statements in this scale indicated the teacher perceived they were excellent in their teaching effectiveness. The items included statements such as "I am among the very best teachers at my school" and "My students would rate me as one of the very best teachers they have ever had." The grand mean of *M* = 3.57 (*SD* = .59) revealed that teachers agreed with the construct measured by this scale, which indicates that they perceive they are effective teachers.

Technology Anxiety. A single item was used to assess the teachers level of technology anxiety, "How much anxiety do you feel when you think about using technology in your instruction?" The teachers responded using the following scale: 1 = No Anxiety, 2 = Some Anxiety, 3 = Moderate Anxiety, and 4 = High Anxiety. Agriscience teachers felt some anxiety (*M* = 1.88, *SD* = .85) when they thought about using technology in their instruction.

Relationship of Technology Availability to Technology Adoption. Point bi-serial correlations were used to determine if statistically significant correlations existed between the availability of selected technology and their technology adoption scale grand mean. A moderate association existed between teachers having two types of technology and the technology adoption scale grand mean, namely, an Internet connection at home and interactive CDs. Also, a moderate relationship existed for teachers who had a teacher e-mail account, a computer at

home, or laser disc or standalone CD players. Teachers with the technology listed adopted technology in their teaching at a higher level (See Table 2).

Relationship of Technology Training Sources to Technology Adoption. The respondents were asked about their sources of technology training. Point bi-serial correlations were used to determine if statistically significant correlations existed between their use of these training sources and their technology adoption scale grand mean. There was a moderate positive association between agriscience teachers reporting they received their technology training through self-taught activities and the technology adoption scale grand mean. There was a low positive association between teachers receiving technology training in college courses and from colleagues, and the technology adoption scale grand mean. Teachers who had received training by self-directed activities, in college courses, and from colleagues had adopted technology at a higher level than teachers who had not received training from these sources (See Table 3).

Table 2
Point Bi-Serial Correlations between the Availability of Technology for Use in Teaching and the Technology Adoption Scale Grand Mean

Technology	r_{pb}	*P*	Effect Size
Internet connection at home	0.33	0.000	Moderate association
Interactive CDs	0.33	0.000	Moderate association
Teacher e-mail account	0.28	0.003	Low association
Computer at home	0.24	0.011	Low association
Laser disc player or standalone CD players	0.22	0.019	Low association
Student e-mail accounts	0.12	0.198	Negligible association
Computer in their office	0.11	0.268	Negligible association
Internet connection in their office	0.10	0.277	Negligible association

Note. *N* = 201. Effect sizes were interpreted using the set of effect size descriptors proposed by Davis (1971).
[a]Respondents checked (/) the technology they had available for use in teaching.

Table 3. *Point Bi-Serial Correlations between Sources of Training and the Technology Adoption Scale Grand Mean*

Source of Training[a]	r_{pb}	*P*	Effect Size
Self-taught	0.30	0.001	Moderate association
College courses	0.25	0.008	Low association
Colleagues	0.21	0.026	Low association
Workshops/conferences	0.06	0.558	Negligible association

Note. *N* = 201. Effect sizes were interpreted using the set of effect size descriptors proposed by Davis (1971).
[a]Respondents checked the sources (/) they had used for their technology training.

Relationship of Perceived Technology Barriers to the Adoption of Technology. A Pearson correlation coefficient was used to determine if a statistically significant correlation existed between the perceived barriers scale grand mean and their technology adoption scale grand mean. There was a moderate negative association between teachers perceptions of barriers to the adoption of technology scale grand mean and the adoption of technology scale grand mean. As teachers' perceived increased barriers to adopting technology, technology adoption decreased ($r = -.42$, $p < .001$).

Relationship of Technology Anxiety to Technology Adoption. A Pearson correlation coefficient was used to determine if a statistically significant correlation existed between teachers' technology anxiety levels and their technology adoption scale grand mean. There was a moderate negative association between the teachers' technology anxiety level and their level of technology adoption. As technology anxiety increased, adoption of technology decreased. ($r = -37$, $p < .001$).

Relationship of Perceived Teaching Effectiveness to the Adoption of Technology. A Pearson correlation coefficient was used to determine if a statistically significant correlation existed between the perceived teaching effectiveness scale grand mean and their technology adoption scale grand mean. There was a low positive association between teachers' perceptions of their teaching effectiveness and the adoption of technology scale grand mean. As teachers' perceptions of their own teaching effectiveness increased, technology adoption increased ($r = .20$, $p < .001$).

Conclusions

It was concluded that agriscience teachers have adopted technology at a substantial level, although they can still do more with technology. Several factors are related to their adoption of technology. One obviously important factor is the availability of technology. Those teachers with Internet connections at home, Interactive CDs, laser disc player or standalone CD players, and teacher e-mail accounts adopt technology at a higher level. However, having student e-mail accounts, a computer in their office, and a computer with Internet connection in their office does not result in increased technology adoption.

It was also concluded that another factor that is of interest to teacher educators and other teacher development professionals is the relationship of teachers' sources of training with their technology adoption. Those teachers who are self-taught, who have attended college courses or who have received training from colleagues adopt technology at a higher level. Conversely, no change in adoption occurs for those teachers who received training in workshops and conferences.

Several teacher factors are relevant to the adoption of technology. Their adoption of technology decreases as perceived barriers to the implementation of technology increases. Also, as they experience increased technology anxiety, they are less likely to adopt technology in the teaching/learning process. And technology adoption increases as teachers perceptions of their own teaching effectiveness increases.

Recommendations and Implications

This study has substantial implications for agriscience teacher educators, other teacher development professionals, and school administrators. First, teachers cannot adopt technology if they don't have it available for their use. Agriscience teachers should work with their school administrators to obtain the technology they need for instruction. Also, school administrators can play a role in removing or alleviating barriers to the adoption of technology.

The fact that completion of college courses on the use of technology in instruction is related to technology adoption appears to document teacher educators' impact on the teachers' proficiency with technology. However, this impact does not appear to be substantial, and teacher educators should work to improve the effectiveness of technology courses that are designed to prepare teachers to use technology in instruction. Of greatest concern in the area of teacher training is the fact that participation in workshops and conferences does not result in increased technology adoption. It is recognized that workshops and conferences do not have the depth provided in college courses; however, it appears that an assessment of the effectiveness and value of workshops and conferences is warranted.

From a secondary agriscience education perspective, a need exists for teachers to work toward the adoption of technology in their programs in a way that will enhance agriscience programs. The use of technology in instruction has become very pervasive in all areas of education, including agriscience education, and agriscience educators should be leaders in efforts to maximize the potential of technology in instruction. With the pervasive impact of technology on students' and teachers' careers and lives, teachers must emphasize knowledge acquisition and management, analysis, and application to the teaching/learning process. This requires agriscience teachers to anticipate changes in the use of technology and to pursue opportunities to upgrade their ability to use technology in instruction

The fact that teachers' self-perceived effectiveness is related to technology adoption has several implications. Does this relationship exist simply because better teachers do everything they can to improve their instruction? Do administrators provide more support in the form of technology and training to those teachers who they perceived are "better" teachers? Or, does technology have a direct result of improved instruction. These questions demand definitive answers and additional research should be conducted in agriscience education to determine the impact of technology on instructional quality.

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A Comparison of On-Campus and Distance Students Progress Through an Asynchronously Delivered Web-Based Course

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Abstract

The purpose of this study was to compare on-campus and distance students' progress through an asynchronously delivered Web-based course. Content analysis techniques were used to describe on-campus and distance student behavior in a graduate course delivered asynchronously over the Web. Students had 114 days to complete and submit all materials. No time constraints were placed on students as to when assignments should be submitted. Findings showed that on-campus students engaged earlier, remain engaged longer, and completed the course sooner than distance students. On-campus students and distance students' overall performance in the course as measured by accumulation of points on assignments was similar. Four major recommendations include: "firm" time-goals for courses delivered asynchronously; provide students the ability (within time-goals) to move through asynchronously delivered courses as fast or slow as *students* choose; evaluating the appropriateness and effectiveness of feedback provided by faculty on assignments; and continue to measure academic rigor of courses delivered using distance education methods.

Introduction

One of the touted benefits of distance learning is the opportunity for faculty to develop individualized instructional sequences for students based on students' unique competencies (Dooley, & Lindner, 2002). Such instruction affords students a greater opportunity to draw upon a variety of academic fields and knowledge bases to achieve personal and professional goals (Lindner, & Dooley, 2002). While academic rigor of courses delivered at a distance are similar to those offered on campus, distance students are less likely to constructively communicate with other students and teachers (Miller, & Pilcher, 2000a).

Since the technology was developed that enables students to learn from a distance, educators have been concerned about ways to maximize their learning (Lindner, Dooley, & Murphy, 2001). The literature has thus far failed to identify significant differences in the nature or personality of distance learners and learners in a traditional setting. For example, in a comparison of Web-based and traditional classroom courses student temperament was not shown to affect the outcome of learning or satisfaction with the course (Stokes, 2001). Lindner and Murphy (2001) showed that the use of Web-course tools could contribute to a student's ability to accomplish course objectives.

Yet distance learners struggle with a unique set of challenges that often lead to non-completion of courses. High attrition rates of students enrolled in distance education courses are a concern of distance educators. (Wickersham & Dooley, 2001). But in order to improve the completion rate, we must first understand the challenges that distance learners face and the coping behaviors that they adopt. A closer look at student behaviors in distance education has shown, for instance, that distance students are less likely to constructively communicate with other students and teachers (Lindner, & Murphy, 2001; Miller & Pilcher 2000a). Further, distance students have varying levels of motivation, different life experiences, and require different levels of directions from instructors (Merriam, 2002).

An explanation of why such qualities lead to non-completion of distance courses is offered by the theory of andragogy. According to Knowles, Holton, & Swanson (1998) adults start to learn again when circumstances in life require additional learning. Adult learning professionals are more effective when they recognize and understand the motivating factors behind adult learning needs. Knowles' version of andragogy presents the individual learner as one who is independent and development oriented (Merriam, 2002). With acceptance of this viewpoint, one could expect a higher rate of incomplete course work from those enrolled in distance education courses. Self-directed learning will, by definition, have students beginning, pausing, stopping or completing their required lessons at their own preferred rate.

Educators have tried a variety of strategies in an attempt to help distance learners overcome their unique challenges successfully. One of the touted benefits of distance learning is the opportunity for faculty to develop individualized instructional sequences for students based on students' unique competencies (Dooley & Lindner, 2002). Such instruction affords students a greater opportunity to draw upon a variety of academic fields and knowledge bases to achieve personal and professional goals (Lindner & Dooley, 2002). While the academic rigor of courses delivered at a distance is similar to those offered on campus, instructional direction requirements

can and should range from continuous input from instructors to leaving students to be self-directed.

The literature identifies more steps that instructors can take to lower attrition in distance education courses. Instructors in Web-based courses should have a methodology to determine the level of involvement of students in the learning process (Pappas, Lederman, & Broadbent, 2001). The facilitator should look toward the initial engagement, continuous engagement, the completion of the course and the students' performance in the course as indicators of satisfaction with the method of instruction, whether the course is offered in a traditional classroom or Web-based setting. An assumption underlying andragogy is that adults are motivated internally rather than externally (Merriam, 2001). With this in mind, it is necessary to retain in Web-based courses many of the same aptitudes, abilities, and dedication as is required in traditional classes, albeit sometimes in a different format.

Distance education students requiring help may receive it in a different format than students in classroom settings (Taplin, Yum, Jegede, Fan, & Chan, 2001). It is necessary for the instructor to maintain a sense of community regardless of where the learning takes place. While this is readily accomplished in a classroom setting, it requires a little more planning and effort for Web-based courses (Brown, 2001). In short, effective learning seems to require student engagement (Kearsley & Shneiderman, 1999).

Instructor behaviors alone cannot determine student success rate, however. Another factor in distance education that is important to study is course design. In particular, the unique challenges faced by distance learners may be exacerbated when the course is offered asynchronously. This method of instruction and education is the result of an attempt to provide flexibility for work time and place. It usually involves learning material, discussions, written assignments, and grading results all taking place at a distance and over the Internet. In asynchronous courses, the course may have a definite start and completion date or it may have a flexible beginning and end. While asynchronous courses may seem to conform to the principles of andragogy and thus have wide appeal for adult learners, the literature has not yet shown that distance learners are more successful in any particular format.

Theoretical Framework

In examining possible differences between on-campus student performance and distance student performance in an asynchronously delivered course four research areas of interest are described.

The first area of interest concerns whether the level of learning remains the same for on-campus and distance learners. Academic rigor has been perceived as being less for off-campus courses compared to the rigor of on-campus courses. This perception was not tied to involvement in either the faculty development programs of the distance education courses or to teaching experience in distance education (Miller, & Ching-Chun, 1999). Here the implication is that pedagogy rather than andragogy is the preferred philosophy of instruction for this group of professors.

A second area of interest is whether distance education students are as satisfied with the course as are the on-campus students. Murphy (2000) has found equal satisfaction among students for courses that were delivered at a distance when compared to the same course offered on campus. Williams' (2000) work shows students felt that online courses required extra work on their part, enabled teachers to shift a portion of the teachers work back to students, and transferred to students printing costs they felt belonged to the institution.

The melding of course content with the learning of the technology to deliver it via the Web has been ascribed as beneficial to students (Daugherty, & Funke, 1998). In this study Daugherty and Funke's students pointed to the convenience, current worldwide information, and stronger motivation to work as being benefits of web learning.

The third area of interest is the quality of education and whether it is the same at distance learning endeavors as the quality of education on-campus. At Iowa State University, the Agriculture faculty perceptions of the quality of off-campus courses were perceived to be lower than on-campus courses (Miller & Ching-Chun, 1999). Students "felt" off-campus courses to be of lower quality than on-campus courses (Miller & Pilcher, 2000b).

Miller and Pilcher (2001) found that instructors reached only some of the desired levels of cognitive learning in distance education compared to the levels reached on campus in the same course. The instructors exceeded their expectations in the "remembering" and "processing" cognitive outcomes. The "creating" and "evaluation" cognitive outcomes were below the desired results (Miller, & Pilcher, 2001).

A final area of interest is the effect of asynchronous delivery. As Agricultural Education and other disciplines move more to distributed models of teaching and learning, more information is needed about asynchronous delivery of course content. In particular, it is important to determine whether there is a difference between on-campus student progress and performance and distance student progress and performance in an asynchronously delivered course. While the principles of andragogy seem to point to the superiority of such a course design for adult learners, the impact on student success and completion rate has yet to be mapped. For instance, there may be differences in student success rates between entirely asynchronous and partially asynchronous courses. Students might begin and end their engagement in asynchronous courses in a unique pattern, compared to students in synchronous courses. It has not yet been determined what impact their schedule of engagement might have on their successful performance in the course.

The present study examined on-campus and distance students' progress and performance through an asynchronously delivered Web-based graduate course in Agricultural Education. The results of this analysis may have implications for both distance instructor behaviors and for program design.

Purpose

The purpose of this study was to compare on-campus and distance students' progress through an asynchronously delivered Web-based course.

Several key questions guided the analysis of each student's progress and performance in the course.

1. When will students begin and end engagement in the course?
2. How long will students remain engaged in the course?
3. How will the students perform in an entirely asynchronously delivered course?

Methods

For this descriptive and historical research, content analysis techniques were used by the researchers to analyze students' engagement and achievement in a graduate course delivered asynchronously to both on-campus and distance students. "Content analysis is a technique that enables researchers to study human behavior in an indirect way, through an analysis of their communications" (Fraenkel, & Wallen, 1999, p. 405). The content analysis for this study consisted of both qualitative and descriptive techniques as described by Fraenkel and Wallen.

As with any study, it is important for the researcher to establish internal validity, external validity, reliability, and objectivity. However, in the qualitative paradigm these terms are referred to as credibility, transferability, dependability, and confirmability. Credibility and dependability were established by using the technique of triangulation. Member checks were conducted by providing respondents with a summary of the data to correct any misinterpretations. The description of the data provides sufficient detail and/or richness so that the reader can interpret and make meaning of the data (thick description), thus establishing transferability. And finally, confirmability was established by conducting an audit trail. The researchers used a variety of qualitative methods to ensure truth-value, applicability, consistency, and neutrality as described below (Erlandson, Harris, Skipper & Allen, 1993).

The naturalistic setting for this study was students enrolled in a graduate course entitled *Principles of Adult Education* during the Spring 2002 semester. This course was a departure from our usual design for graduate-level distance education courses. Unlike our other distance-delivered graduate course offerings that have included and even emphasized the use of synchronous delivery strategies (face to face meetings, audio and videoconferencing), this course employed only the asynchronous technologies and delivery strategies available through WebCT. Regardless of the location of the student, no synchronous interaction was planned or conducted. There were 24 students enrolled in the course (17 distance students and 7 on-campus students). WebCT is a commercial software set of Web course-development tools for creating instructional environments at a distance (WebCT, 2001).

Students had 114 days to complete and submit all materials. January 14, 2002 was the first day students could submit assignments and May 7, 2002 was the last day. No time constraints were placed on students as to when assignments should be submitted. Students were provided the following written instructions.

> Welcome to AGED 610 "Principles of Adult Education". This course is designed to be asynchronously delivered...meaning you can work on meeting the course

objectives at any time or location. You can also work on most assignments out of sequence. For example, you may wish to work on Module 1 and 4 before working on Module 2 and 3.

There are 14 course modules that you will work through over the semester. You will complete 12 assignments along the way (ALL ASSIGNMENTS MUST BE SUBMITTED THROUGH WEBCT'S ASSIGNMENT FEATURE): Four reaction papers; four argument papers; twenty online discussion postings; one student led instruction; one learning contract; and one application project.

ALL ASSIGNMENTS ARE DUE MAY 7, 2002.

The data collection instrument was based on the research questions. Four categories were used to classify the data. Initial engagement was defined operationally as the first day students submitted an assignment. Continuous engagement was defined operationally as the number of days between the submission of the first and last assignment. Completion of course was defined operationally as the last day students submitted an assignment. Performance in course was defined operationally as the percentage of points earned on each assignment and overall.

Additionally on-campus and distance learners were interviewed via telephone to help the researchers gain a thicker description of why students engaged and performed as they did. These students represented those on-campus (OCE) and distance students (DE) that engaged early and those on-campus (OCL) and distance students (DL) that completed the course late.

The researchers recognize the design limitations of using intact classes. Caution is warranted against transferring these findings beyond this class. Additional research is needed to support and prove the transferability of findings and recommendations to other naturalistic settings.

Findings

The findings of this study were reported in four areas: initial engagement, continuous engagement, completion of course, and performance in course.

Initial Engagement

Overall students' initial engagement in the course varied (Min=4 days to engage; Max=113 days to engage). Students, on average, initially engaged in the course approximately 43 days (SD=39.5) after the beginning of the course. The first quarter of the students began submitting materials online within eight days of the start of the course. The second quarter of students began submitting materials online between 12 and 21 days. The third quarter of students began submitting materials online between 25 and 83 days. The fourth quarter of students began submitting materials online between 83 and 113 days.

As shown in Figure 1, on average, on-campus students (M=20.9 days to engage; SD 9.3) tended to engage in the asynchronously delivered course over 30 days sooner than distance students (M=43.6 days to engage; SD=43.6).

When asked why did they begin the course when they did, students noted several reasons. One on-campus student who submitted the first assignment early noted they did so in order, "To finish it. It was the first day I could get on." (OCE) A distance student that submitted early stated that they "had intentions to use every Wednesday and so the first Wednesday that came up after classes began I got in there and did it." (DE)

One on-campus student who submitted the first assignment late noted "I wanted to submit my assignments as soon as my officemate did. So when she submitted hers, I submitted mine." (OCL) A distance student that submitted late stated that "when I had mentally gone through what I needed to do to complete the first assignment and had it prepared. I logged on and sent it in." (DL)

Student achievement on the first assignment was similar for on-campus and distance students regardless of when a student initially engage in the course. The average score for all students on the first assignment was 92.4%. On-campus students averaged 94.2% and distance students averaged 91.6% on the first assignment.

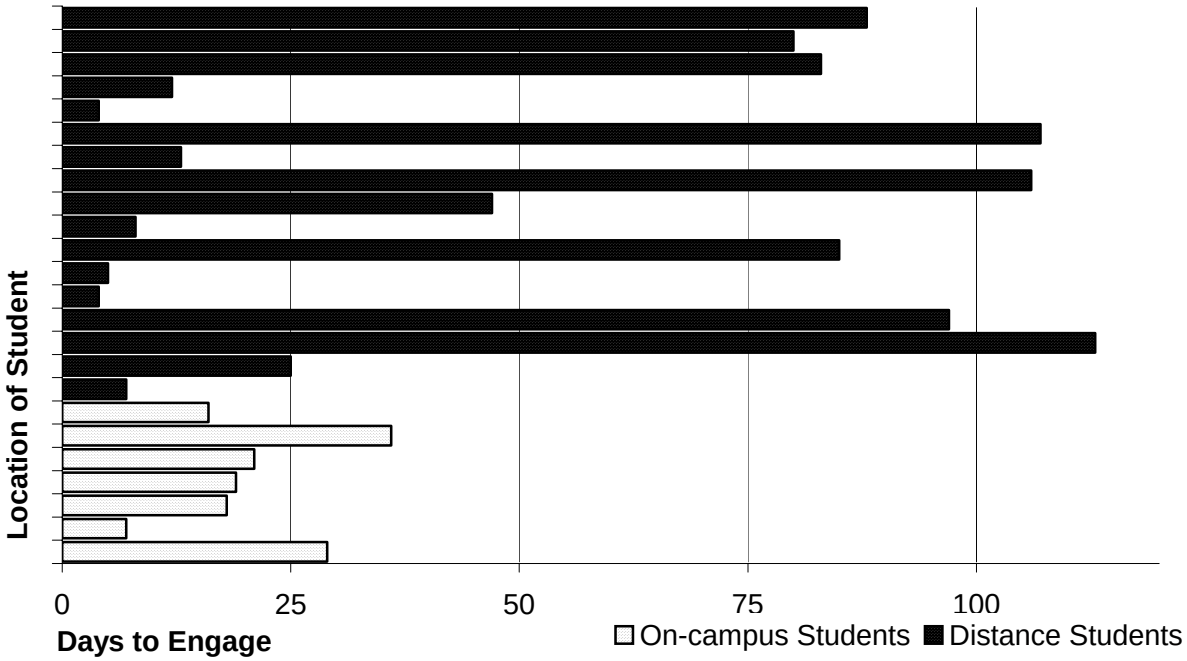

Figure 1. Initial engagement in course by location of student.

Continuous Engagement

Overall students' continuous engagement in the course varied (Min=1 day engaged; Max=110 days engaged). Students, on average, engaged in the course approximately 58 days (SD=32.2) after initial engagement. The first quartile of the students engaged in the course for

79 to 110 days. The second quartile of students engaged in the course for 69 and 77 days. The third quartile engaged in the course between 30 and 67 days. The fourth quartile engaged in the course between 1 and 27 days.

As shown in Figure 2, on average, on-campus students (M=74.2 days engaged; SD 12.1) tended to engage in the asynchronously delivered course over 23 days longer than distance students (M=51.2 days engaged; SD=35.6).

The following are representative responses to why students spent as much time on the course website as they did and whether they spent more time "engaged" in the course while off-line or while on-line. Most students spent more time engaged off-line as represented by the following comments. "I spent more time engaged in the course off-line. I read the book and other publications I could find – I spent a lot of time online engaged in research for the class – but not in the course webpage. I have a dial-up connection." (DL) "I spent more time engaged off-line. I read the comments on-line, but would think about and draft replies off-line." (DE) "I spent more time engaged off-line. Reading assignments and taking notes from the book. I printed out all the notes from the website and looked them over off-line." (OCL)

One student who spent more time on-line noted, "I enjoyed the online course. I probably spent more time online. I loved the comments from the other students—reading what other people wrote. I was answering chat room and discussion questions even after I had finished the course. I enjoyed the give and take." (OCE)

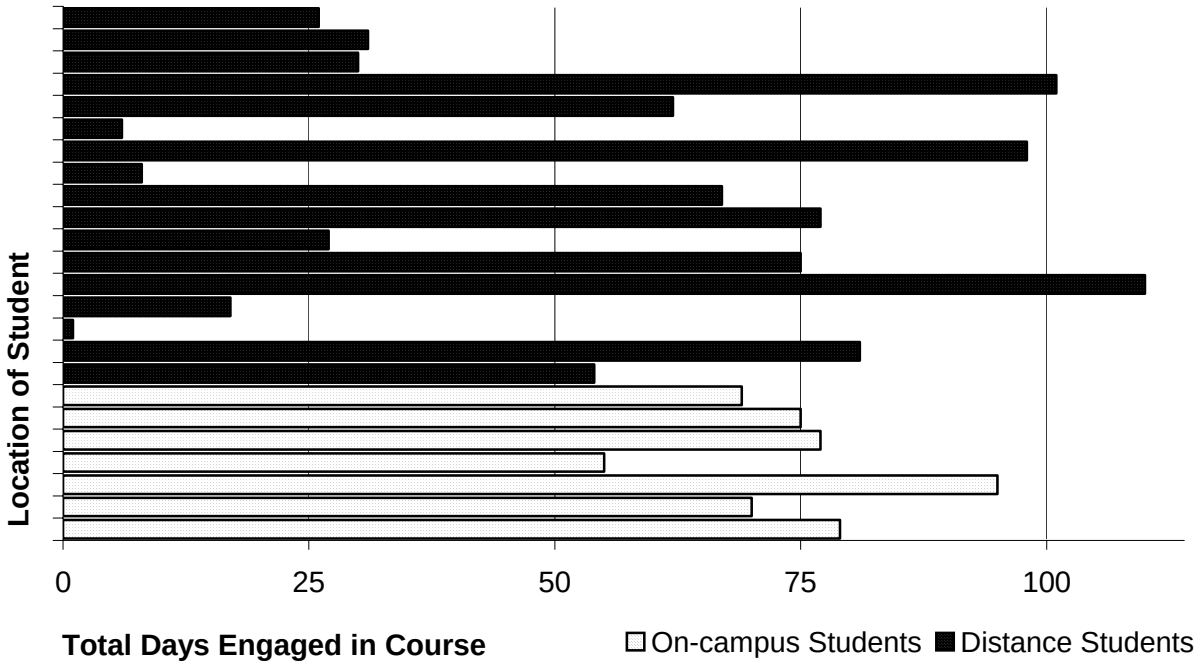

Figure 2. Total days engaged in course by location of student.

Completion of Course

Overall students' completion date in the course varied (Min= day 61; Max=day 114). Students, on average, completed the course on approximately the 101st day (SD=17.7) of the course. The first quartile of the students completed the course by the 80th day. The second quartile for between the 85th and 105th day. The third quartile for between the 111th and 112th day. The fourth quartile on the last day (114th day). No on-campus students waited until the last day to complete the course. Over 35% of distance students waited until the last day to complete the course.

As shown in Figure 3, on average, on-campus students (M=95.1 end date; SD 16.4) tended to complete the asynchronously delivered course almost eight days sooner than distance students (M=103.2 end date; SD=18.1).

Student comments varied when asked why they completed the course when they did and what influenced their completion date. "I had done everything. It was the day I got to the last item to do finished." (OCE) "The only thing that influenced my completion date was the final completion date—I would've taken more time to complete if more had been available. This was a self-paced system within parameters…" (DL) "I was nearing the deadline. I had jumped to another class to meet the deadlines in the middle of that course." (DE) "Toward the end of the semester I was setting up my trip to Mexico for data collection and writing my Thesis. So I finished early to free up time for those activities." (OCL)

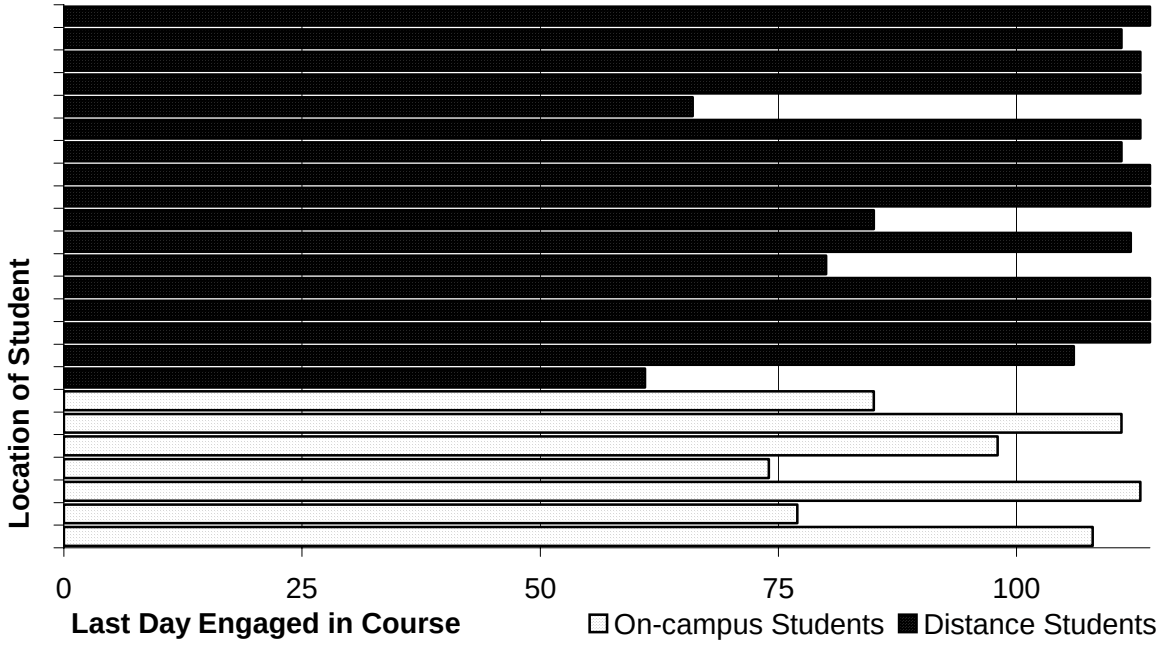

Figure 3. Last day student was engaged in course by location of student.

Performance in Course

Overall student achievement for on-campus and distance students was similar. The average overall score for all students was 92.8%. On-campus students averaged 93.0% and distance students averaged 92.7% overall in the course.

When asked did they think that completing assignments on the course website was an indication of their mastery of the concepts in the course, students that engaged early were more likely to say yes than students that engaged late. One student that engaged early noted, "Yes. The assignments covered a variety of different types of topics—he gave us so many ways to become engaged that I cannot image someone would be unable to demonstrate what they did know about the subject." (OCE) Another student stated, "if we consider all the assignments as including the discussions – YES. I was able to demonstrate my learning as well as any other means of demonstrating it." (DE)

One student that engaged late stated "No. Much of my learning isn't reflected in the assignments. Only some of the results of my learning are included in the assignments. Completing the assignments forced me do more research and that research allowed me to reflect on the content. I chased rabbits and delved into much more of the minutia of the course content." (DL) Another noted "to an extent. I learned a lot about self-directed learning – from the experience of being in the course -- that I didn't share in the course assignments." (OCL)

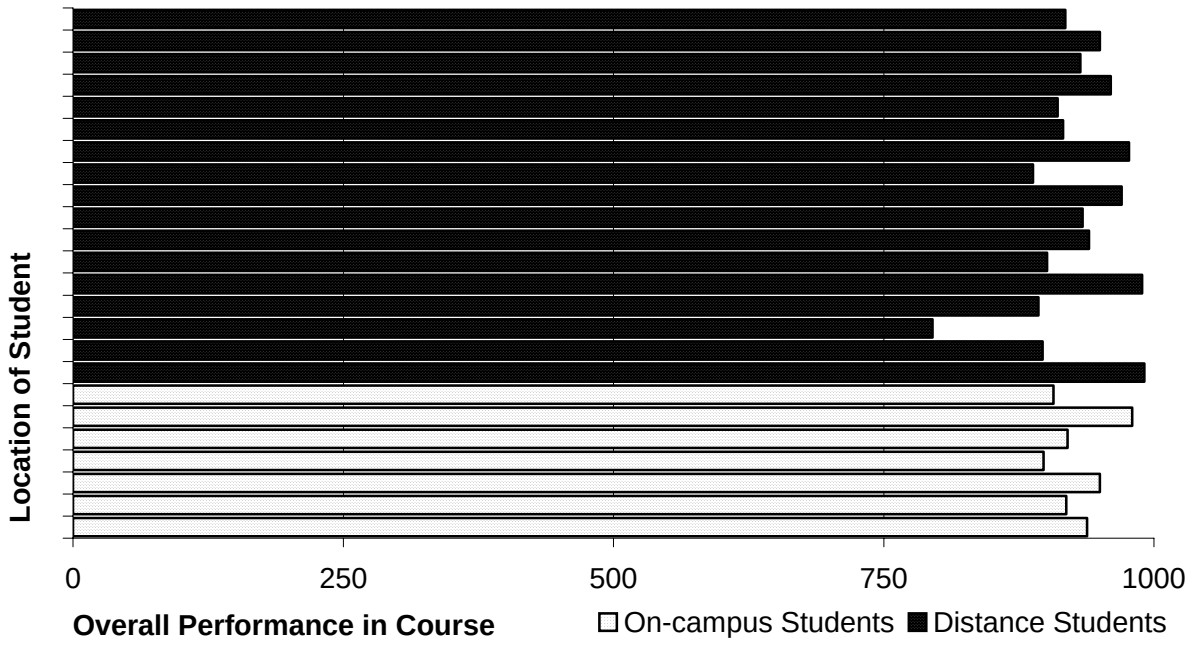

Figure 4. Overall student performance in course by location of student.

Discussion, Conclusions, and Implications

As methods of delivering courses at a distance and on-campus using asynchronous strategies are implemented and tested, the findings from this study may provide useful

information to those teachers delivering such courses. For example, we found that those students who engaged early tended to continuously engage for a longer period of time than those that engaged later. An implication exists that by not structuring an early engagement activity, students may engage less in the course. Given that we are bureaucratically constrained to teach our courses within the timeframe of a semester, we recommend more structure and "firm" time-goals for courses delivered asynchronously. We are, for example, now requiring the first assignment to be submitted within one-week of the beginning of the course. Additional "firm" maximum time goals have been established at the 25, 50, 75, and 100-day mark.

Students' continuous engagement in the course varied dramatically. Most students spent more time engaged off-line that on-line. A limitation of this study is that no attempts were made to measure off-line engagement; future research should do so. Those students that were continuously engaged in the course for less than 25 days were the *last* students to engage in the course. An implication exists that when given few time constraints, students *learn* at dramatically different "speeds." That is if we accurately measure learning. The course instructor's ego was "bruised" a little by the fact that many of the students could complete the course in such a short period of time with little input from the instructor. It is recommended, notwithstanding the instructors ego, that students are allowed to move through asynchronously delivered courses as fast or slow (within time-goals) as *students* choose. To do otherwise would merely punish those faster learning students or those students willing and capable of completing the instructional objectives of the course ahead of the end of the semester. This is, as Dooley and Lindner (2002) noted, one of the benefits of distance learning and affords students and teachers the opportunity to implement individualized instructional sequences.

Although a majority of students waited until near the 114th day to complete their engagement in the course, a quarter of the students were able to complete the course by the 80th day. While all the students were able to complete the course in 114 days, many choose to "back-load" submission of assignments. This resulted in the instructor have a burgeoning amount of assignments to score before grades were due. Instructor feedback, further, on some assignments was not possible and was not essential for students to perform as well as those that received constant feedback…another bruise to the instructor's ego. For students turning in multiple assignments at the end of the course, feedback would not have helped anyway. An implication exists that in asynchronously delivered courses, an instructors traditional role of providing feedback is less important than other roles such as motivator, coach, or delegator (Grow, 1992).

Additional research is needed to describe how an instructor's role shifts when moving from the traditional classroom to a "virtual classroom." In addition to maximum "time-goals," instructors may wish to consider focusing on ways to help students draw upon their unique experiences and competencies in completing assignments (Lindner, & Dooley, 2002).

Although on-campus and distance learners performed equally well on assignments, students that engaged early were more likely to indicate that completing the assignments was an indication of their learning than those that engaged late. An implication exists that prolonged engagement in a course is necessary for students to master concepts, but not necessary to get a "good" grade. Additional research is needed to determine if student mastery of course concepts is related to prolonged engagement.

It is recommended that we continue to measure academic rigor of courses delivered using distance education methods (Miller, & Pilcher, 2000a). Are we measuring success and rigor correctly? Should we attempt to measure success through authentic assessments of students' competencies? Are completing assignments and/or taking tests and receiving a good grade an indication of learning? These are questions we will continue to explore and welcome those willing to work with us. To paraphrase one of our distance students who logged on the last day and turned all of the assignments in at once, until we truly measure learning "we are just *chasing rabbits*." [Emphasis Added]

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Disengaged Farmers: The Land Grant System's Overlooked Clientele

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Abstract

The land–grant university was founded to promote equality in American society by educating the common man, developing knowledge to solve problems, and by disseminating that knowledge to all who need it. The Cooperative Extension Service (CES) offers research based information and non-formal education to the public, and serves as a link between the universities' researchers and the citizen: However, some in the population are not benefiting from the land-grant system. The focus of this study was to describe the differences between Oklahoma wheat producers who knew about extension programs and those who did not know about extension programs. The theoretical framework for the study was Rogers' model for the diffusion of innovation. The hypothesis was that those who did not know about extension programs would fit the profile of laggards/late adopters described in the literature. The findings of the study strongly supported the hypothesis and implied that the university must become more proactive in reaching this group. The findings also illustrate a need for more research in this area to better understand and serve all of the land-grant university's stakeholders.

Introduction/Theoretical Framework

The land-grant university system was intended to provide opportunity and equality in American society by educating the common man. American land-grant universities serve three basic functions in our society teaching, research, and extension (Seevers, Graham, Gamon, & Conklin, 1997). The Cooperative Extension Service (CES) has a long history of service to Americans as a link between research and teaching faculty at land-grant universities and the public. The principle function of CES is to make scientific information available to all who need it, (Seevers, et al., 1997). Extension work is guided by three principles. The first principle is reaching people at their level of need, interest, and understanding. The second principle is teaching people to determine their own priorities. And the third principle is teaching people to help themselves, (Seevers, et al, 1997). However, a 2001 study in Oklahoma found that approximately 10 percent of the wheat producers in the state did not know about extension programs (Kelsey & Mariger, 2002). The problem is the findings of that study are an indication that a considerable proportion of the land-grant university's clientele are not aware of the bounty of information gleaned from the findings of research professionals within the land grant university system.

Much of the theory of extending the knowledge base generated at land-grant universities is based on the diffusion of innovations advanced by E. M. Rogers (Seevers, et al. 1997, and van den Ban, & Hawkins, 1996). Diffusion is the process by which an innovation is communicated to members of a social system over time. Diffusion is a special type of communication concerned with the spread of new ideas (Rogers, 1995). The ultimate goal concerning the diffusion of ideas is their consideration and adoption by members of a particular group. Adoption is the decision to accept or use new ideas or technologies, (Severs, et al, 1997). The adoption process consists of five steps including: awareness, interest, evaluation, trial, adoption. It is the role of the change agent (CES) to inform, influence, and facilitate the adoption of new ideas. The relative speed at which individuals in a group move through the adoption process and adopt new ideas can be used to categorize them into one of five groups including: innovators, early adopters, early majority, late majority, and laggards, (Rogers, 1995). It is the later category, laggards, which is the focus of this study. Laggards or later adopters are described as traditionalists or "diehards"; they are the last in a social group to adopt new ideas, (Rogers, 1995). Laggards are socially isolated and tend to only interact with others with traditional views. Late adopters tend to have little involvement in formal groups and most of their contacts are confined to their immediate social group such as friends and relatives. Laggards or late adopters do use general farm literature and mass media such as radio as a source of farming information. However, laggards generally do not use agricultural agencies as a source of information. Not only are county agents not used by this group, late adopters are likely to hold unfavorable views of them as a source of agricultural information. Instead laggards/late adopters are most likely to consult neighboring farmers and local farm dealers who are personally known to them (Lionberger, 1960). Laggards differ from earlier adopters on several important characteristics; laggards are generally less educated, have smaller and less specialized farms, smaller social networks, fewer contacts outside their social networks, less contact with change agents and tend to be less likely to seek information than earlier adopters. Perhaps the key characteristic of laggards is their orientation to the past as their knowledge base for problem solving, (Rogers, 1995).

Purpose & Objectives

The purpose of this study was to describe the differences between wheat producers who knew about extension programs and those who did not. The researchers' working hypothesis was that wheat producers who did not know about extension programs fit the profile of laggards. The specific objectives of this study were to:

1. Identify differences in the demographic and operational characteristics of wheat producers who knew about extension programs and those who did not.
2. Describe the differences in the agricultural problems, challenges and concerns of wheat producers who knew about extension programs and those who did not.
3. Identify differences in the factors, wheat producers who knew about extension programs and those who did not, consider when making production-related decisions.
4. Identify differences in the informational sources preferred by wheat producers who knew about extension programs and those who did not.
5. Describe the best alternatives for establishing communication between the university and wheat producers who did not know about extension programs.

Methods and Procedures

The study was an *ex post facto,* descriptive design with data collection via a self-administered mail survey. There were approximately 15,000 Oklahoma wheat producers in the population according to the 1997 Census of Agriculture. A proportionally stratified random sample based on the population of wheat producers in each of the state's 77 counties was drawn (Ary, Jacobs, & Rasavieh, 1996). A sample size of 375 would have been adequate at the 95 percent confidence level, (Krejcie & Morgan, 1970); however, it was decided to take a 100 percent over sample of the population, (n=750) to address a predicted low response rate of about 20 percent.

The draft instrument was circulated among the Wheat Research (WR) faculty, as well as to a panel of experts comprised of researchers experienced in surveying agricultural populations and extension educators and specialists who work extensively with the state's wheat producers. Both the WR faculty and the panel of experts expressed satisfaction with the face and content validity of the instrument.

The instrument was pilot tested with a random sample of wheat producers (n=100). The data from the 20 returned surveys were analyzed and revisions made to the instrument. The revised instrument was then mailed to the sample of 750 wheat producers. The reliability was determined using Cronbach's alpha (Ary, et al, 1996). The reliability coefficient was 0.94 for all scale items.

The mail survey used a modified tailored design method (Dillman, 2000). Mailings included an initial mailing that contained a survey, cover letter, and postage-paid return envelope. A reminder postcard was mailed one week later. A second survey, cover letter and postage-paid return envelope followed one week later to nonrespondents. Finally a second

reminder postcard was mailed to all nonrespondents. A 29.2 percent useable response rate was achieved with this procedure.

Control for nonresponse error was addressed through four separate procedures. First, the effort was made to achieve the highest response rate possible by using the (Dillman, 2000) multiple mailing approach. Second, several demographic characteristics of the respondents were compared to the characteristics of the population from the 1997 Census of Agriculture (Miller & Smith, 1983). No significant differences were found at the 95 percent confidence level. Third, a comparison was made between early and late respondents. The first 25 percent of the respondents were compared to the last 25 percent to respond (those who responded after one mailing and those who did not respond until they had been contacted four times) (Lindner, Murphy, & Briers, 2001). Again, no significant differences were found between the groups. Fourth, a random sample of ten percent of nonrespondents were drawn (n=50); of these, 33 were reached by telephone to complete a portion of the instrument, (Lindner, et al, 2001). A comparison was made between the respondents and the nonrespondents' age and the proportion of land they owned using an independent sample *t-test*. Respondents and nonrespondents were also compared based on their ethnicity and educational attainment using a C*hi-square* test. No significant differences were found between respondents and nonrespondents on any of the variables at the 0.05 alpha level.

Parametric inferential statistics such as *t-tests* have five assumptions that must be met in-order to yield valid results. First the data must be interval or ratio type measurements. Second the sample must be random. Third the observations must be independent. Fourth the observations must be normally distributed on the dependent variable. Fifth there must be homogeneity of variance between groups (Stevens, 2002). While the data in this study meets the assumptions of interval/ratio measurements, randomness and independence; the small size of the group of those who did not know about extension programs (n=24) threatens the assumptions of normality and homogeneity of variance. The authors used two separate strategies to correct for the small size and lack of balance in the analysis. The *t-test* is robust with regard to Type I errors as long as the sample size is greater than 12 (Keppel, 1991). Because the distributions of the dependent variables were not normal and asymmetric, the alpha level of 0.05 was adjusted to a more conservative 0.025 to account for any distortions that occur under these conditions (Keppel, 1991). Because there were fewer respondents who did not know about extension programs, than those who did, the samples were unbalanced. When sample sizes differ greatly (when the larger group is more than one and a half times the size of the smaller group) between groups or treatment conditions homogeneity of variance should not be assumed, (Stevens, 2002). With the *t-test*, the solution to this problem is to simply not assume equal variance and use the Satterthwaite's approximation of the standard error and estimated degrees of freedom (Steel, Torrie, Dickey, 1997).

In contrast to parametric tests, non-parametric tests require few if any assumptions about the population under study. Non-parametric tests assume only independence of observations, mutually exclusive categories and observations measured in frequencies to yield valid results, (Ary, Jacobs, & Razaveih, 1996). *Chi-squared* tests were used extensively in this study to test for differences between groups on nominal and ordinal variables.

There are many misconceptions about the use of inferential statistics; one of the most serious misinterpretations is to equate statistical significance with practical importance (Wiersma, 2000). It is almost always necessary to include some index of effect size with the results of inferential tests. For this study, Cohen's d was calculated for *t-tests* and *Cramer's V* was calculated for *Chi-square* tests as recommended in (Lowry, 2002).

The alpha level of 0.05 was set *a priori* and was used for all statistical tests and procedures, except as noted in the *t-tests*. The Statistical Package for the Social Sciences (SPSS) version 8.0, computer software, was used for all statistical analyses.

Results & Findings

For ease of reading those who knew about extension programs and could have used them are referred to as engaged respondents, while those who were not aware of extension programs are labeled as disengaged respondents. In-order to identify differences between engaged and disengaged respondents, the groups were compared using either a *t-test* for interval and ratio data, and *Chi-square* for nominal and ordinal variables.

The first objective of this study was to identify differences in the demographic and operational characteristics of engaged versus disengaged wheat producers. The results of the *t-tests* indicated that disengaged respondents did not differ significantly in age, the percent ownership of land, or hours spent farming per week. As presented in Table 1 only the acres of wheat planted in the 2000-2001 crop season (an indicator of farm size) and the number of agricultural organizations to which they belong differ significantly between the groups. Disengaged respondents (*n*=24) planted an average of 279 acres as compared to an average of 697 acres for engaged respondents (*n*=140). Membership in agricultural organizations was also significantly lower among disengaged respondents (*n*=24) with a mean of 1.13 organizations compared with a mean of 1.81 organizations for the engaged respondents (*n*=144).

Table 1
Differences in engaged versus disengaged wheat producers' demographic characteristics.

Demographic	t	df	Significance	Cohen's d	Effect size
Acres planted 2000-2001	4.491	63.767	0.000	1.1247	Large
Number of Agricultural organizations	2.934	34.541	0.006	0.9984	Large

Note: Equality of variance not assumed (standard error based on Satertthweight's approximation and df)

In-addition to the interval and ratio variables the two groups were compared on nominal and ordinal variables including; gender, county, ethnicity, primary source of income, off-farm employment, educational attainment, expansion plans, retirement plans, government farm payments, short-term loans, long-term loans, crop insurance, wheat check-off funding, type of operation, crops raised and livestock raised. Disengaged respondents differed significantly on five of the 17 variables in the analysis. The data in Table 2, indicated the most notable difference between engaged farmers (*n*=145) and disengaged farmers (*n*=24) was their level of formal education. The engaged respondents had a median educational level of some college while disengaged respondents had a median level of high school graduate. The ethnicity of the two groups also differed significantly, the vast majority of all respondents were white non-Hispanic.

However only four of 147 (2.7%) of the engaged respondents were not white non-Hispanics, while three of 23 (13%) of the disengaged farmers were not white non-Hispanic. In addition all the black respondents (*n*=2) were engaged respondents, while most native Americans two out of three (66%) were disengaged respondents. The data also showed that disengaged respondents had fewer long term loans, wheat was less frequently their principle agricultural enterprise, and they collected on crop insurance policies less frequently than engaged respondents.

Table 2
Demographic differences between engaged and disengaged farmers.

Demographic	Chi-Square	df	Sig	Cramer's V	Strength of association
Educational attainment	24.508	8	0.002	0.382	Moderate
Ethnicity	14.322	4	0.006	0.290	Moderate
Long term loans	7.048	1	0.008	0.204	Moderate
Principle enterprise is wheat	6.340	1	0.012	0.193	Weak
Collect on crop insurance	5.050	1	0.025	0.178	Weak

The second objective of this study was to describe the differences in the agricultural problems, challenges, and concerns between engaged and disengaged farmers. The section of the survey instrument addressing wheat production problems included 43 summated scale items. The survey asked respondents to rate the items regarding various potential wheat production problems on a four-point scale: "not a problem", "less serious problem", "serious problem", and "very serious problem." Table 3 showed that disengaged respondents differed significantly on seven of the 43 wheat production problems. It is notable that six of the items that were significantly different were among the ten wheat disease items. In all cases, disengaged respondents rated these wheat diseases as less problematic than engaged respondents. Disengaged respondents only differed significantly on one other scale item; Russian wheat aphids. Disengaged respondents rated Russian wheat aphids as less problematic than the engaged respondents.

Table 3
Differences in wheat production problems between engaged and disengaged farmers

Wheat production problem	Chi-Square	df	Sig	Cramer's V	Strength of association
Tan spot	11.615	2	0.003	0.326	Moderate
Wheat rusts	9.923	3	0.019	0.283	Moderate
Bunts and smuts	9.333	3	0.025	0.293	Moderate
Wheat streak virus	9.210	3	0.027	0.283	Moderate
Russian wheat aphid	8.149	3	0.043	0.272	Moderate
Soil born mosaic virus	8.095	3	0.044	0.264	Moderate
Septoria leaf blotch	7.769	2	0.021	0.271	Moderate

The third objective of this study was to identify differences in the factors engaged and disengaged farmers consider when making production-related decisions. The wheat producer survey instrument included ten summated scale items about decision-making factors considered by producers when making production decisions. The survey asked respondents to rate each

decision making factor on it's "importance" using a three-point scale: "not at all important", "somewhat important", and "very important". Disengaged respondents did not differ significantly from the other respondents in five of the ten decision-making factors including: maximizing income, commodity prices, minimizing costs, cost of inputs, and the terms of lease agreements. However, Table 4 revealed that disengaged respondents rated long term sustainability, maximizing yield, crop insurance, government commodity program funds, and interest rates as significantly less important factors influencing decision making than engaged farmers.

Table 4
Differences in decision making factors for engaged versus disengaged farmers.

Decision making factor	Chi-Square	df	Sig	Cramer's V	Strength of association
Long term sustainability	24.486	2	0.000	0.441	Relatively strong
Maximizing yield	15.232	2	0.000	0.332	Moderate
Crop insurance	14.094	2	0.001	0.332	Moderate
Government commodity program funds	12.881	2	0.002	0.312	Moderate
Credit interest rates	7.343	2	0.025	0.240	Moderate

The fourth objective of this study was to identify differences in the information sources preferred by engaged and disengaged farmers. The wheat producer survey instrument contained 16 summated scale items concerning their use of sources of wheat production information. The survey asked respondents to indicate how frequently they used various sources of information on a four point-scale described as: "always", "frequently", "sometimes" and "never". Engaged respondents and disengaged respondents did not differ significantly on their use of non-extension faculty, the Noble Foundation, trade or technical journals, scientific journals, friends/family /other farmers, newspapers, television/radio, government agencies, farm organizations, crop consultants, the internet, or public libraries. However, as can be seen in Table 5, extension publications, cooperative extension, other universities, and businesses/suppliers were used significantly less by disengaged respondents.

Table 5
Sources of information that differed between engaged and disengaged respondents.

Sources of wheat production information	Chi-Square	df	Sig	Cramer's V	Strength of association
Extension publications	33.797	3	0.000	0.499	Relatively strong
Extension	26.372	3	0.000	0.439	Relatively strong
Other universities	8.775	3	0.032	0.269	Moderate
Businesses and suppliers	8.060	3	0.045	0.243	Moderate

In-addition to the scale items on sources of information, respondents were asked to write in three publications and three non-written sources of information they most often used for wheat production information. The publications most frequently used by disengaged respondents are

listed in Table 6. The general farm publications listed most frequently were: Progressive Farmer, Farm Journal, High Plains Journal, and the Farmer Stockman.

Table 6
Publications utilized by disengaged farmers

Publications	Frequency	Percent
Progressive Farmer	5	20.83
Farm Journal	4	16.67
High Plains Journal	4	16.67
Farmer Stockman	3	12.50
Furrow	1	4.17
University publication	1	4.17
Test Plot Results	1	4.17
South West Farm Press	1	4.17
Successful Farmer	1	4.17

(n=24)

The most frequently used non-written sources of information listed by disengaged respondents were friends/family/other farmers and Agricultural dealers (see Table 7).

Table 7
Other sources of information utilized by disengaged farmers

Source of information	Frequency	Percent
Friends family or other farmers	7	29.16
Agricultural dealers	3	12.50
Common sense	1	4.17
Coop	1	4.17
Grain buyers	1	4.17
Internet	1	4.17

(n=24)

The fifth objective of this study was to describe the best alternatives for establishing communication between the university and wheat producers who did not know about extension programs. The respondents were asked a series of questions regarding their relationship with the university including if they attended the university, if a family member attended the university, if they served on advisory boards or committees, if they cooperated with faculty on research projects, or if they have direct communication with faculty or staff. Disengaged respondents did not differ significantly from engaged respondents on board service, participation in research projects, or direct communication with faculty. However, as can be seen in Table 8, disengaged respondents were significantly less frequently graduates of the university and less frequently or had a close family member who attended the university.

Table 8
Differences in engaged versus disengaged respondents connections to the university.

Connection to the university	Chi-Square	df	Sig	Cramer's V	Strength of association
Family member attended the university	5.480	1	0.019	0.178	Weak
University graduate	5.318	1	0.021	0.176	Weak

In-addition to the questions about their connections to the university, respondents were asked to respond to the open-ended question: *"How could communication between you and the university be improved?"* Of the 24 disengaged respondents, nine answered the item. The most frequently listed recommendations for improving communication between the university and disengaged respondents were to mail information directly to farmers (*n*=2) or to produce a newsletter to convey information to farmers (*n*=2). Other responses to this item were: "communication should be more frequent", "I don't know how to improve communication", "provide information on what help is available", " I am a small farmer I don't need the university", and "the university only helps large farmers with money" each with one response.

Conclusions, Implications and Recommendations

This study was based on a random sample of wheat producers in Oklahoma. The authors make no claims or inference beyond this population of wheat producers. Readers may note certain parallels between the findings of this study and other populations, but should exercise caution in interpreting for or extending these findings to other groups.

The findings of this study support the hypothesis that disengaged respondents fit the classification of laggards described by Rogers (1995). The findings of this study revealed that disengaged farmers fit the profile of laggards in terms of demographic characteristics and information seeking behavior. Disengaged respondents had farms about half the size of the engaged respondents. The lower educational attainment of disengaged respondents also fits the profile of laggards. Laggards or late adopters have fewer contacts in formal organizations according to, Lionberger (1960). This is mirrored by the results of this study where it was found that disengaged respondents belonged to about half as many organizations as the engaged respondents.

The information seeking behavior of disengaged farmers also supports the laggard hypothesis. Lionberger (1960) stated that late adopters read general farm literature, and use mass media, but do not use government agents. The findings of this study support this statement. Analysis of the sources of information used by the respondents indicated that disengaged respondents did not use cooperative extension, extension publications or other universities as much as the engaged respondents. However, disengaged respondents did not differ in their use of trade/technical journals or newsletters and listed the same publications as the engaged respondents did as sources of wheat information. The most frequently cited non-written source of information among this group were friends, family and other farmers which is also a characteristic of laggards/late adopters according to, Lionberger (1960). Over all, disengaged respondents sought information less frequently and employed fewer sources of information than

engaged farmers in the study. Again Rogers (1995), states this is one of the defining characteristics of laggards.

The findings showed disengaged respondents did not differ from other respondents on 36 of 43 selected production problems and challenges. However it was apparent that they did differ significantly and consistently was wheat diseases. Furthermore the analysis revealed that of the seven wheat production problem areas, where disengaged respondents differed from the engaged respondents, were wheat diseases. One possible explanation for this finding is that disengaged respondents did not know how to recognize the presence of wheat pathogens or how to identify the symptoms of specific pathogens (James Key, personal communication July 16, 2002). To test this theory, the university wheat disease specialist was asked if he thought the idea had merit. The wheat disease specialist agreed that it was possible that disengaged farmers did not know how to recognize wheat pathogens. However, the specialist also gave an alternative explanation in which differences in tillage practices could account for this situation. The state specialist concluded that if those disengaged producers were laggards and had not adopted "no till" or "minimum till" farming practices or were still burning their crop residue; it would impact the behavior of pathogens in their fields which could account for the differences between the two groups. (Robert Hunger personal communication August 2, 2002).

It was apparent that the disengaged farmers differed significantly from the engaged farmers on the factors they consider when making production decisions. The disengaged respondents did not consider credit and interest rates an important in making production decisions. This finding making makes sense when one considers that disengaged respondents had a significantly fewer long-term loans. It was also apparent that disengaged farmers did not consider long-term sustainability important when making wheat production decisions. The data show that engaged respondents particularly those who use extension frequently consider long-term sustainability to be "very important." This supports the findings of (Dillman, Engle, Long, & Lamiman, 1989), who found that farmers' use of extension was highly correlated to their adoption of low impact farming technology. It was also found that disengaged farmers also considered maximizing yields to be less important than engaged farmers. A logical conclusion drawn from these findings is that disengaged farmers are risk adverse, and complacent in terms of their farming practices. This group appears to be unaware of the economic and environmental benefits of adopting best management practices.

It was concluded that disengaged respondents were less connected to the university on all levels, not just extension. While it was predictable that disengaged respondents were less likely to be university alumni, it is important to note that they were also less frequently related to someone who attended the university. Laggards/late adopters are thought to rely on smaller social networks composed of people with similar views and sources of information (Rogers, 1995 and Lionberger, 1960). The implication is that a close family member who attended the university could have been a conduit or connection between the university and the disengaged farmer. However, a conclusion of this study is that this group of farmers is isolated from the university with little chance of making a connection with out an active effort on the part of the university. Furthermore the antidotal evidence about how the university can better serve this group indicated disengaged farmers are not going to seek help from the university. Of the nine responses to the question, "how can communication between you and the university be

improved", four suggested that the university should simply mail information directly to farmers. It then becomes apparent that the passive nature of these recommendations supports the idea that in-order to serve these farmers the university will have to seek them out and market information to them.

The literature on the diffusion and adoption of innovations, provides some guidance to extension agents, planners, and specialists on approaching clientele in each adopter category. The implication for the practice of extension is importance of extension professionals' recognition people in each of the adopter categories and their ability assume the appropriate role to extend research-based information to their clientele, (Seevers, et al, 1997). In recent years extension theory has focused on mass media approaches that reach larger audiences. It could be concluded that the mass media is an effective way to raise awareness; however, laggards are thought to be suspicious of change agents and mass media is not effective method of changing strongly held beliefs, (Rogers, 1995). Creative solutions to address this problem will be required if the university is going to engage with this group. The barriers between disengaged farmers and the land-grant university may be breached with greater personal contact between these farmers and CES agents but strategies for reaching disengaged must be developed.

The literature on the diffusion and adoption of innovations also raises questions about laggards/late adopters. Two theories have been proposed as to why people fall in to the various adopter categories; one being the individual blame hypothesis, and the other being the system blame hypothesis. The individual blame hypothesis holds that it is the characteristics of the individual such as traditional or conservative attitudes that cause them to be laggards. However, in contrast the system blame hypothesis holds that individuals become laggards do to the contextual factors of their situation such as limited resources(van den Ban, & Hawkins, 1996).

One of the studies supporting the system blame hypothesis was conducted by *Centro Internacional de Mejoramiento de Maiz y Trigo* (CIMMYT) or International Maize and Wheat Improvement Center located in Mexico City. Economists and scientists working for the CIMMYT studied the adoption patterns of farmers in the Mexican altiplano. The conclusions of that study were that the agroclimatic and socioeconomic circumstances of farmers were better predictors of adoption patterns than the characteristics of individual farmers (Byerlee, & Hesse de Polanco, 1982). The farmers who did not adopt a technology were acting rationally because the technology did not fit their circumstances. Farm size was the only individual characteristic found to be important in the CIMMYT study. However even smaller farmers adopt the same technologies as large farmers after an initial lag time, so farm size appears to be only a temporary factor in adoption (Byerlee, & Hesse de Polanco, 1982). According to Rogers (1995), it is a mistake to imply that laggards are to blame for their relatively late adoption of innovations, because the system blame hypothesis may better describe the reality of the laggards situation.

According to van den Ban, & Hawkins (1996), each case should be tested with both hypotheses to determine which best fits,. Furthermore, both hypotheses can contribute to a better understanding of how to better serve disengaged farmers. Clearly, more information is needed about the barriers between disengaged farmers and the university. Further research should be conducted with regard to disengaged farmers. Perhaps a qualitative case study of disengaged

farmers who fit this profile would provide answers as to how the university could better connect with this particular group.

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An Assessment of Agricultural Education Faculty Perceptions Toward Compensation Levels and Practices

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Abstract

The purpose of this descriptive and correlational study was to examine perceptions of faculty in agricultural education of faculty compensation levels and compensation practices. A survey of agricultural education faculty in the United States was conducted. Data for the study were collected by mailed questionnaire. An 80% response rate was achieved. Findings showed that over 60% of participants indicated their compensation level was too low. Overall, faculty compensation level and practice scores tended to be negative. Faculty compensation level and practice scores tended to increase when faculty perceived interdepartmental salary to be fair, faculty perceived salary by rank at their university to be similar, and faculty perceived salary by rank to be similar at other universities.

Introduction

The ability of an organization to evaluate and compensate employees effectively reflects its essential mission and philosophy (Fink & Longenecker, 1998). Compensation programs should be designed to help implement strategies that support an organization's mission and strategic objectives (Buford & Lindner, 2002). A compensation system should further reinforce changes in organizational culture, work processes, and the behavioral and performance expectations connected to performances. Assessment helps ensure that employees will be available, motivated, and directed toward achieving their critical mission in the organization (Fink & Longenecker, 1998). Compensation policies and practices should be consistent internally, competitive externally, and should reward individual performance fairly and equitably (Milkovich & Newman, 1999; Wallace & Fay, 1988).

If jobs that are similar in content and value are paid similarly, and dissimilar jobs are paid more or less in accordance with the job hierarchy, then the criterion of internal consistency has been met. External competitiveness requires that an employer pay a fair rate of salary when compared to the salaries of similar jobs or skill levels in the external market (Buford & Lindner, 2002). When these elements are violated, job satisfaction and motivation may be sacrificed.

Buford and Lindner (2002) further noted that adequate and fair compensation programs are needed to attract, retain, and motivate employees to achieve organizational goals. Therefore, research on faculty compensation levels may help administrators and faculty members gain a better understanding of the effects of current compensation strategies and may help in creating better recruitment, retention, and reward policies and procedures.

According to Ledford and Hawk (2000) compensation programs are designed to implement strategies that support the organizational mission and strategic objectives. Such strategies might include competing in the market, improving productivity, reducing costs, building teams, rewarding individual performance, providing upward mobility, encouraging employees to expand job boundaries, developing employee potential, and complying with laws and regulations. In practice, however, compensation programs are typically a set of techniques and procedures put in place with little, if any, regard for strategic implications. When properly carried out, a technique or procedure accomplishes its intended purpose, which may or may not implement a strategy.

In some cases, compensation programs may actually prevent strategies from being implemented. For example, a pay structure with a large number of narrowly defined pay grades discourages employees from taking on additional responsibilities without a grade promotion. This also illustrates the point that certain strategies are mutually exclusive. The organization must decide which strategy is more appropriate (encouraging employees to expand job boundaries or providing upward mobility). In any case, a clearly articulated compensation strategy is necessary if the program is to match the unique characteristics, culture, and objectives of the organization.

Renewed interest in the quality of teaching in America's college classrooms has resulted in an increased examination of the underlying policies and procedures with respect to

compensation needed to ensure society-ready graduates (Wardlow & Johnson, 1999). Zingheim and Schuster (1995) found that in education, pay was correlated with job satisfaction and employee retention.

When agricultural education professionals perceive compensation strategies to be unfair, job satisfaction and performance are at risk. Recent evidence suggests that many people are dissatisfied with their jobs or alienated from work altogether. Causes of this dissatisfaction can range from unhealthy supervisory relationships to non-contingent reward systems to dislike of the actual work (Vogt & VanTilberg, 1988).

Hammond, *et al*., (1999) found that faculty perceptions toward their compensation programs were unfavorable and led to lower levels of motivation, satisfaction, and work ethic. McClain (1987) showed that faculty did not believe teaching was adequately rewarded with merit, promotion, and tenure. Rather than having all teachers receive the same pay within a system of regulated and mandated compensation systems, teachers should be compensated with a system that better corresponds with teachers' competencies and performance. Compensation systems for educators should be based on demonstrated improvement, reflected in traditional supply/demand considerations in the marketplace, and with training systems that focus on increasing student academic improvement (Bowman, 2001).

Modifications to compensation systems should recognize that superior teachers should be paid more than average teachers; poorly performing teachers should be expeditiously removed; and across-the-board pay hikes should be resisted and/or discontinued (Bowman, 2001). Negative perceptions towards an institution's compensation program can have detrimental effects. Fink and Longenecker (1998) noted that it takes a very long time to undo damage caused by an ineffective compensation system and that unjust compensation policies may result in the poor use of human resources, frustration, high turnover, and lower productivity.

Fink and Longenecker (1998) noted that the key factors which created frustration within compensation systems were consistently low merit pay percentages, unattainable/conflicting goals, diminutive payouts for goal attainment, internal/external salary compression, unclear performance standards/goals, internal pay inequities, unstructured/unprofessional performance reviews, compensation not commensurate of responsibility, and a lack of trust in the performance measurement system and political performance ratings. Key factors found to be consequences of an ineffective supervisory compensation system are demotivation/erosion of work ethic, consideration of leaving the organization, less willingness to take on new challenges, increased levels of work-related frustration, decline in morale within the supervisory ranks, feelings of being unappreciated, unwillingness to change/try new things, increased stress, bitterness/anger, and a lack of trust in the organization (Fink & Longenecker, 1998).

An employee's compensation includes all types of financial and non-financial returns that employees receive as part of the employment relationship. These include direct, indirect, and intrinsic compensation (Buford & Lindner, 2002). For the purpose of this paper, compensation levels and practices are defined as the factors identified by Fink and Longenecker that have the potential to produce negative outcomes in an organization or those that result in perceptions of unfairness and inequalities in pay. An organization's compensation practices include policies,

procedures, and strategies that provide guidance in administering the overall compensation system. These include internal consistency, external competitiveness, employee contribution, pay adjustment and rewards for performance and legal aspects.

Research has shown that agricultural education professionals have perceived that they are not being fairly compensated. Data on agricultural education faculty members for the years 1998 to 2001 is available on the American Association for Agricultural Education website. Bowen and Radhakrishna (1991) found that agricultural education faculty during the years 1980 to 1990 were most satisfied with interpersonal relationships inherent in being a faculty member, and least satisfied with the level and method used to determine their salaries. They further noted that job satisfaction levels of agricultural education faculty remained constant over the same time period.

For one to more fully understand the effects of an organization's compensation program, it is necessary to periodically examine the program and employees' perceptions (Buford & Lindner, 2002; Barkema & Bomez-Mejia, 1998). In order to recruit, retain, and reward the best agricultural education faculty, universities need to research and examine faculty compensation systems more thoroughly. Engleberg (1991) noted that the first step in developing an effective compensation program was to conduct a needs assessment. Assessing the perceptions of agricultural education professionals about faculty compensation levels and practices may provide valuable information to faculty and administrators which will help ensure compensation strategies result in recruiting, retaining, and rewarding the best agricultural education faculty.

Purpose

The purpose of this descriptive and correlational study was to examine the perceptions of faculty in agricultural education of faculty compensation levels and practices. This research attempts to provide a better understanding of factors that are related to faculty perceptions toward compensation levels and practices, and further attempts to provide useful information that will help agricultural education departments develop and implement more effective compensation systems. The specific objective were to as follows: 1) describe perceptions of post-secondary agricultural education professionals by faculty compensation levels; 2) describe perceptions of post-secondary agricultural education professionals by compensation practices; and 3) describe faculty compensation levels and practices by selected personal characteristics.

Methodology

The research design used for this study was descriptive and correlational in nature. This study had two dependent variables and four independent variables. The dependent variables were the perceptions of faculty compensation levels and the perceptions of compensation practices. The independent variables included whether salaries were perceived as being fair when compared to salaries of others interdepartmentally, others of the same rank in other departments, others of the same discipline at other universities, and whether or not overall faculty compensation levels were considered fair.

Systematic sampling procedures were used for this study (Gall, Borg, & Gall, 1996). The sample number was derived using the table "Determining Sample Size for Research Activities"

(Krejcie & Morgan, 1970). The sample was drawn from approximately 400 non-emeritus agricultural education professionals across the United States who were listed in the American Association for Agricultural Education Directory of University Faculty, September 2001 edition. The sample consisted of 196 people. A random starting place was selected and every other name was pulled for the sample population.

The research instrument was designed based on the review of literature (Fink & Longenecker, 1998). The first section of ten statements was designed to measure the perceptions of faculty compensation levels. The second section of ten statements was designed to measure the perceptions of compensation practices. The participants were asked to indicate their agreement with these 20 statements by marking their response on a five point Likert-type scale. The points on the scale were 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree. The third section of the instrument was designed to gather personal information on participants. A panel of experts at Texas A&M University established face and content validity. The instrument was pilot tested with 13 faculty members in the Animal Science Department at Texas A&M University. Reliability was estimated by calculating a Cronbachs' Alpha Coefficient. Reliability for faculty compensation levels was estimated at .88 for faculty compensation levels and .89 for compensation practices. Data for this study were collected using a mailed questionnaire. A response rate of 79.6% (n=154) was obtained.

Nonresponse error was controlled by comparing early responses to late responses (Lindner, Murphy & Briers, 2000). The last wave of respondents (f=30) were compared to the first wave of respondents (f=124) on the variables of faculty compensation levels and compensation practices. There were no significant differences between early and late respondents and faculty compensation levels, $t(154)=1.78$, $p>.05$ and compensation practices, $t(154)=.31$, $p>.05$. It was, therefore, concluded that results could be generalized to the target population, and nonresponse error was not a threat to the external validity of the study.

Alpha for all statistical procedures was set *a priori* at .05. To assess the magnitude of statistical differences, effect sizes were calculated, interpreted, and reported (Cohen, 1988). Faculty compensation levels, compensation practices, and personal characteristics were analyzed and described by calculating frequencies and percentages by level of response. A compensation level score and a compensation practice score were computed by summing the respective item responses: to make comparisons by personal characteristics, to reduce measurement error, and to provide a "richer" representation of the variables (Hair, Anderson, Tatham, & Black, 1998).

Findings

The following section presents findings by objective. Overall, 64% of the respondents perceived that compensation levels were too low. Thirty-five percent of faculty perceived that compensation levels were just right and one respondent replied that compensation levels were too high. Approximately 60% of participants agreed or strongly agreed that their salaries were fair when compared to others within their department. Almost 50% of respondents indicated that they agreed or strongly agreed their salary was fair when compared with others of their same rank in other departments. Less than 40% of respondents agreed or strongly agreed that their salaries were fair when compared to others in their discipline at other universities.

Objective 1

As shown in Table 1, more respondents disagreed or strongly disagreed with faculty compensation levels than did those who agreed or strongly agreed (*M*=2.61). One hundred six (69.2%) respondents disagreed or strongly disagreed that current compensation levels have resulted in decreased levels of work-related frustration. Ninety-seven respondents (63.0%) disagreed or strongly disagreed that current compensation levels for faculty have led to less bitterness/anger, and 90 respondents (58.4%) disagreed or strongly disagreed that current compensation levels for faculty have led to more trust in the organization.

Table 1
Perceptions of Faculty Compensation Levels (*n*=154)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Current compensation levels for faculty have resulted in motivation of work ethic	8	5.2	50	32.5	32	20.8	56	36.4	8	5.2
Current compensation levels have resulted in faculty retention	11	7.1	61	39.6	27	17.5	51	33.1	4	2.6
Current compensation levels have resulted in more willingness to take on new challenges	19	12.3	56	36.4	35	22.7	39	25.3	5	3.2
Current compensation levels for faculty have resulted in feelings of being appreciated	15	9.7	63	40.9	40	26.0	35	22.7	1	.06
Current compensation levels for faculty have led to decreased stress	12	7.8	63	40.9	43	27.9	32	20.8	4	2.6
Current compensation levels for faculty have led to a rise in morale in supervisory ranks	11	7.1	65	42.2	44	28.6	32	20.8	2	1.3
Current compensation levels for faculty have led to more trust in the organization	26	16.9	64	41.6	42	27.3	21	13.6	1	.6
Current compensation levels for faculty have resulted in a willingness to change/try new things	9	5.8	74	48.1	51	33.1	19	12.3	1	0.6
Current compensation levels for faculty have led to less bitterness/anger	15	9.7	82	53.2	39	25.3	18	11.7	0	0.0
Current compensation levels have resulted in decreased levels of work-related frustration	27	17.6	79	51.6	34	22.2	13	8.5	0	0.0

Note: *M*=2.61, *SD*=.67; 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree

Objective 2

Table 2 shows that 90 respondents (58.4%) agreed or strongly agreed that their organization conducted effective and professional performance reviews on faculty. Eighty-seven respondents (56.5%) agreed or strongly agreed that their organization set realistic and effective performance goals for faculty members. Ninety-seven participants (63.0%) disagreed or strongly disagreed that their organization provided attractive merit pay percentages for faculty members. Eighty-three participants (53.9%) disagreed or strongly disagreed that their organization provided adequate compensation rewards for goal attainment.

Table 2
Faculty Perceptions of Compensation Practices (*n*=154)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*	*f*	*%*
My organization sets realistic and effective performance goals for faculty members	8	5.2	32	20.8	27	17.5	77	50.0	10	6.5
My organization conducts effective and professional performance reviews on faculty	11	7.1	34	22.1	19	12.3	65	42.2	25	16.2
My organization's compensation system is internally consistent with respect to assistant, associate and full professors	17	11.0	42	27.3	27	17.5	61	39.6	7	4.5
My organization accurately measures goal attainment for faculty performance	12	7.8	50	32.5	30	19.5	55	35.7	7	4.5
My organization sets clear and unambiguous performance standards and goals for all faculty	20	13.0	54	35.1	25	16.2	49	31.8	6	3.9
My organization compensates faculty in a manner that is commensurate with responsibilities	22	14.3	54	35.1	26	16.9	50	32.5	2	1.3
My organization creates performance ratings that are accurate and unbiased for all faculty	15	9.7	41	26.6	50	32.5	45	29.2	3	1.9
My organization makes adjustments to faculty salaries to avoid salary compression	21	13.7	43	28.1	39	25.5	40	26.1	10	6.5
My organization provides attractive merit pay percentages for faculty members	26	16.9	71	46.1	17	11.0	35	22.7	5	3.2
My organization provides adequate compensation rewards for goal attainment	20	13.0	63	40.9	34	22.1	33	21.4	4	2.6

Note: *M*= 2.90, *SD*=.77, 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree

Objective 3

Participants tended to be undecided (M=3.33) with respect to salary fairness as compared to other in their department. Table 3 shows there was a statistically significant difference between mean faculty compensation level scores when compared to whether the participants perceived interdepartmental salaries to be fair, $F(4,148)=9.18$. A large effect size (f=.50) was found. Participants who strongly disagreed or disagreed that interdepartmental faculty salaries were fair tended to have lower faculty compensation level scores than did those who agreed or strongly agreed.

Table 3 shows statistically significant difference mean compensation practice scores when compared to the whether participants perceived interdepartmental salaries to be fair, $F(4,148)=10.84$, $p<.05$. A large effect size (f=.54) was found. Participants who strongly disagreed or disagreed that interdepartmental faculty salaries were fair tended to have lower compensation practice scores than did those who agreed or strongly agreed. Participants who were undecided tended to have lower compensation practice scores than did those who strongly agreed.

Table 3
Perceptions of Salary Fairness when Compared to Others within the Department (n=152)

Interdepartmental salary is fair[a]	*f*	*M*	*SD*	*F*	*p*
Faculty Compensation Levels[b]					
Strongly Disagree	17	2.23	.86	9.18*	.00
Disagree	28	2.20	.48		
Undecided	17	2.59	.64		
Agree	70	2.72	.54		
Strongly Agree	21	3.13	.74		
Compensation Practices[c]					
Strongly Disagree	17	2.27	.92	10.84*	.00
Disagree	28	2.50	.60		
Undecided	17	2.67	.86		
Agree	70	3.08	.59		
Strongly Agree	21	3.43	.69		

Note: Two participants did not indicate a response. [a]M=3.33, SD=1.24; M[b]=2.61, SD=.67, f=.50; M[c]=.2.90, SD=.77, f=.54; *p<.05

Participants tended to be undecided (M=3.10) with respect to salary fairness as compared to others of the same rank in other departments. Table 4 shows there were statistically significant differences between mean faculty compensation level scores when compared to whether the participants perceived salaries to be fair when compared to other of the same rank in other departments, $F(4, 147)=7.25$, $p<.05$. A small effect size (f=.20) was found. Participants who strongly disagreed or disagreed that faculty salaries were fair when compared to others of similar rank in other departments tended to have lower faculty compensation level scores than did those who agreed or strongly agreed. Participants who were undecided if faculty salaries were fair when compared to others of the same rank in other departments tended to have lower faculty compensation level scores than did those who strongly agreed.

Table 4 shows statistically significant difference between mean compensation practice scores when compared to whether participants perceived faculty salaries to be fair when compared to others of the same rank in other departments, $F(4,147)=7.91$, $p<.05$. A small effect size (f=.20) was found. Participants who strongly disagreed that faculty salaries were fair when compared to others of the same rank in other departments tended to have lower compensation practice scores than did those who agreed or strongly agreed. Participants who disagreed or were undecided that faculty salaries were fair when compared to others of the same rank in other departments tended to have lower compensation practice scores than did those who strongly agreed.

Table 4
Perceptions of Salary Fairness when Compared to Others of Similar Rank (n=151)

Similar Rank Salary is Fair[a]	*f*	*M*	*SD*	*F*	*p*
Faculty Compensation Levels[b]					
Strongly Disagree	18	2.19	.86	7.25*	.00
Disagree	38	2.38	.57		
Undecided	23	2.55	.65		
Agree	57	2.77	.59		
Strongly Agree	16	3.16	.58		
Compensation Practices[c]					
Strongly Disagree	18	2.41	.89	7.91*	.00
Disagree	38	2.71	.68		
Undecided	23	2.70	.71		
Agree	57	3.07	.66		
Strongly Agree	16	3.56	.60		

Note: Two participants did not indicate a response; [a]M=3.10, SD=1.23; M^b=2.61, SD=.67, f=.20; M^c=2.90, SD=.77, f=.22; *$p<.05$

Participants tended to undecided (*M*=2.92) with respect to salary fairness as compared to others in my discipline at other universities. Table 5 shows a statistically significant difference between mean faculty compensation level scores when compared to whether participants perceived salaries as fair when compared to others in their discipline at other universities, $F(4, 146)=7.54$, $p<.05$. A small effect size ($f=.21$) was found. Participants who strongly disagreed that faculty salaries were fair when compared to others of the same discipline at other universities tended to have lower faculty compensation level scores than did those who were undecided, agreed or strongly agreed. Participants who disagreed that faculty salaries were fair when compared to others in the same discipline at other universities tended to have lower faculty compensation level scores than did those who agreed.

Table 5 shows a significant difference between mean compensation practice scores when compared to whether the participants perceived salaries to be fair when compared to others in the same discipline at other universities, $F(4,146)=5.60$, $p<.05$. A small effect size ($f=.15$) was found. Participants who disagreed or strongly disagreed that faculty salaries were fair when compared to others in the same discipline at other universities tended to have lower compensation practice scores than did those who agreed.

Table 5
Perceptions of Salary Fairness when Compared to Other Universities (*n*=151)

Fair Salary as Compared to Other Universities[a]	*f*	*M*	*SD*	*F*	*p*
Faculty Compensation Levels[b]					
Strongly Disagree	27	2.15	.14	7.54*	.00
Disagree	34	2.45	.09		
Undecided	32	2.65	.11		
Agree	40	2.89	.09		
Strongly Agree	18	2.94	.18		
Compensation Practices[c]					
Strongly Disagree	27	2.45	.14	5.60*	.00
Disagree	34	2.70	.11		
Undecided	32	3.00	.13		
Agree	40	3.24	.10		
Strongly Agree	18	3.01	.23		

Note: Three participants did not respond. [a]M=2.92, SD=1.30; [b]M=2.61, SD=.67, f=.21; [c]M=2.90, SD=.77, f=.15; *$p<.05$

Table 6 shows there are statistically significant differences between mean faculty compensation level scores when pertaining to how participants rated their perceptions of the faculty compensation level in the organization, $t(148)=5.02$, $p<.05$. A medium effect size ($d=.79$) was found. Participants who perceived faculty compensation level scores to be about right had higher scores than those who indicated too low. Mean compensation practice scores statistically differed by participants' perceptions of faculty compensation, $t(148)=4.47$, $p<.05$. A medium effect size ($d=.74$) was found. Participants who perceived faculty compensation practices scores to be about right had higher scores than those who indicated too low.

Table 6
Perceptions of Faculty Compensation Levels (n=149)

Faculty compensation levels in the organization are…	*f*	*M*	*SD*	*t*	*p*
Faculty Compensation Levels[a]					
About right	52	2.96	.58	5.02*	.00
Too low	96	2.43	.64		
Compensation Practices[b]					
About right	52	3.26	.64	4.47*	.00
Too low	96	2.69	.77		

Note: Five participants did not indicate a response, 1 participant responded that faculty compensation levels were too high, $M^a=2.61$, $SD=.67$, $d=.79$; $M^b=2.90$, $SD=.77$, $d=.74$; *$p<.05$

Conclusions and Implications

The following conclusions were drawn and implications made, based on the study objectives. The results address the need, as described by Buford and Lindner (2002), Barkema and Bomez-Mejia (1998) and Engleberg (1991), for organizations to periodically examine and assess faculty members' perceptions of their organization's compensation programs. This information may be useful in designing and implementing compensation strategies and procedures that are consistent internally and are competitive externally, that value employee contributions, and that reward faculty for performance. The first objective in designing an effective compensation program that supports an organization's strategic objectives is to ensure internal consistency and external competitiveness.

Overall, 64% of the respondents perceived that compensation levels were too low. An implication exists that compensation levels for faculty members in agricultural education may not be externally competitive with what other types of institutions pay employees that have similar competencies and value to the organization (Buford & Lindner, 2002). Additional research needs to be conducted to determine externally competitive compensation levels. Faculty members need to voice their concerns about their feelings of compensation and rewarded performance. By voicing their concerns with current compensation strategies and suggesting possible solutions, faculty and administrators may be able to proactively address this concern before problems arise. Faculty members with low compensation level scores may also consider other employment opportunities or ask for a raise.

According to Hammond *et al*., (1999) unfavorable faculty perceptions toward their

compensation programs lead to lower levels of motivation, satisfaction, and work ethic. An implication exists that by raising compensation levels, agricultural education faculty will have increased motivation, satisfaction, and work ethic. Compensation levels may be having a negative impact on the abilities of departments of agricultural education to attain strategic objectives (Fink and Longenecker, 1998). Additional research is needed to determine if increased compensation levels will result in higher levels of motivation, satisfaction, and work ethic.

A majority of agricultural education faculty perceived that current compensation practices were unfair or inequitable. More participants disagreed or strongly disagreed with compensation practices than those who agreed or strongly agreed. Faculty perceived that current compensation levels have resulted in increased levels of work frustration, decreased willingness to change/try new things, decreased trust in the organization, and increased stress. Fink and Longenecker (1998) found that ineffective compensation practices have the potential to create perceptions of unfairness and inequities in pay. They recommended that compensation practices be modified and adapted over time, depending on how well the employees perform. An implication exists that faculty perceptions of unfairness and inequality may be decreased by providing adequate compensation rewards for goal attainment, providing attractive merit pay increases, making adjustments to salaries to avoid salary compression, and creating performance ratings that are accurate and unbiased for all faculty. As departments of agricultural education implement these recommendations, research such as this should be conducted to ascertain if desired results are occurring.

Agricultural education faculty tended to be undecided with respect to salary fairness. This finding suggests that the criterion of internal consistency has not been met. Faculty members who perceived that their salaries were fair, as compared with salaries of others in their department, tended to have higher faculty compensation level scores and compensation practice scores. Those who strongly agreed or agreed that salary was fair when compared to others in the department, others of the same rank in other departments, and others of the same discipline at other universities, tended to have the highest faculty compensation and practice scores. Similarly, participants who perceived that their salary was fair as compared with others of the same rank and as compared to others in their discipline at other universities tended to have higher faculty compensation level scores and compensation practice scores. An implication exists that job satisfaction, motivation, and performance can be improved by increasing faculty perceptions of internal consistency with respect to salary (Buford & Lindner, 2002).

It is recommended that departments of agricultural education conduct compensation audits periodically to ensure that current compensation programs are internally consistent, are externally competitive, value employee contributions, and reward faculty for performance. Additional research is needed to describe if increased faculty perceptions with respect to compensation levels and practices will result in increased job satisfaction, motivation, and performance. Research is further needed to describe if more externally equitable salaries will have similar results.

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Undergraduate Agriculture Student Critical Thinking Abilities and Anticipated Career Goals: Is There a Relationship?

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Abstract

This study attempted to examine the relationship between College of Agricultural and Life Sciences student critical thinking disposition and career choice. The researchers measured critical thinking disposition using the California Critical Thinking Disposition Inventory (Facione, Facione, & Giancarlo, 1996). Demographic data were collected with a researcher-developed instrument. The demographic instrument contained variables identified in similar research conducted with University of Florida's College of Agricultural and Life Sciences students (Rudd, Baker, & Hoover, 1998). A panel of experts in the Department of Agricultural Education and Communication at the University of Florida validated the instrument.

Students in six classes in the spring semester of 2001 were selected for this study. Courses were chosen to specifically focus on students enrolled in the College of Agricultural and Life Sciences. Specific courses chosen for the study were AEB 3341 - Selling Strategically, AEB 3300 - Agricultural and Food Marketing, HUNN 2201 HNRS - Honors Fundamentals of Human Nutrition, HUN 2201 - Fundamentals of Human Nutrition, PLS 3221 - Plant Propagation, and ORH 4804C - Annual and Perennial Gardening.

The study did not find a significant relationship between career choice and critical thinking disposition. It did find a conflict in student disposition by gender with an earlier study.

Introduction and Theoretical Framework

Colleges of Agriculture around the country are constantly changing. New technologies and information have spawned the development of many new majors and career choices for College of Agriculture, Natural Resources, and Life Sciences students across the country. How does this influx of information, and technology coupled with the teaching and learning environment in universities impact student career choice?

There have been a number of scholars in agricultural education attempting to examine factors related to students' career choice. Some are investigating student performance, academic history, certification history, and participation in youth leadership activities as factors that influence a student's career choice. However, no scholars in the field of agriculture have looked at the relationship between a student's disposition toward critical thinking and their anticipated career choice. This study attempted to define students not only in terms of their career goals and their disposition towards critical thinking, but to also look for connections between the two.

Critical Thinking

Attempts to measure, define, and develop critical thinking in educational, psychological, and philosophical circles are goals across disciplines in higher education today. Since the early efforts of Dewey (1933) to teach students to be purposeful in thinking while examining multiple perspectives and consider consequences, teachers have been struggling with teaching students to think in and about their discipline.

According to Ennis (1987) critical thinking is reasonable and reflective thinking focused on deciding what to believe or do. Halpern (1996) defined critical thinking as "…the use of cognitive skills or strategies that increase the probability of a desirable outcome" (p. 5). Other definitions include: the formation of logical inferences (Simon & Kaplan, 1989), developing careful and logical reasoning (Stahl & Stahl, 1991), deciding what action to take or what to believe through reasonable reflective thinking (Ennis, 1991) and purposeful determination of whether to accept, reject, or suspend judgement (Moore & Parker, 1994). In a comprehensive attempt to define critical thinking, Pascarella and Terenzini (1991) compiled the following, "…critical thinking has been defined and measured in a number of ways, but typically involves the individual's ability to do some or all of the following: identify central issues and assumptions in an argument, recognize important relationships, make correct inferences from data, deduce conclusions from information or data provided, interpret whether conclusions are warranted on the basis of the data given, and evaluate evidence or authority" (p. 118).

Significant progress toward a definition of critical thinking was achieved when a group of leading researchers in critical thinking were asked to define critical thinking through a Delphi study in 1990 (Facione). The Delphi group hypothesized that there is a set of intellectual virtues or habits of mind that reflect one's disposition to think critically. These virtues are identified below in the Delphi consensus statement (p. 2):

"The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making

judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit."

In a closely related definition, Burden and Byrd (1994) categorized critical thinking as a higher-order thinking activity that requires a set of cognitive skills. In a 1987 comprehensive review of existing literature, Beyer posited that critical thinking requires a set of skills and approaches to be effective. Beyer's (1987) critical thinking skills include:

1. Distinguishing between verifiable facts and value claims
2. Distinguishing relevant from irrelevant information, claims, and reasons
3. Determining factual accuracy of a statement
4. Determining credibility of a source
5. Identifying ambiguous claims or arguments
6. Identifying unstated assumptions
7. Detecting bias
8. Identifying logical fallacies
9. Recognizing logical inconsistencies in a line of reasoning
10. Determining the strength of an argument or claim

In an effort to clarify the process of critical thinking, Paul (1995) wrote that critical thinking is a unique and purposeful form of thinking that is practiced systematically and purposefully. The thinker imposes standards and criteria on the thinking process and uses them to construct thinking.

Critical thinking skills in colleges of agriculture have not been widely studied. Torres & Cano (1995) found a moderately positive relationship between a student's ability to think critically (as determined by the Developing Cognitive Abilities Test) and the student's learning style. Torres and Cano proposed a conceptual framework for addressing cognitive ability, however a working definition of critical thinking was not addressed. Whittington, Stup, Bish, and Allen (1997) conducted further inquiry in agricultural education related to critical thinking. In their attempt to address cognitive discourse provided by professors, the researchers attempted to equate critical thinking with levels of cognition. In a college–wide study at the University of Florida, Rudd, Baker, & Hoover (2000) found that about one-fourth of College of Agriculture and Life Sciences students possessed low critical thinking dispositions while only two-percent possessed high critical thinking dispositions. The researchers also found that women were significantly higher in their overall critical thinking ability, intellectual maturity, truth seeking, and open mindedness.

Although thinking critically utilizes higher-order thinking, critical thinking and higher-order thinking are not equivalent terms. Critical thinking is not a "catch-all" category for higher-order thinking. It is one of a family of closely related forms of higher-order thinking. Other forms include problem solving, creative thinking, and decision-making (Facione, 1990).

In their college-wide study, Rudd, Baker, and Hoover (2000) defined critical thinking as:

> "a reasoned, purposive, and introspective approach to solving problems or addressing questions with incomplete evidence and information and for which an incontrovertible solution is unlikely" (p. 5).

This definition of critical thinking was used for the purposes of this study.

The California Critical Thinking Disposition Inventory (CCTDI)

The CCTDI consists of seven sub-scales or constructs and an overall CCTDI total Score. The recommended cut score for each scale or construct is 40 and the suggested target score is 50. All scores range up to 60. Persons who score below 40 on a given scale are weak in that critical thinking dispositional aspect, persons who score above 50 on a scale are strong in that dispositional aspect.

Level of education appears to be a significant variable in determining CCTDI score. Preliminary research comparing undergraduate students with graduate students indicates that across all scores the graduate students show a marked increase. For example, 60% of the undergraduates scored below the Truth-Seeking construct scale of 40, where only 26% of the graduates scored below 40 (Facione, Sanchez, Facione, 1994). Comparisons between undergraduates (e.g. freshmen vs. seniors) have not been made in colleges of agriculture.

In recording a 50, a person is demonstrating consistent strength in that dispositional aspect. Inversely, scoring below 40 indicates that, on average, the person responds in opposition to the critical thinking dispositional aspect measured by a given scale.

Just as scores of less than 40 shows weakness, an overall CCTDI score of less than 280 shows serious overall deficiency in the disposition toward critical thinking. An overall score of 350 or more is a solid indication of across-the-board strength in the disposition toward critical thinking. However, an overall score of 350 is rare. People tend to have both strengths and weaknesses. Facione et. al. (1994) found that 6% of undergraduate students scored 350 or higher, indicating a high disposition for critical thinking. Over 22% of the undergraduate students scored below 280, characterizing then as deficient in critical thinking disposition. The following descriptions of the CCTDI constructs are from the CCTDI test manual (Facione, Facione, & Giancarlo, 1996)

> *Analyticity* is a construct consisting of 11 items from the CCTDI. This construct targets the disposition of being alert to potentially problematic situations, anticipating possible results or consequences, and prizing the application of reason and the use of evidence even if the problem at hand turns out to be challenging or difficult. The analytically inclined person is alert to potential difficulties, either conceptual or behavior, and consistently looks to anticipatory intervention, reason giving, and fact-finding as effective ways to resolve matters.

> *Self-confidence* is a construct consisting of nine items from the CCTDI. This construct refers to the level of trust one places in one's own reasoning process.

Critically thinking self-confident persons trust themselves to make good judgements and believe that others trust them as well, since they believe that others look to them to resolve problems, decide what to do, and bring reasonable closure to inquiry.

Inquisitiveness is a construct consisting of 10 items from the CCTDI. The inquisitive person is one who values being well-informed, wants to know how things work, and values learning even if the immediate payoff is not directly evident.

Maturity is a construct consisting of 10 items from the CCTDI. The maturity scale addresses cognitive maturity and epistemic development. CCTDI scoring gives preference to those disposed to approach problems, inquiry, and decision making with a sense that some problems are ill-structured, some situations admit of more than one plausible option, and many times judgments based on standards, contexts, and evidence which precludes certainty must be made.

Open-mindedness is a construct consisting of 12 items from the CCTDI. This construct targets the disposition of being open-minded and tolerant of divergent views with sensitivity to the possibility of one's own bias. The open-minded person respects the rights of others to holding differing opinions.

Systematicity is a construct consisting of 11 items from the CCTDI, targeting the disposition to being organized, orderly, focused, and diligent in inquiry. No particular kind of organization, e.g. linear or nonlinear, is given priority on the CCTDI. The systematic person strives to approach specific issues, questions or problems in an orderly, focused, and diligent way, however that might be accomplished.

Truth-seeking is a construct consisting of 12 items from the CCTDI, representative of those eager to seek the truth, who are courageous about asking questions, and honest and objective about pursuing inquiry even if the findings do not support one's interests or one's preconceived opinions. The truth-seeker would rather pursue the truth than win the argument.

Total Score is a measure consisting of the 75 items from the CCTDI.

The CCTDI is used extensively in military science, law enforcement, allied health, engineering, and business (Facione, Facione, & Giancarlo, 1996). The researchers did not find evidence of CCTDI use in colleges of agriculture. Since the instrument had been used with populations of college students in other science-based majors the instrument was deemed appropriate by the researchers for the purpose of identifying agriculture students' disposition to think critically.

Career Choice

Studies have been conducted in agricultural education in an effort to identify factors that influence an individual's career choice. Fraze and Briers (1986) examined the relationship between a student's career choice and their level of participation in FFA activities. However, in terms of career choice, their study was limited to whether or not the student entered or did not enter agricultural occupations. Their study found that students who actively participated in FFA activities were more likely to enter into agricultural professions than those who had low levels of participation. Their study also showed that students who actively participated in a variety of FFA activities were more likely to enter choice agricultural careers than those who participated actively in one FFA activity.

Baker and Hedges (1991) conducted a study to determine what influence factors such as academic history in the professional education portion of their agricultural education program, cumulative grade point average, and certification history had on graduates' career choices. In their study, the authors defined career choice in terms of whether or not a graduate entered the teaching profession. Their study showed that those who entered the teaching profession were significantly different in terms of their certification status and the grade they received in their student teaching.

Each of these studies attempted to identify factors that influence career choice decisions, but none went beyond looking at students' previous experiences. Studies have been conducted in other fields to address the influence of the disposition a student possesses to think critically on their career choice. Walsh (1996) conducted a study comparing practice and non-practice disciplines. She categorized students' career choices in the field of nursing, education, and business as practice disciplines while students choosing careers in English, history, and psychology were classified as non-practice disciplines. This study showed differences among majors in five of the seven constructs of the CCTDI: Truth-seeking, Open-mindedness, Confidence, Inquisitiveness, and Maturity.

According to Facione, Sanchez, Facione, & Gainen (1995), "the seven CCTDI dispositional scales are discipline neutral, yet each can be readily interpreted within the liberal arts and sciences as well as professional disciplines" (p. 6). The findings of the Walsh study support this assertion. A student's disposition towards critical thinking may therefore influence his or her decision on a career. There has been no research conducted that tries to examine the relationship between these two variables for students enrolled in a College of Agriculture.

Purpose and Objectives

Are there relationships between how a student thinks and the career field they choose? Are students with high dispositions for critical thinking more likely to choose one career over another?

Attempts to understand students in higher education programs in colleges of agriculture have been limited in breadth and depth. Although much knowledge exists about career choices

of agricultural students', little has been done to examine the relationship that this choice has with other student characteristics beyond demographics. The overall purpose of this study was to explore the relationship between career choice and student disposition toward critical thinking.

The specific objectives of this study were to:

1. determine student gender and anticipated career goal,
2. determine student disposition toward critical thinking,
3. examine the relationship between student gender, anticipated career goal, and critical thinking disposition.

Methods

Students in six classes in the spring semester of 2001 were selected for this study. Courses were chosen to specifically focus on students enrolled in the College of Agricultural and Life Sciences. Specific courses chosen for the study were AEB 3341 - Selling Strategically, AEB 3300 - Agricultural and Food Marketing, HUNN 2201 HNRS - Honors Fundamentals of Human Nutrition, HUN 2201 - Fundamentals of Human Nutrition, PLS 3221 - Plant Propagation, and ORH 4804C - Annual and Perennial Gardening.

Demographic data were collected with a researcher-developed instrument. The demographic instrument contained variables identified in similar research conducted with University of Florida's College of Agricultural and Life Sciences students (Rudd, Baker, & Hoover, 1998). A panel of experts in the Department of Agricultural Education and Communication at the University of Florida validated the instrument.

Critical thinking disposition data were collected using the CCTDI (Facione, Facione, & Giancarlo, 1996). The California Critical Thinking Disposition Inventory (CCTDI) consists of 75 Likert-type questions that represent seven critical thinking constructs. The developers report an overall reliability (Chronbach's α) of .90 and scale reliability scores from .72 - .80. Total scores range form 75-450.

This study is limited in that the sample is not random and the results can only be used to describe the students who participated in the study.

Results/Findings

A total of 344 students participated in the study. The average age of the participants was 21.82 years ($S\,D$ = 4.87). The sample included 196 (57.6%) females and 144 (42.4%) males (four students did not report their gender). A total of 17 anticipated career choices were included.

The mean total score of the CCTDI for the sample was 293.31. Scores ranged from a low of 220 to a high score of 387. Six students (1.74%) were classified as holding a strong disposition for critical thinking with scores of 350 or higher. There were 115 (33.43%) students

who scored in the weak disposition for critical thinking range (below 280). Males scored an average of 294.22 while females scored 292.75.

There was no significant difference (p=.62) between males and females in the total CCTDI score. However, gender differences were significant in four of the CCTDI constructs. Males scored significantly higher than females in the truth seeking, inquisitiveness, and maturity constructs while females score significantly higher than males in the open mindedness construct (Table 1).

Table 1.
CCTDI Total and Construct Scores for Selected College of Agriculture and Life Sciences Students (n=340).

Construct	Sample Mean	Male Mean	Female Mean	F-Value	Probability
Truth-seeking	36.69	37.51	36.09	5.050	.025
Open-mindedness	41.54	40.59	42.24	8.873	.003
Analyticity	45.14	45.36	44.97	.336	.562
Systematicity	40.81	40.53	41.02	.533	.466
Self-confidence	43.33	42.76	43.74	2.061	.152
Inquisitiveness	42.19	43.02	41.58	4.682	.031
Maturity	43.46	44.24	42.89	4.424	.036
Total	293.37	294.22	292.75	.248	.619

There were a total of 17 career choice responses on the demographic instrument. Responses were categorized as either bench or social science careers. Respondents who provided no answer, other, or undecided as a response were classified as such. CCTDI means for career choice classification varied from a low of 289.06 (n=108) for those students who provided no response to the career choice classification to a high of 302.10 (n=20) for those students who answered 'other' to the career choice classification question (Table 2). Students whose career choice that could be classified as a social science had a mean CCTDI score of 291.40 while those whose career choice could be classified as a bench science had a mean score of 297.51.

There was no significant difference (p=.10) in the mean CCTDI score of the bench science and social science career classifications. Comparisons of critical thinking total scores and construct scores between bench and social science career classifications revealed a significant difference in the open-mindedness construct (p<.00) and the self-confidence construct (p=.04) (Table 3). Respondents in the social science classification (n=87) had a mean open-mindedness construct score of 40.18 and respondents in the bench science classification (n=117) had a mean construct score of 42.65. Respondents in the social science classification had a mean self-confidence construct score of 42.55 and respondents in the bench science classification had a mean construct score of 44.35.

Table 2.
CCTDI Means by Career Choice Classification for Selected College of Agricultural and Life Sciences Students (n=344).

Career Classification	n	% of Sample	Mean CCTDI Score	SD
Bench Science	117	34.0	297.51	27.59
Social Science	87	25.3	291.40	24.67
Other	20	5.8	302.10	23.38
Undecided	12	3.5	289.67	37.14
No Response	108	31.4	289.06	26.94
Total	344	100.0	293.31	26.99

Table 3.
CCTDI Construct Means by Social and Bench Science Career Choice Classification (n=344).

Construct	Bench Science Mean	Social Science Mean	Significance
Truth-seeking	36.92	36.61	.69
Open-mindedness	42.65	40.18	.00
Analyticity	46.15	44.66	.07
Systematicity	41.65	40.80	.34
Self-confidence	44.35	42.55	.04
Inquisitiveness	42.34	42.20	.87
Maturity	43.44	44.28	.29

Conclusions

This population of students in the College of Agricultural and Life Sciences at the University averaged 22 years of age and consisted of slightly more females (57.6%) than males. Students in the sample represented 17 different career choice responses.

The total CCTDI scores indicated that 1.74% of the students in this sample had a strong disposition for critical thinking and 33.43% had a weak disposition for critical thinking. These results are consistent with those of Rudd, Baker, & Hoover (2000). In their study, 1.7% of participants had a strong disposition for critical thinking and 30.5% had a weak disposition for critical thinking.

The CCTDI revealed that the students surveyed scored below 50 in all construct areas indicating that, as a whole, these students do not possess a strong disposition toward critical thinking in any construct. This conclusion is consistent with that of Rudd, Baker, & Hoover (2000). Students scored above 40 in six of the seven construct areas (open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity). One construct, truth-seeking, was identified as having "weak" critical thinking disposition aspects with students scoring below 40 points in that construct. Rudd, Baker, & Hoover also found students to exhibit "weak" critical thinking dispositions in the area of truth-seeking.

There are significant gender differences in critical thinking disposition with males having a greater disposition to think critically within the constructs of truth-seeking, inquisitiveness, and maturity and females having a greater disposition to think critically within the construct of open-mindedness. There were no significant differences between males and females in the CCTDI total score. These findings do not support the findings of Rudd, Baker, and Hoover (2000) who found that females have a greater disposition to think critically as judged by the CCTDI total score and the constructs of truth-seeking, open-mindedness, and maturity.

Students choosing bench science careers scored higher than students choosing social science careers in total score and were significantly higher in the constructs of open-mindedness and self-confidence.

Implications and Recommendations

Although there were some differences noted, the practical differences between the two populations were minor. This set of participants does not indicate any significant ties between career choice and critical thinking disposition other than the finding of significant difference in open-mindedness and self-confidence. Perhaps the education and experience of those students seeking a bench science career would provide them with superior preparation for considering other points of view before making decisions.

The conflicting gender finding suggests the need for additional research to be conducted examining the relationship between gender and critical thinking dispositions of students in colleges of agriculture. Because the findings of the current study both support and conflict with the findings of previous research in agricultural education (Rudd, Baker, & Hoover, 2000), the validity of the CCTDI for use with college of agriculture students should be questioned. Additional research is needed to investigate the scale reliability of the CCTDI for use with college of agriculture students.

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A Correlational Analysis Of Instructional Technology Characteristics In North Carolina And Virginia Secondary Agricultural Education Curricula

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Abstract

The focus of this correlational study was to determine which selected demographic and program variables could be utilized in developing an instructional technology profile of North Carolina and Virginia secondary agricultural education teachers. Overall no demographic or program variables were found to be significant indicators to develop a profile. Recommendations included future research upon other instructional technology variables and possibly implementing a "train the trainer" philosophy to encourage more technology adoption by the majority of North Carolina and Virginia secondary agricultural education teachers.

Introduction

The educational field has witnessed many profound changes over the past few decades. Traditional educational models have emphasized a teacher-centered environment, in which the majority of information is disseminated through the teacher (Simonson & Thompson, 1997). With today's highly technological society this mode of education has come under great scrutiny, with many educational professionals and legislators calling for change. Educators and other related professionals across the nation have started to realize the importance of having students to become independent thinkers, explore complex problems, and apply the knowledge to real-life situations (Simonson & Thompson, 1997). According to Simonson & Thompson (1997) many experts in the field of education recognize technology as an essential component to support this new wave of thought sweeping the academic world. The new instructional technology tools are seen as mechanisms that support active learning in students. What implications do the aforementioned factors mean for secondary agricultural education, particularly in North Carolina and Virginia? The National Research Council (1988) in the book Understanding Agriculture emphasized that in order for agricultural education to remain viable educators should emulate the best current programs while generating new ways to deliver agricultural education. The field of instructional technology offers many avenues by which agricultural educators can disseminate the latest agricultural knowledge to clientele in both formal and informal educational settings.

As the current Information Age places greater pressures on existing educational structures, educators are seeking new technologies to enhance instructional opportunities to prepare students for the workforce of tomorrow. "Computerized instruction should be included in secondary vocational agriculture programs to teach computer literacy, a needed skill in agricultural occupations, and to enhance student learning" (Rodenstein & Lambert, 1982, p. 41). Before implementing any form of instructional technology into secondary agricultural education, careful consideration should be given to the perceptions of the teachers who will utilize the technology. In addition to this factor perhaps attention should be given to the association between secondary agricultural education teachers demographic/program characteristics and their overall views and utilization of instructional technology, in order to develop a profile. Perhaps an instructional technology profile could aid agricultural teacher educators and public school administrators in developing strategies to help North Carolina and Virginia secondary agricultural education teachers more effectively utilize technology to improve student learning outcomes.

Research on demographic variables and their influence on instructional technology implementation in agricultural education is very limited. Layfield and Scanlon (1999) conducted a nationwide study on the use of the Internet by agricultural education teachers. The study found that years of teaching experience and age were not found to have any influence on Internet use. Another demographic variable studied was educational level of teachers, this study indicated that teachers with bachelors degrees were more likely to be Internet users than others With the previously stated factors serving as a foundation for this study what demographic and program characteristics could be utilized to develop an instructional technology profile of North Carolina and Virginia secondary agricultural education teachers?

Theoretical Framework

In order to develop an instructional technology profile of North Carolina and Virginia secondary agricultural education teachers, the theoretical framework for this study was guided by E.M. Rogers's (1995) diffusion of innovations theory. This theory was initially designed to describe patterns of adoption, explain the mechanism, and assist in predicting whether and how a new invention will be successful. According to the diffusion of innovation theory, technological innovation is communicated through particular channels, over time, among the members of a social system. The stages through which a technological innovation passes are knowledge (exposure to its existence, and understanding of its functions), persuasion (the forming of a favorable attitude to it), decision (commitment to its adoption), implementation (putting it to use), and confirmation (reinforcement based on positive outcomes from it). Additionally innovations have certain characteristics: relative advantage (the degree to which it is perceived to be better than what it supercedes), compatibility (consistency with existing values, past experiences and needs), complexity (difficulty of understanding and use), trialability (the degree to which it can be experimented with on a limited basis), and observability (the visibility of its results). The diffusion of innovation theory also classifies individuals into technology adopter categories, which directly relates to the individual instructional technology characteristics of agricultural education teachers in this study (Figure 1). The adopter categories are innovators (venturesome), early adopters (respectable), early majority (deliberate), late majority (skeptical), and laggards (traditional).

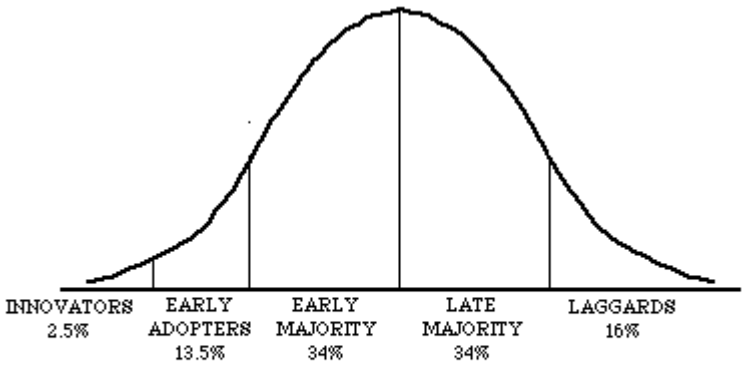

Figure 1. Bell shaped curve showing categories of individual innovativeness and percentages within each category

Earlier adopting individuals tend not to be different in age, but to have more years of education, higher social status and upward social mobility, be in larger organizations, have greater empathy, less dogmatism, a greater ability to deal with abstractions, greater rationality, greater intelligence, a greater ability to cope with uncertainty and risk, higher aspirations, more contact with other people, greater exposure to both mass media and interpersonal communications channels and engage in more active information seeking.

Another imperative component of the diffusion of innovation theory concerns the roles that individuals play in the process. Important roles in the innovation process include: opinion leaders (who have relatively frequent informal influence over the behavior of others); change

agents (who positively influence innovation decisions, by mediating between the change agency and the relevant social system); change aides (who complement the change agent, by having more intensive contact with clients, and who have less competence credibility but more safety or trustworthiness credibility). The change agent functions are: to develop a need for change on the part of the client; to establish an information-exchange relationship; to diagnose the client problems; to create intent to change in the client; to translate this intent into action; to stabilize adoption and prevent discontinuance; and to shift the client from reliance on the change agent to self-reliance. Regarding the diffusion of innovation theory what demographic and program characteristics could be utilized to develop an instructional technology profile of North Carolina and Virginia secondary agricultural education teachers?

Purpose and Objectives

The purpose of this correlational study was to analyze the association between demographic and program characteristics of North Carolina and Virginia secondary agricultural education teachers and various instructional technology variables. An additional purpose was to identify demographic and program variables that could be utilized to form an instructional technology profile of North and Virginia secondary agricultural educators. In order to accomplish the aforementioned purposes the following objectives were developed: 1. To identify the demographic and program characteristics of North Carolina and Virginia secondary agricultural educators. 2. To determine the association between program characteristics/demographic variables and selected instructional technology variables in North Carolina and Virginia secondary agricultural education curricula.

Methodology

An instrument was developed by the researcher based on the objectives of the study. Questions were adapted and modified from previous studies by the Instructional Technology Department of the Kansas City Public School District (1997), and Murphy and Terry (1998). Additional questions were added by the researcher to meet the research objectives. Additional questions were added by the researcher to meet the research objectives. The completed instrument consisted of six sections, with sections one, three, four, and six consisting of two subsections each. The sections were titled: Section I.: (A) instructor's utilization of instructional technology tools, (B) student's utilization of instructional technology tools; Section II.: access to selected instructional technology; Section III: (A) computers in your classroom and home, (B) priority of major goals for the use of computer technology (this subsection consisted of six mini-sections); Section IV: (A) benefits of instructional technology, (B) barriers to instructional technology; Section V.: instructional technology's future role in agricultural education; and Section VI.: (A) personal characteristics, (B) program characteristics. Sections one, two, three, four, and five contained Likert-type items, while section six contained a mixture of open-ended questions and Likert-type items. The validity of the instrument was established by means of content and face validity. A panel of experts with experience in instructional technology analyzed the instrument for content validity. Face validity was established during a pilot study consisting of 40 Iowa secondary agriculture teachers. On April 15, 1999 40 Iowa secondary agriculture teachers were mailed a preliminary survey and given two weeks to complete and return the survey. After two weeks sixteen surveys had been returned. After all pilot surveys had

been collected; instrument reliability was determined by utilizing Chronbach's Coefficient Alpha. Chronbach's Coefficient Alpha for sections one through five where .76, .80, .75, .89, and .84 respectively. After the reliability level was determined, a few questions were deleted and adjusted. In order to allow for correlational analysis, variables in each section of the survey, particularly subsections, and mini-sections of the survey were summated to form twelve different constructs in order to allow for comparisons with selected demographic and program variables.

The population for this correlational survey study consisted of secondary agriculture teachers in North Carolina and Virginia that were listed in the 1998-99 North Carolina Agricultural Education Directory (N = 370) and Virginia Vocational Agriculture Teacher's Association Directory (N = 313). Based on Krejcie and Morgan's (1970) formula for a 5% margin of error, a random sample of 242 would be required for a population of this size. As is the nature of survey research a certain loss rate can be expected. In an attempt to achieve the target sample size of 242, the researcher investigated the return rate of similar studies in agricultural education in the area of instructional technology. After a thorough analysis of these studies the researcher concluded that 65% could be expected to be returned. In order to account for the potential loss rate, 380 agricultural teachers were sampled. The sample size was calculated by taking the desired return rate of 65% and the target sample size of 242 into account. Two hundred forty-two comprises 65% of 380; by utilizing this logic the researcher was more confident in obtaining the target return of 242 agricultural education teachers across both states. The Statistical Package for the Social Sciences, Personal Computer Version 7.0, and Microsoft Excel were used to generate random numbers for the sample selection. The stratified random sample was drawn from the population of agricultural education teachers in North Carolina (N = 370) and Virginia (N = 313). After the random numbers were generated 210 agricultural education teachers from North Carolina and 170 from Virginia were selected for the study. Elements of Dillman's Total Design Method (1978) were utilized to achieve an optimal return rate. On May 21, 1999 380 surveys were mailed to randomly selected teachers across the states of North Carolina and Virginia. Along with the survey, and return stamped envelope, teachers received a cover letter from the researcher and researcher's major professor outlining the purpose of the research. In addition to these materials, teachers from North Carolina also received a letter from the North Carolina - State Agricultural Education Director, in support of this research. Teachers in Virginia received a similar letter from the chairperson of the agricultural education department at Virginia Polytechnic and State University. After two weeks 122 surveys had been received. A follow-up letter was mailed to non-respondents, after two more weeks, 43 more surveys had been received. On June 17, 1999, 225 surveys were mailed to all non-respondents along with another cover letter and a return stamped envelope. Non-respondents were given a deadline of July 31, 1999, to return the survey.

By July 1, 1999, 40 more surveys had been received for a final return rate of 53% (200 surveys). Readers should note that even though only 200 surveys were returned of the 380 mailed, 200 comprised 83 % of the target goal of 242. This was considered highly acceptable by the researcher. Of the 200 surveys that were returned, 195 were useable (NC = 85, VA = 110). Five surveys were lost due to frame error, and five surveys were returned unusable, mainly due to being incompletely filled out. Non-response error was handled by utilizing the "double-dip procedure" (Miller and Smith, 1983). Ten percent of the non-respondents were telephoned and asked selected questions from the survey. After this was accomplished, t-tests were conducted to

compare the answers of respondents versus non-respondents. No statistically significant differences could be found between the two groups.

Findings

Objective One

Demographic and program data was collected with section three of the survey. The majority of respondents in this study were male. The average age of North Carolina and Virginia agricultural teachers was forty. The majority of teachers in this study held a master's degree. Teachers in both states respectively had taught secondary agriculture for fourteen years. Teachers in North Carolina and Virginia on average had taken 25 hours of instructional technology training. A great proportion of North Carolina and Virginia agricultural teachers had home computers and Internet access. The majority of home computers were PC (IBM compatible) computers. Regarding program variables the average program in North Carolina and Virginia had an enrollment of 101 and 97 respectively. The average FFA membership for North Carolina and Virginia agricultural programs was 77 and 71 respectively. The majority of agricultural teachers taught subjects such as horticulture, agricultural mechanics, agricultural science, and animal science. In relation to program variables the bulk of computers in North Carolina and Virginia secondary agricultural programs were PC (IBM compatible).

Objective Two

Table 1 shows the point biserial correlations between teacher's state affiliation and selected instructional technology variables. For the purpose of data analysis and to be parsimonious in the discussion of objective two, individual items in each section of the survey were summated in order to perform correlational analysis with selected demographic and program variables. For the remainder of the discussion on objective two this will serve as the guiding principle. The associations between teacher's state affiliation and selected instructional technology variables ranged in magnitude from negligible to low. Two significant relationships were found in relation to teacher's state affiliation. In relation to information access and research, agriculture teachers in North Carolina were slightly more likely to place a higher priority on this area, than Virginia agriculture teachers. North Carolina agricultural teachers were also slightly more likely to see more benefits to instructional technology implementation in agricultural education than Virginia teachers. Overall North Carolina and Virginia agriculture teachers were found to have many similarities in relation to the selected instructional technology variables.

Table 1.
Summary of Relationships Between Teacher's State Affiliation and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	-.040
Student's Utilization of Instructional Technology Tools	.040
Access to Selected Instructional Technology Tools	-.109
Information access and research	-.246*
Communications	-.151
Data/Information Analysis	-.103
Graphing Software	-.152
Publication/Information Production	.003
Content area tutorials or drill and practice	-.072
Benefits of Instructional Technology	-.148*
Barriers to Instructional Technology	.019
Instructional Technology's Future Role In Agricultural Education	.094

**p = <.05 (Point Biserial)*
Note: Scale for teacher's state affiliation: 0 = North Carolina, 1 = Virginia

Table 2 shows the point biserial correlations between gender and selected instructional technology variables. Associations between gender and the selected instructional technology variables ranged in magnitude from negligible to low. One significant relationship was found to exist between gender and the selected variables. Male agriculture teachers have slightly more access to instructional technology tools than female agriculture teachers. Overall, however, male and female agriculture teachers were found to be equal on the selected variables.

Table 2.
Summary of Relationships Between Gender and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	.016
Student's Utilization of Instructional Technology Tools	-.003
Access to Selected Instructional Technology Tools	.161*
Information access and research	-.127
Communications	.012
Data/Information Analysis	.037
Graphing Software	.018
Publication/Information Production	-.139
Content area tutorials or drill and practice	-.120
Benefits of Instructional Technology	.017
Barriers to Instructional Technology	-.060
Instructional Technology's Future Role In Agricultural Education	-.039

**p = <.05 (Point Biserial), Note: 0 = Female, 1 = Male*

Table 3 presents Pearson correlations between age and selected instructional technology variables. Associations between age and selected instructional technology variables ranged in magnitude from negligible to low. Older teachers tended to have slightly more access to instructional technology tools than younger teachers. Overall agricultural teachers of all ages were found to be homogenous in relation to selected instructional technology variables.

Table 3.
Summary of Relationships Between Age and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	-.090
Student's Utilization of Instructional Technology Tools	-.008
Access to Selected Instructional Technology Tools	.141*
Information access and research	-.017
Communications	-.052
Data/Information Analysis	-.073
Graphing Software	.065
Publication/Information Production	-.132
Content area tutorials or drill and practice	-.046
Benefits of Instructional Technology	.078
Barriers to Instructional Technology	-.009
Instructional Technology's Future Role In Agricultural Education	.038

**p = <.05 (Pearson)*

Table 4 shows the point biserial correlations between highest degree earned and selected instructional technology variables. For data analysis purposes the variable degree was recoded into two categories. The categories of specialist and doctorate contained low frequencies, so in order to analyze the data in correlation form the two categories were combined with the master's degree category. The new variable was entitled graduate. All associations were negligible in magnitude. Overall agriculture teachers of all educational levels were equal on the selected instructional technology variables.

Table 4.
Summary of Relationships Between Highest Degree Earned and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	-.086
Student's Utilization of Instructional Technology Tools	-.061
Access to Selected Instructional Technology Tools	.058
Information access and research	-.007
Communications	.041
Data/Information Analysis	-.066
Graphing Software	-.012
Publication/Information Production	-.005
Content area tutorials or drill and practice	-.080
Benefits of Instructional Technology	-.055
Barriers to Instructional Technology	.022
Instructional Technology's Future Role In Agricultural Education	.057

**p = <.05 (Point Biserial)*
Note: The factor degree was recoded for purpose of analysis: 0 = Bachelor, 1 (Graduate) = Master's, Specialist, Doctorate

Table 5 shows Pearson correlations between years of teaching secondary agriculture and selected instructional technology variables. Variables ranged in magnitude from negligible to low. One significant relationship was found between years of teaching secondary agriculture and selected instructional variables. The fewer years a person has been teaching secondary agricultural education, the more likely they are to place a priority on using

publication/information production software for daily instructional activities. Overall the amount of years a person has been teaching secondary agricultural education has little association with selected instructional technology variables.

Table 5.
Summary of Relationships Between Years of Teaching Secondary Agriculture and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	-.035
Student's Utilization of Instructional Technology Tools	.031
Access to Selected Instructional Technology Tools	.065
Information access and research	-.036
Communications	-.062
Data/Information Analysis	.007
Graphing Software	.010
Publication/Information Production	-.148*
Content area tutorials or drill and practice	-.109
Benefits of Instructional Technology	.085
Barriers to Instructional Technology	.006
Instructional Technology's Future Role In Agricultural Education	.074

**p = <.05 (Pearson)*

Table 6 shows Pearson correlations between secondary agriculture teacher's program enrollment and selected instructional technology variables. Pearson correlations ranged in magnitude from negligible to low. One significant relationship existed between program enrollment and selected instructional technology variables. Specifically the more students an agriculture teacher instructed the more likely they were to utilize instructional technology in their agriculture program.

Table 6.
Summary of Relationships Between Secondary Agriculture Program Enrollment and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	.211*
Student's Utilization of Instructional Technology Tools	.105
Access to Selected Instructional Technology Tools	.027
Information access and research	.119
Communications	.025
Data/Information Analysis	.094
Graphing Software	-.038
Publication/Information Production	-.016
Content area tutorials or drill and practice	-.050
Benefits of Instructional Technology	.084
Barriers to Instructional Technology	-.070
Instructional Technology's Future Role In Agricultural Education	-.054

**p = <.05 (Pearson)*

Table 7 shows the Pearson correlations between FFA membership and selected instructional technology variables. Pearson correlations ranged in magnitude from negligible to

low. Two significant relationships were found between FFA membership and selected instructional technology variables. Specifically, the less an agriculture program's FFA membership was, the more likely the agriculture teacher was to use graphing software in their daily instructional activities. Additionally, the less a program's FFA membership was, the more likely the agriculture teacher was to utilize content area tutorials or drill and practice software. Additionally, the less a program's FFA membership was, to utilize content area tutorials or drill and practice software.

Table 7.
Summary of Relationships Between Secondary Agricultural FFA Program Membership and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	.094
Student's Utilization of Instructional Technology Tools	.069
Access to Selected Instructional Technology Tools	.009
Information access and research	.039
Communications	-.036
Data/Information Analysis	.047
Graphing Software	-.159*
Publication/Information Production	-.037
Content area tutorials or drill and practice	-.143*
Benefits of Instructional Technology	.094
Barriers to Instructional Technology	-.048
Instructional Technology's Future Role In Agricultural Education	-.077

**p = <.05 (Pearson)*

Table 8 shows the point biserial correlations between a teacher's home computer access and selected instructional technology variables. Point biserial correlations ranged in magnitude from negligible to low. Two significant relationships were found between a teacher's home computer access and selected instructional technology variables. Specifically agriculture teachers with home computer access were slightly more likely to have students utilizing instructional technology more frequently for daily instructional activities than those who lacked home computer access. In addition teachers who lacked home computer access had slightly more access to instructional technology in their secondary agricultural education programs on a daily basis.

Table 8.
Summary of Relationships Between Secondary Agricultural Education Teacher's Home Computer Access and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	.087
Student's Utilization of Instructional Technology Tools	.160*
Access to Selected Instructional Technology Tools	-.161*
Information access and research	-.053
Communications	.039
Data/Information Analysis	-.029
Graphing Software	.103
Publication/Information Production	.013
Content area tutorials or drill and practice	-.010
Benefits of Instructional Technology	-.091
Barriers to Instructional Technology	-.097
Instructional Technology's Future Role In Agricultural Education	.007

**p = <.05 (Point Biserial), Note: Scale for Home Computer Access: 0 = No, 1 = Yes*

Table 9 shows the point biserial correlations between secondary agricultural education teacher's home Internet access and selected instructional technology variables. The point biserial correlations ranged in magnitude from negligible to low. Only one significant relationship was found between secondary agricultural education teacher's home Internet access and selected instructional technology variables. Specifically teachers who lacked Internet access at home were slightly more likely to see benefits to instructional technology.

Table 9.
Summary of Relationships Between Secondary Agricultural Education Teacher's Internet Home Access and Selected Instructional Technology Variables

Variable	Association
Instructor's Utilization of Instructional Technology Tools	.066
Student's Utilization of Instructional Technology Tools	.045
Access to Selected Instructional Technology Tools	-.138
Information access and research	-.116
Communications	.041
Data/Information Analysis	-.091
Graphing Software	.060
Publication/Information Production	.038
Content area tutorials or drill and practice	.016
Benefits of Instructional Technology	-.169*
Barriers to Instructional Technology	-.091
Instructional Technology's Future Role In Agricultural Education	-.019

**p = <.05 (Point Biserial), Note: Scale for Internet Home Access: 0 = No, 1 = Yes*

Conclusions

In relation to the association between program characteristics/demographic variables and selected instructional technology variables in secondary agricultural education curricula in North Carolina and Virginia, associations ranged in magnitude from low to negligible. This finding indicates that the selected demographic and program variables are very weak characteristics to be utilized in developing an instructional technology profile of secondary agricultural education

programs in North Carolina and Virginia. In relation to the diffusion of innovation theory, agricultural educators in this study seemed to exhibit characteristics of the late majority and laggard categories in relation to their instructional technology profile. Perhaps agricultural teachers in this study did not see the relative advantage and compatibility of instructional technology innovation, which are major components of the diffusion of innovation theory, components which could contribute to agricultural teachers becoming change agents, change aides, and opinion leaders in the profession.

Recommendations

1. Future research should perhaps focus upon the benefits of instructional technology as perceived by North Carolina and Virginia secondary agricultural teachers in Alston and Miller (2001). The benefits centered around four major areas: (1) an increase in the availability of educational opportunities, (2) improved informational resources for faculty and students, (3) more effective instructional materials, and (4) more convenient delivery methods for instructors. Maybe these benefits could be expounded upon by state agricultural education leaders to infuse more instructional technology into the curricula.

2. Future research should perhaps center upon the barriers of instructional technology as perceived by North Carolina and Virginia secondary agricultural teachers in Alston and Miller (2001). The barriers to instructional technology centered on money for equipment, lack of technical support, lack of appropriate facilities, and lack of time to learn and implement the new immerging technologies in secondary agricultural education settings. Maybe these barriers could be eliminated or reduced in order to infuse more instructional technology into the curricula and encourage technology adoption.

3. Perhaps future research could focus upon the uncertainty of the future of instructional technology as perceived by North Carolina and Virginia secondary agricultural education teachers in Alston and Miller (2001). If the uncertainty is eliminated perhaps the teachers will at the least become early majority adopters of instructional technology.

4. Maybe a “train the trainer” philosophy could be adopted by state agricultural education leaders where by which instructional technology innovators could be identified among agricultural education teachers and then exposed to the latest instructional innovations. In turn these individuals could serve as opinion leaders, change agents, and change aides in bringing about instructional technology infusion into secondary agricultural education.

Implications

The diffusion of instructional technology innovation in North Carolina and Virginia secondary agricultural education could bring about improved learning outcomes if implemented in a sound pedagogical manner and encouraged by innovators, opinion leaders, and change agents. Instructional technology is a reality in the future of the global educational system and should be embraced in a systematic manner in order to effectively improve students’ learning.

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A Comparison of Inservice Needs of Middle and High School Agriculture Teachers

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Abstract

Agriculture is a constantly changing field. As such, many believe that agricultural education must also change if it is to remain a vital part of American education. As agricultural education shifts from its traditional focus on *production* agriculture to its new focus on *consumption* agriculture, teachers of agriculture may need to re-tool more frequently than has been done in the past. However, are all agriculture teachers offered the inservice training they need most? Therefore, to ascertain this, the objective of this study was to identify and compare inservice needs of middle school and high school agriculture teachers related to 1) FFA and SAE Supervision, 2) Instruction and Curriculum, 3) Technical Agriculture, 4) Program Planning and Management, and 5) Teacher Professional Development. This study yielded several interesting conclusions. The first is that the inservice needs of middle school teachers are similar in the categories of *FFA and SAE supervision, Program Planning and Management,* and *Teacher Professional Development*. However, their needs are considerably different in the categories of *Technical Agriculture* and *Instruction & Curriculum*. When examining specific inservice training items, the greatest inservice training need by both middle school and high school agriculture teachers is writing grant proposals for external funding. In contrast, the lowest needed inservice training items for both middle school and high school teachers were in the agricultural mechanics area.

Introduction/Theoretical Framework

Agriculture is a constantly changing field. As such, many believe that agricultural education must also change if it is to remain a vital part of American education. As agricultural education shifts from its traditional focus on *production* agriculture to its new focus on *consumption* agriculture, teachers of agriculture may need to re-tool more frequently than has been done in the past. However, are all agriculture teachers offered the inservice training they need most?

Evolving changes in educational practices, educational technology, technical agriculture, and FFA events have created a need for agriculture teachers to update their knowledge. Agriculture teachers often use inservice education to accomplish this. Topics of this inservice training have historically been determined by teacher educators in university agricultural education departments (Barrick, Ladewig, & Hedges, 1983). Teacher educators have predominantly used three methods for identifying inservice needs: research (Layfield & Dobbins, 2000; Washburn, King, Garton, & Harbstreit, 2001), their personal experiences (Barrick et al., 1983), and informal inquiries with agriculture teachers (Barrick et al., 1983). Some of those observations have often been less than accurate, however. In a comparison of agriculture teacher needs by teachers and teacher educators and other state program staff, Garton and Chung (1996) found that the topics rated highest by the teachers themselves were different from those topics rated highest by teacher educators and other state program staff. Other researchers have studied factors that affect inservice needs of agriculture teachers. Among these are time, years of teaching experience, and geographic location.

Inservice needs of agriculture teachers change over time. In a 1987 study of beginning agriculture teachers in Missouri, Birkenholz and Harbstreit found the greatest needs for inservice training to be in 1) using a microcomputer in the classroom, 2) developing skills in agribusiness management, 3) developing skills in electricity, 4) training teams for vocational agriculture and FFA contests, and 5) assisting students with SOEP records. Nine years later, Garton and Chung (1996) reported that the greatest inservice needs had changed to 1) completing reports for local/state administrators, 2) motivating students to learn, 3) preparing FFA degree applications, 4) developing an effective public relations program, and 5) preparing proficiency award applications.

Inservice needs of agriculture teachers also change with teaching experience (Birkenholz & Harbstreit, 1987; Claycomb & Petty, 1983; Layfield & Dobbins, 2000; Washburn et al., 2001). Layfield and Dobbins identified 1) utilizing a local advisory committee, 2) developing local adult education programs, 3) organizing fund raising activities for the local FFA chapter, 4) preparing agriculture/FFA contest teams, and 5) developing SAE opportunities for students as being of greatest need for beginning teachers. In contrast, the authors identified 1) using computers in classroom teaching, 2) preparing FFA degree applications, 3) preparing proficiency award applications, 4) using multimedia equipment in teaching, and 5) teaching record keeping skills as the highest ranked needs for experienced teachers.

Finally, inservice needs vary by geographic location. A study by Washburn et al. (2001) revealed that inservice needs varied somewhat between two bordering states in the Midwest.

The authors reported that 33% of the top 15 inservice needs were different between the states. Only three items, 1) writing grants for external funding, 2) modifying curriculum to meet changes in technology, and 3) designing and modifying curriculum and course offerings to attract high quality students, were similarly listed in the top five of both states.

Given that inservice needs can vary with time, years of teaching experience, and geographic location, are there other factors that can affect inservice needs of teachers? Frick (1993) implied that middle school teachers have different needs when he recommended that teacher education programs conduct inservice sessions and modify preservice programs to prepare current and prospective middle school agriculture teachers. However, missing from the research base are studies that identify and compare the inservice needs of agriculture teachers based on grade level taught.

Purpose/Objectives

The purpose of this action research was to determine the current inservice needs of agricultural education teachers in middle and high school agriculture programs. The results of this study will guide decisions for topic selection of inservice sessions offered by the Agricultural Education department of the corresponding land grant university. Ultimately, these inservice sessions will be targeted to specific groups, based upon their needs. To achieve this purpose, the objective of this study was to identify and compare inservice needs of middle school and high school agriculture teachers related to FFA and SAE Supervision, Instruction and Curriculum, Technical Agriculture, Program Planning and Management, and Teacher Professional Development.

Procedures

The instrument used in this study was adapted from the instruments used by Garton and Chung (1996) and Washburn et al. (2001). The instrument contained 80 items and was divided into the following sections: 1) FFA and SAE supervision, 2) instruction and curriculum, 3) technical agriculture, 4) program management and planning, and 5) teacher professional development. Respondents were asked to rate their need for inservice education for each item using a 5-point Likert-type scale. The scale ranged from no need (1) to very strong need (5). The instrument was evaluated for face and content validity by an expert panel of teacher education faculty, graduate students, and teachers not included in the study. Reliability as a measure of internal consistency was established. Cronbach's alpha values ranged from .88 to .95.

The population for this study consisted of agriculture teachers who attended the state FFA convention and/or agriculture teachers' conference (n= 132). The researchers administered the instrument on-site.

Since it was reasoned that the teachers who would participate in inservice training were likely those who completed the questionnaire, no effort was made to control for non-response error. According to Miller and Carr (1997), coaxing responses from non-respondents in this situation would likely have skewed the results and affected the inservice training decisions made based upon these results.

Findings

The primary objective of this study was to identify and compare inservice needs of middle school and high school agriculture teachers related to 1) FFA and SAE supervision, 2) instruction and curriculum, 3) technical agriculture, 4) program management and planning, and 5) teacher professional development. Data was collected from 30 middle school teachers and 76 high school teachers (n=106).

In the *FFA and SAE Supervision* category, the needs of middle school and high school teachers were slightly different (see Table 1). The needs ranked highest by middle school teachers were 1) developing SAE opportunities for students, 2) organizing and maintaining an alumni association, 3) preparing for career development events, 4) supervising SAE programs, and 5) preparing POA & national chapter award applications. By comparison, the needs ranked highest by high school teachers were 1) preparing proficiency award applications, 2) preparing for career development events, 3) preparing POA & national chapter award applications, 4) preparing FFA degree applications, and 5) developing SAE opportunities for students. It is interesting to note that preparing proficiency award applications for high school teachers was by far the greatest need (3.78), which was also the overall second highest item for high school on the needs assessment questionnaire. Furthermore, the grand means are considerably different for middle and high school teachers (2.88 and 3.15 respectively).

Table 1
FFA and SAE Supervision Needs Rankings

	Middle School (Grand Mean = 2.88)				High School (Grand Mean = 3.15)			
Item	CR[a]	*OR*[b]	M	SD	CR[a]	OR[b]	*M*	*SD*
Developing SAE opportunities for students	1	15	3.33	1.32	5	35	3.20	1.22
Organizing and maintaining an alumni association	2	29	3.17	1.42	7	62	2.92	1.29
Preparing for Career Development Events	3	35	3.13	1.11	2	13	3.47	1.07
Supervising SAE programs—traditional and non-traditional	3	35	3.13	1.31	6	52	3.05	1.17
Preparing POA & National Chapter Applications	5	42	3.07	1.17	2	13	3.47	1.08
Preparing proficiency award applications	6	59	2.80	1.42	1	2	3.78	1.07
Supervising Show Animal SAE Projects	7	68	2.67	1.30	9	79	2.49	1.24
Preparing FFA degree applications	8	73	2.45	1.27	4	32	3.23	1.19
Supervising CO-OP/OJT programs	9	78	2.17	1.18	8	73	2.74	1.22

Note. 1=no need, 2=some need, 3=moderate need, 4=strong need, and 5=very strong need.
[a]Rank within category, [b]Overall rank on 80 items

When examining the rankings of inservice needs of agriculture teachers in the *Instruction and Curriculum* category, many similarities existed, yet the two groups ranked several items considerably different (See Table 2). Eight items, 1) changing the curriculum to meet changes in technology, 2) teaching leadership, 3) developing a statewide core curriculum for agricultural education, 4) teaching in laboratory settings, 5) motivating students, 6) designing and modifying curriculum and course offerings to attract high quality students, 7) integrating science into agriculture instruction, and 8) motivating students, ranked in the top ten for middle school and

high school teachers. However, designing programs for non-traditional & urban students (3rd for middle school and 13th for high school), integrating state performance tests and benchmark standards into the curriculum (13th for middle school and 1st for high school), and using computer technology and computer applications (12th for middle school and 4th for high school) ranked very differently for the two groups. Nevertheless, the grand means for the two groups were very similar (3.05 and 3.10, respectively).

Table 2
Instruction and Curriculum Needs Rankings

	Middle (Grand Mean = 3.05)				High (Grand Mean = 3.10)			
Item	CR[a]	*OR*[b]	*M*	*SD*	CR[a]	OR[b]	*M*	*SD*
Changing the curriculum to meet changes in Technology	1	8	3.41	1.32	2	9	3.53	.97
Teaching leadership	2	12	3.37	1.13	7	25	3.32	1.13
Designing programs for non-traditional & urban Students	3	17	3.30	1.24	13	66	2.83	1.19
Developing a statewide core curriculum for Ag. Education	4	18	3.27	1.17	8	30	3.24	1.09
Teaching in laboratory settings	4	18	3.27	1.26	10	36	3.19	1.17
Designing and modifying curriculum and course offerings to attract high quality students	6	25	3.21	1.18	5	17	3.45	1.08
Integrating science into agriculture instruction	6	25	3.21	1.24	6	22	3.33	1.18
Motivating students—teaching techniques and ideas	6	25	3.21	1.35	3	12	3.48	1.13
Modifying Lessons for special needs and ESOL Students	9	29	3.17	1.23	14	67	2.80	1.19
Developing critical thinking skills in your students	9	29	3.17	1.26	11	37	3.18	1.05
Integrating math into agriculture instruction	11	34	3.14	1.30	9	34	3.22	1.15
Using computer technology and computer Applications	12	45	3.03	1.19	4	13	3.47	1.08
Integrating State Performance Tests and Benchmark standards into the curriculum	13	48	3.00	1.14	1	8	3.55	1.10
Teaching problem-solving and decision making Skills	13	48	3.00	1.25	12	40	3.17	1.15
Managing student behavior	15	52	2.97	1.30	16	75	2.66	1.21
Developing a magnet program or academy	16	65	2.73	1.55	19	78	2.53	1.42
Testing and assessing student performance	17	69	2.57	.90	15	74	2.68	1.17
Understanding learning styles	18	70	2.50	.97	17	76	2.63	1.07
Planning and effective use of block scheduling	19	72	2.47	1.36	18	77	2.60	1.32

Note. 1=no need, 2=some need, 3=moderate need, 4=strong need, and 5=very strong need.
[a]Rank within category, [b]Overall rank on 80 items

Middle school and high school agriculture teachers had very different needs in the *Technical Agriculture* category (See Table 3). Only advances in biotechnology (3rd for middle school and 1st for high school), agricultural sales & marketing (5th for middle school and 8th for high school), animal health (8th for middle school and 7th for high school), and record keeping

skills (9th for both middle school and high school) appeared in the top ten for both groups. Greenhouse operation & management (1st for middle school and 19th for high school), food science & food safety (2nd for middle school and 20th for high school), plant identification and use (3rd for middle school and 22nd for high school), genetic engineering (23rd for middle school and 2nd for high school), animal reproduction (17th for middle school and 3rd for high school), global positioning systems (22nd for middle school and 4th for high school), aquaculture (13th for middle school and 5th for high school), landscaping (5th for middle school and 16th for high school), floriculture (9th for middle school and 29th for high school), and tissue culture (15th for middle school and 6th for high school) were ranked noticeably different by both groups. Interestingly, both groups expressed similar needs (3.70 for middle school and 3.72 for high school) for their highest ranked item. Furthermore, the grand means were similar (3.03 and 3.14 respectively).

Table 3
Technical Agriculture Needs Rankings

	Middle (Grand Mean = 3.03)				High (Grand Mean = 3.14)			
Item	CR[a]	OR[b]	*M*	*SD*	CR[a]	OR[b]	*M*	*SD*
Greenhouse Operation & Management	1	2	3.70	1.34	19	45	3.11	1.15
Food Science & Food Safety	2	3	3.60	1.33	20	48	3.09	1.12
Plant Identification and Use	3	4	3.53	1.36	22	51	3.07	1.14
Advances in biotechnology	3	4	3.53	1.36	1	3	3.72	1.01
Agricultural Sales & Marketing	5	6	3.43	1.22	8	22	3.33	1.12
Landscaping	5	6	3.43	1.25	16	43	3.13	1.15
Plant Propagation	7	10	3.40	1.52	14	37	3.18	1.05
Animal Health	8	15	3.33	1.35	7	22	3.33	1.20
Forestry	9	18	3.27	1.23	18	45	3.11	1.13
Floriculture	9	18	3.27	1.23	29	68	2.79	1.19
Record Keeping Skills	9	18	3.27	1.26	9	26	3.29	1.14
Animal Nutrition	12	23	3.23	1.25	12	29	3.25	1.16
Aquaculture	12	23	3.23	1.41	5	19	3.37	1.20
Global Agriculture Issues	14	28	3.20	1.19	10	27	3.28	1.07
Tissue Culture	15	29	3.17	1.42	6	21	3.34	1.11
Soil Science	16	35	3.13	1.31	26	61	2.95	1.10
Natural Resources Management	17	39	3.10	1.29	17	44	3.12	1.09
Water Quality/Water Regulations	17	39	3.10	1.32	14	37	3.18	.99
Animal Reproduction—A.I. And Embryo Transfer	17	39	3.10	1.45	3	10	3.50	1.23
Financial Management	20	42	3.07	1.20	13	30	3.24	1.11
Meat Science	21	45	3.03	1.27	21	50	3.08	1.18
Global Positioning Systems (GPS)	22	48	3.00	1.36	4	19	3.37	1.19
Genetic Engineering	23	52	2.97	1.25	2	6	3.58	1.05
Restricted Pesticide License Training	24	59	2.80	1.49	10	27	3.28	1.26
Waste Management	25	63	2.77	1.33	27	63	2.89	1.02
Turfgrass	25	63	2.77	1.38	23	53	3.04	1.15
Forages	27	67	2.72	1.13	24	59	2.97	1.01
Ag. Mechanics—Small Project Construction	28	70	2.50	1.33	25	60	2.96	1.18
Small Engine Technology	29	74	2.37	1.38	30	69	2.78	1.27
Electricity and Controls	30	76	2.34	1.40	28	64	2.85	1.21
Tool and Machine Conditioning and Repair	31	77	2.33	1.40	33	72	2.76	1.17
Oxy-Acetylene Welding and Plasma Cutting	32	78	2.17	1.18	31	70	2.77	1.20
Ag Mechanics—Large Project Construction	33	80	1.97	1.19	31	70	2.77	1.16

Note. 1=no need, 2=some need, 3=moderate need, 4=strong need, and 5=very strong need.
[a]Rank within category, [b]Overall rank on 80 items

The *Program Management and Planning* category revealed little difference in the needs of middle school and high school agriculture teachers (See Table 4). The top three items, writing grant proposals for external funding, recruiting and retaining quality students, and building the image of agriculture programs and courses were the exact same for both groups. While establishing a public relations program, developing business/community relations, and

establishing a working relationship with local media all appeared in the top six needs for both groups. Noticeably, one item, writing grant proposals for external funding was the highest ranked item in the category and the highest item overall for both groups. Additionally, the grand means were only slightly different (3.04 and 3.17 respectively).

Table 4
Program Management and Planning Needs Rankings

	Middle (Grand Mean = 3.04)				High (Grand Mean = 3.17)			
Item	CR[a]	OR[b]	*M*	*SD*	CR[a]	OR[b]	*M*	*SD*
Writing grant proposals for external funding	1	1	4.07	1.39	1	1	3.93	1.17
Recruiting and retaining quality students	2	10	3.40	1.38	2	4	3.67	1.12
Building the image of agriculture programs and Courses	3	13	3.34	1.20	3	11	3.49	1.21
Establishing a public relations program	4	30	3.17	1.21	5	32	3.23	1.18
Developing business/community relations	5	38	3.13	1.20	6	40	3.17	1.11
Establishing a working relationship with local Media	6	42	3.07	1.44	4	18	3.45	1.20
Fundraising	6	42	3.07	1.48	13	58	3.00	1.27
Conducting needs assessments and surveys to assist in planning middle and secondary agriculture programs	8	55	2.93	1.31	14	64	2.85	.97
Completing reports for local and state Administrators	8	55	2.93	1.39	11	56	3.01	1.13
Utilizing a local advisory committee	10	57	2.90	1.42	10	53	3.04	1.17
Managing learning labs	10	57	2.90	1.37	6	40	3.17	1.11
Evaluating the local agriculture program	12	59	2.80	1.24	11	56	3.01	1.02
Planning and maintaining a school land lab	13	62	2.79	1.35	9	48	3.09	1.18
Building collaborative relationships	14	65	2.73	1.11	8	45	3.11	1.07
Developing an adult program	15	74	2.37	1.35	15	80	2.31	1.12

Note. 1=no need, 2=some need, 3=moderate need, 4=strong need, and 5=very strong need.
[a]Rank within category, [b]Overall rank on 80 items

The *Teacher Professional Development* category yielded nearly identical rankings by both middle school and high school teachers (See Table 5). However, it is interesting to note that for the category, middle school teachers had a lower grand mean than the high school teachers (3.18 and 3.42, respectively).

Table 5
Teacher Professional Development Needs Rankings

	Middle (Grand Mean = 3.18)				High (Grand Mean = 3.42)			
Item	CR[a]	OR[b]	*M*	*SD*	CR[a]	OR[b]	*M*	*SD*
Managing and reducing work-related stress	1	8	3.41	1.35	2	7	3.57	1.23
Time management tips & techniques	2	13	3.34	1.59	1	5	3.61	1.24
Professional growth and development	3	48	3.00	1.34	3	13	3.47	1.08
Becoming a member of the total school community	4	54	2.96	1.37	4	53	3.04	1.20

Note. 1=no need, 2=some need, 3=moderate need, 4=strong need, and 5=very strong need.
[a]Rank within category, [b]Overall rank on 80 items

Conclusions/Recommendations/Implications

This study provides several interesting conclusions. The first is that the inservice needs of middle school teachers are similar in the categories of *FFA and SAE supervision, Program Planning and Management,* and *Teacher Professional Development*. However, their needs are considerably different in the categories of *Technical Agriculture* and *Instruction & Curriculum*. When examining the *Technical Agriculture* category, a pattern emerges from the data. That is that middle school teachers had the greatest need in areas that dealt with broad content areas and agricultural literacy topics. While in contrast, high school teachers had the greatest needs in highly specific, technical areas. This is not surprising, given that the curriculums taught by each group mirrored their expressed needs for inservice training. This finding alone warrants a new approach to inservice training for agriculture teachers in the state of this study.

Given the extensive amount of time and effort required to offer exceptional inservice training sessions, it is recommended that when selecting topics for sessions in the categories of *Technical Agriculture* and *Instruction & Curriculum* that different sessions are directed specifically to middle or high school teachers based on the findings in this study. Furthermore, the findings of this study could suggest that middle school and high school teachers require different academic content relating to technical agriculture, curriculum development, and instructional techniques during their preservice teacher education.

When examining specific inservice training items, the greatest inservice training need by both middle school and high school agriculture teachers is writing grant proposals for external funding. This conclusion is consistent with the findings of Washburn et al. (2001). Therefore, it is recommended that inservice training sessions relating to this topic be conducted at various locations throughout the state in this study. Additionally, the unanimous selection of this item as having the greatest need indicates that curriculum related to grant writing should be incorporated into the preservice teacher program at the land grant institution in the state of this study.

Individual items related to advances in technology and science (computers, biotechnology, genetic engineering, etc.) are needed by both groups. Again, this conclusion is consistent with Washburn et al. (2001). Current inservice offerings in the state of this study are addressing some of these needs. Consequently, it is recommended that these inservice sessions are continued and expanded to reflect the findings of this study.

In contrast, the lowest needed inservice training items for both middle school and high school teachers were in the agricultural mechanics area. This was not a surprising finding, however, given that Camp, Broyles, and Skelton (2002) reported that there were no programs in the state being surveyed with a primary focus on agricultural mechanics. The low need for inservice training in this area likely confirms the notion that most teachers in this state do not teach a great deal of agricultural mechanics content. Furthermore, these findings indicate that the agricultural mechanics instruction that preservice teachers received in the state of this study either meets or exceeds the knowledge needed to be an agriculture teacher.

Statewide testing and school grading has affected the inservice needs of high school agriculture teachers as indicated by the inservice item, integrating state performance tests and benchmark standards into the curriculum, ranking first in the *Curriculum and Instruction* category. Therefore, it is recommended that inservice training be offered related to this topic to high school teachers. Moreover, it is recommended that this topic be addressed in the preservice teacher education program in the state of this study.

As indicated by Washburn et al. (2001), identified inservice needs in one state are not necessarily the same in a similar state. Hence, it is recommended that this study be replicated in other states that have similar populations of middle school agriculture teachers.

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Integrating Adult Learning into Extension: Identifying Importance and Possession of Adult Education Competencies Among County Extension Faculty

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Abstract

An ex post facto case study was conducted to determine critical professional development needs of county extension faculty in the area of adult education. To conduct the study, a survey was administered to a group of 60 county extension faculty representing one extension district within a Southeastern US state. The constructs measured in the survey included embedded perceptions as to the importance and degree of possession of a set of adult learning concepts and practices expressed as skills/competencies, the perception of the need for training in these areas, and general demographic information.

On average, faculty felt that they spend about 50% of their time on adult education, and the majority perceived themselves as effective adult educators. However, respondents also believed that they have a substantial need for training in adult education. Data analysis indicated that gender and background in adult education were significant predictors of both perceived importance and possession of skills/competencies in the field of adult education. Results also indicated that while no significant differences existed between those with and those without a formal background in adult education in terms of perceived importance, those with a formal degree in this area felt they possessed these skills/competencies to a significantly greater degree than those without a formal degree. Although generalizability is limited to the extension district in which the study took place, these findings do suggest that the extension system might significantly benefit from active integration of adult education into the realms of formal training, hiring and professional development opportunities.

Introduction/Theoretical Framework

"Extension was borne of a need to provide innovative, informal adult education programs" (Astroth and Robbins, 1987, p.1).

While the above quote may aptly serve to emphasize the significance of adult education as an integral aspect of the cooperative extension system, the jury is still out as to how effectively extension has been able to integrate adult learning concepts, training and practices into the organization as a whole. As the world's largest nonformal adult education organization (Boone, 1985), it could be reasonably assumed that Extensionists possess the requisite knowledge and skills to anticipate and recognize adult needs and to direct learning activities that adequately address those specific requirements. It has been argued, however, that in many situations, extension professionals have been hired to work in extension primarily because of efficacy in a particular subject area rather than experience or skills as educators (Seevers, 1995). Further, although extension agents are often well grounded in their respective subject areas, they may not have had much training in educating adults (Cornell, 1999).

Previous research in this area has shown that the success of an extension program depends, not only on the quality of content offered, but also on the ability of the extension educator to effectively facilitate adult learning (Cornell, 1999; Birkenholz, 1999; Rogers, 1996). For example, findings from a study that included a historical review of the hiring practices, pre-professional training requirements and the nature of the Ohio Cooperative Extension Service (OCES), demonstrated the importance of making available professional development in the area of adult education (OCES, 1989). A look at pre-professional educational requirements as well as on-the-job staff development opportunities indicated that most extension professionals were not trained to assume the role of an adult educator, but rather to serve as experts in a particular science-based field (Seevers, 1995). From the above, it could be assumed that the degree to which extension educators perceive the need, desirability and utility of understanding and applying adult learning theory and concepts could be related to programmatic success. But although a few current studies that look at the outcomes of integrating adult learning concepts into extension education exist (Murdock & Paterson, 2002; Gillis & English, 2001), current research focusing on the perceived importance and utility of applying adult learning concepts in the extension setting are missing from the research base. Further, research is also limited with respect to understanding what demographic factors, such as gender, age, and previous education might be predictive of the degree to which county faculty perceive the importance of, as well as feel they possess, these important capabilities.

Adults as learners

Some tend to think of the word "adult" in terms of age. But according to Rogers, no single age can define an adult even within one society, let alone on a comparative basis, because legal and social liabilities come into play at different ages (1996). He argues that a more satisfactory approach may be to identify some of those characteristics inherent within the concept of adulthood. Though they may differ by the person and culture, far-sightedness, self-control, established and accepted values, security, experience and autonomy are among the most common characteristics (1996).

Malcolm Knowles (1990) outlined nine common characteristics to plan for and utilize with any adult learner regardless of level, subject or situation. Knowles contends that adults need to control their learning, as well as feel that what they are learning has immediate utility, and is focused on issues that directly concern them. Adults need to test their learning as they go along, rather than receive background theory and general information. They need to anticipate how they will use their learning, and to expect performance improvement to result from their learning. Adult learning is greatest when it maximizes available resources. It requires a climate that is collaborative, respectful, mutual and informal, and it relies on information that is appropriate to what is known at a given time; i.e., it is developmentally paced (1990).

Innate in these characteristics are the notions that adults have a basic need for control of, a need to take relevance from, and a need for involvement in any learning experience. Boulmetis (1998) finds Knowles' list to be "true of all adults regardless of their age, gender, socio-economic status, ethnicity or race. Surprisingly enough, Knowles' characteristics apply to all these groups—singly and collectively" (p.2). Boulmetis contends that most authors on the subject, even those outside the adult education arena, write about important learning or training principles that are very similar to those of Knowles (Boulmetis, 1998).

Birkenholz (1999) asserts that adults with more education have a stronger tendency to participate in adult education activities than those who have less education. He explains that this is because, as people expand their knowledge base, they also increase awareness of what they do *not* know. Although education expands the base of knowledge, it also tends to expand a sense of ignorance or inadequacy that serves to drive life-long learning and motivation to learn (1999).

Henschke (1998) contends that adult educators are models. He outlined four components for the practice of modeling in the preparation of adult educators. The first ingredient is the theory of andragogy—the art and science of helping adults learn (Knowles, 1990). Its primary principle is the desire, potential and ability for self-directedness on the part of the learner. Other principles that comprise this theory include: (a) perceiving the learner's experience as a resource for learning, (b) seeing developmental tasks of social roles as crucial in activating the need and readiness for learning, (c) learners need a situation-centered or problem-centered orientation to learning, (d) understanding that motivation of adult learners is internal, rather than merely external, and (e) learners need a valid reason why they need to learn something to appreciate its importance.

Henschke's use of andragogy is based on the work of Knowles. Henschke contends that andragogy is the basis for the next component in his model, which involves attitude. According to Henschke, andragogy is much more than a method or theory (1998).

> "It (andragogy) is an attitude of mind and heart, and it becomes a transforming power and positive influence in modeling the preparation of adult learners. An attitude for caring for the learner as a valuable, unique person, and of helping the learner to accomplish his or her educational goals. It is essential for an adult educator" (p. 12).

The third component of his model is congruence. When andragogical principles are applied consistently, congruency with learners will be achieved in the form of mutual agreement of voluntary conformity. This requires congruency of theory and practice (1998). The final ingredient is trust, which Henschke describes as coming from both the attitude of andragogy and congruency. The adult educator must initiate trust with learners (1998). "If he or she effectively models the principles of adult education, learners have a golden opportunity to become great adult educators themselves (p. 12)." Without trust, Henschke notes, the learners may not learn something they would have, or would have learned less well, more slowly, or not at all. "A lack of trust seriously hampers the learning process" (p. 12).

Adult learners and extension professional development

Maricle and Nolting (1991) postulate that to effectively present programs to adult participants in extension, it is important to know how adults develop as they mature, and what learning style most appropriately fits each developmental stage. They define adult development as "the study of adult capacity to improve over time" (1991). Adults change in predictable ways according to age, individual characteristics, and demands of the environment (1991). They contend that cognition, conceptual development, and personality development should all be considered when developing Extension programs for adults (1991). Knowing how adults develop from simplistic, concrete thinking to multi-information and abstract thinking is vital to program success (1991).

One of the ways in which to insure that Extensionists have the skills they need to educate adults is through extension professional development activities and programs. Skills and competencies designed for extension educators are enhanced by the process of staff development (Seevers, Graham, Gamon & Conklin, 1997). Professional staff development can take the form of in-service training, professional organizations, personal reading, computer networks, and mentoring programs (1997).

Guskey (2000) defines professional development within an organization as a process that is intentional, ongoing, and systematic. He defines *intentional* to include a consciously designed effort to bring about positive change and improvement. This needs to be a deliberate process that is guided by a clear vision of purposes and planned goals. For professional development to be the most effective, individuals must appreciate its possibilities and the necessity for improvement in all aspects of the workplace. Professional development is *ongoing* because every day presents a variety of challenging learning opportunities, and Extension faculty must stay abreast of new knowledge, technology and information. Training and development are necessary if extension professionals are to keep up with the growing and expanding global knowledge base. Effective professional development is *systematic* because the process must consider change over an extended period of time, and it must take into account all levels of the organization (2000).

For the past ten years, there has been an increase in research outlining the best procedures in professional development (Galbo, 1998). According to Galbo, there has also been an attempt to connect adult learning theory to the design of professional development training (1998). She contends that educators have made an effort to link the best practices in professional

development with information on adult learning because they believe that the most effective professional development results from connecting the two fields (1998). Galbo denotes that Knowles' research has important implications for staff development providers (1998). "While andragogy teaches us that there is not one best way to design staff development programs, applying adult learning theory can help those responsible for planning staff development training to meet the individual requirements of adult learners" (p. 1). Galbo indicates that professional staff development is much more likely to be effective in facilitating reform if the implementation of staff development practice is also based on the key findings of adult learning theory (1998).

Purpose/Objectives

Based on the concept that youth and adult audiences respond to education differently, and in fact learn differently (Birkenholz, 1999), it can be argued that county extension faculty need to understand how to tailor their extension education programs for these disparate audiences. Given the focus on educating adults, it could be assumed that knowledge, understanding and capability in applying adult education concepts and skills would be important assets for county extension faculty. From an organizational perspective, demonstrating that competency in adult education is an important and valued skills set could be useful in terms of identifying a new and potentially important area for professional development and in-service training opportunities.

The purpose of this study, therefore, was to conduct a case study designed to explore and determine perceived levels of importance, competency and need for training in adult learning theories and practices among a population of county extension faculty in one extension district. Consequently, the objectives of the study were as follows:

1. Describe county extension faculty respondents' overall perceptions of the importance of adult education theories, concepts and practices;
2. Describe county extension faculty respondents' overall perceptions of the degree to which they felt they possessed these adult education skills/competencies;
3. Determine the amount of variance in the perceived overall importance and degree of possession of adult education skills/competencies as explained by the linear combination of faculties' age, gender, academic rank, years of service in position, and background in adult education, in order to assess which combination of factors best predicted perceived importance and possession of the above attributes.
4. Determine the differences in both perceived importance and possession of skills/competencies based upon age, gender, academic rank, and background in adult education.

Methods/Procedures

The research design for this study, a one shot case study in which observations were made in the form of a questionnaire, was causal comparative in nature (Ary, Jacobs & Razavieh, 1996). The design and methods were modeled on the work of Bata (1999) who conducted a similar study of professional needs and educational competencies of extension educators. The population for the study (N=70) was comprised of county extension faculty in one of five state

extension districts. The survey was developed and administered to a convenience sample of faculty (*n*=60) attending a district meeting of all county extension faculty.

The survey consisted of three sections of five-point Likert-type statements adapted from instruments developed by Hiemstra & Sisco (1990), Bata (1999), and Place (2001). The constructs measured embedded perceptions as to the importance and degree of possession of adult learning concepts and practices expressed as skills/competencies, as well as perceptions of the need for training in this area. The first section of the instrument measured the perceptions of importance and degree of possession of a set of 15 adult education skills/competencies that were based on accepted adult education concepts and practices. The second part of the instrument measured the perceived need for training in the field of adult learning, and included two questions focusing on the estimated percent of time an faculty spends with adult education, as well as their perceptions of need for additional training in adult education. The third section of the instrument collected demographic information, including age, gender, academic rank, educational background, years of service, position appointment and time in that position.

All items were reviewed for face and content validity via a panel of experts comprised of faculty and graduate students with expertise and training in adult education (Ary et al., 1996). Cronbach's alpha reliability coefficient for the resulting scale was .86.

Results/Findings

Demographic characteristic results indicated that 60.2% of the faculty in the sample were female. The majority of respondents held a master's degree (65%), followed by a doctorate (18.3%) while a smaller percentage had only a bachelor's degree (15%). The average length of time county extension faculty had been employed was 8.4 years (*SD*=9.48). Furthermore, 75.8% of the faculty had a length of service in their current position in the category of between 1-10 years. The average age of respondents was 44 years. Of the faculty who responded, 45.6% possessed a background in the field of education. Nearly 71% of total respondents had no formal background in the field of adult education. Of those who did have a background in education, 65% of these respondents had an adult education background.

To determine what were the key needs in this domain, respondents' ratings of the perceived importance and degree of possession of each item in the skills/competencies battery were categorized according to a convention adapted from Bata (1999), wherein means that ranged between 1.00 - 1.49 were categorized as "low" in terms of level of importance; means between 1.50 - 2.49 were categorized as "below average"; means between 2.50 - 3.49 were considered "average"; means ranging between 3.50 - 4.49 were "above average"; and means between 4.50 - 5.00 were considered "high" in level of importance.

Based on the above, the grand mean for perceived importance of the set of adult learning skills/competencies was perceived as above average (*M*=4.22, *SD*=0.79). Six items in this construct were categorized as high in level of importance: "ability to conceptualize and plan extension programs for adult learners (*M*=4.75, *SD*=0.57), "ability to recognize the needs of a diverse adult student population (ex. gender, social, cultural, etc.) and plan programs accordingly" (*M*= 4.70, *SD*=0.56), "ability to use various active learning strategies to motivate

adults to learn" (*M*=4.72, *SD*=0.56), "ability to design and deliver effective educational materials to adult learners" (*M*=4.82, *SD*=0.47), "ability to understand needs of adult participants of extension programs" (*M*=4.73, *SD*=0.58), and "ability to recognize differences between youth and adult learners and how to design learning materials for both audiences" (*M*=4.70, *SD*=0.50) (Table 1).

The grand mean for the degree to which respondents felt they possessed the skills/competencies in the battery was rated to be above average (*M*=3.55, *SD*=0.87). Nine of the fifteen individual items in this construct were in the above average range. In terms of degree of perceived possession, six of the skills/competencies were in the average range: "ability to recognize philosophical roots of adult learning and explain how they apply in Extension" (*M*=3.28, *SD*=0.92), "ability to trace the historical development of the field of adult and continuing education in the U.S." (*M*=2.80, *SD*=1.05), "ability to distinguish different theoretical explanations of adult learning" (*M*=3.05, *SD*=1.05), "ability to define the terms "pedagogy" and "andragogy" and tell how they relate to instruction" (*M*=2.52, *SD*=1.16), "ability to name the pertinent attributes of adult learners, within a *developmental perspective*" (*M*= 2.98, *SD*=1.03), and "ability to access and utilize Web-based learning modules, consisting of PowerPoint® presentations, Video Clips and text layouts for professional development training" (*M*=3.27, *SD*=1.01). The means of two items fell at the lower end of the average range: "ability to trace the historical development of the field of adult and continuing education in the U.S." and "ability to define the terms "pedagogy" and "andragogy" and tell how they relate to instruction." (See Table 1).

Table 1
Attribute Importance (Imp) and Possession (Poss): Field of Adult Learning Construct (n=60)

Field Construct	*Imp Mean*	*Imp SD*	*Poss Mean*	*Poss SD*
Defining the Field- Familiarity with the significance of the field of adult learning and its application to Extension education.	4.37	0.91	3.66	0.86
Philosophical roots of the field—Ability to recognize philosophical roots of adult learning and explain how they apply in Extension.	3.73	0.95	3.28	0.92
Historical Roots of Adult Learning—Ability to trace the historical development of the field of adult and continuing education in the U.S.	3.22	1.08	2.80	1.05
Adult Learning—Ability to distinguish different theoretical explanations of adult learning.	3.75	1.01	3.05	1.02
Program Planning—Ability to conceptualize and plan Extension programs for adult learners.	4.75	0.57	4.08	0.72
Recognizing Diversity—Ability to recognize the needs of a diverse adult student population (ex. gender, social, cultural, etc.) and plan programs	4.70	0.56	4.08	0.70
Pedagogy vs. Andragogy—Ability to define the terms “pedagogy” and “andragogy” and tell how they relate to instruction.	3.09	1.11	2.52	1.16
Adult Learners—Ability to name the pertinent attributes of adult learners, within a *developmental*	3.68	1.04	2.98	1.03
Motivation of Learners—Ability to use various active learning strategies to motivate adults to learn	4.72	0.56	4.03	0.80
Instructional Materials—Ability to design and deliver effective educational materials to adult learners.	4.82	0.47	4.17	0.69
Approaches to Instruction—Ability to differentiate between and utilize learner-centered and teacher-centered approaches to instruction.	4.47	0.68	3.80	0.78
Becoming an adult education professional—Ability to identify the major characteristics of what it means to be a professional in the field of adult education.	4.10	1.02	3.63	0.88
Understanding learner needs—Ability to understand needs of adult participants of Extension programs.	4.73	0.58	4.05	0.79

Table 1. (Continued)

Field Construct	*Imp Mean*	*Imp SD*	*Poss Mean*	*Poss SD*
Youth vs. Adult Instruction—Ability to recognize differences between youth and adult learners and how to design learning materials for both audiences.	4.70	0.50	3.97	0.71
Web-based Learning—Ability to access and utilize Web-based learning modules, consisting of PowerPoint® presentations, Video Clips and text layouts for professional development training.	4.40	0.76	3.27	1.01
Overall Totals	4.22	.79	3.55	.87

In addition to the skills/competencies items, two items in the survey assessed respondents' perceptions of need for training in the field of adult learning. Overall, respondents felt that they spent nearly 50% of their time with adult education. Not surprisingly, county faculty also perceived their need for additional training in adult education to be substantial (*M*=3.53, *SD*=1.14).

The third research objective was to determine the amount of variance in the perceived importance and possession of adult education skills/competencies as explained by the linear combination of the faculties' age, gender, academic rank, years of service in position, and background in adult education. To accomplish this objective, multiple linear regression was run, utilizing first, skill/competency importance, and then, degree of possession of skills/competencies as the dependent variables (See Table 2).

Table 2
Regression of Age, Gender, Academic Rank, Years in Position and Adult Education Background on Perceived Importance of Skills/Competencies (n=60)

Variables	*B*	*t*	*Sig.*	*F*	*p*
Age	-0.116	-1.754	0.085	3.796	0.006**
Gender	0.446	3.564	0.001**		
Academic Rank	-5.149	-0.533	0.596		
Years in Position	3.300	0.020	0.984		
Adult Ed Background	-0.269	-2.210	0.032*		

Standard Error = 0.4483
$R^2 = 0.066$
Adjusted $R^2 = 0.012$
** = p < .05; ** = p < .01*

Results indicated that both gender and background in adult education were significant predictors of both perceived importance of adult education skills/competencies, as well as perceived degree of possession. (See Table 3).

Table 3
Regression of Age, Gender, Academic Rank, Years in Position and Adult Education Background on Perceived Degree of Possession (n=60)

Variables	*B*	*t*	*Sig.*	*F*	*p*
Age	0.136	1.653	0.104	5.185	0.001**
Gender	0.396	2.770	0.008**		
Academic Rank	3.473	0.038	0.315		
Years in Position	2.522	0.115	0.909		
Adult Ed Background	-0.535	-3.834	0.000**		

Standard Error = 0.559
R^2 = 0.052
Adjusted R^2 = -0.003
** = p < .05; ** = p < .01*

The fourth objective was to determine if significant differences existed in the perceived importance and possession of the skills/competencies as a function of age, gender, academic level and adult education background. To accomplish this objective, ANOVA models were run utilizing first, perceived importance, and then, perceived degree of possession as the dependent variables. While no differences were found as a function of age, statistically significant differences were found between males and females in terms of overall perceived importance of adult learning skills/competencies $F(1, 57)=6.88$, $p < .02$, such that females perceived these skills/competencies as significantly more important (M=4.36, SD =.41) than males (M=4.02, SD =.54). There were no statistically significant gender differences $F(1, 57) = 2.42$, $p<.12$) observed for perceived degree of possession (males M= 3.44, SD =. 57), (females M = 3.66, SD =. 50) of the skills/competencies.

With respect to academic level and perceived importance of adult education skills/competencies, statistically significant differences were found $F(2, 58) = 3.19$, $p < .05$. Further analysis indicated that those with a bachelor's degree as their highest academic rank had significantly lower perceptions (M=3.90, SD = .50), of the importance of the skills/competencies than those with master's degrees (M=4.32, SD = .44) and Ph.D.'s (M=4.12, SD = .56). There were no significant differences among the three different academic degree levels, $F(2, 58)=.03$, $p < .10$, in terms of perceived degree of possession of adult education attributes (bachelor M = 3.51, SD = .52; masters M = 3.56, SD = .56; Ph.D. M = 3.57, SD = .59).

Finally, with respect to perceptions of importance of skills/competencies, no significant differences existed, $F(1, 57) = 1.67$, $p < .3$, between those with (M= 4.34, SD = .55) or those without a background in adult education (M= 4.16, SD = .46). In terms of perceived degree of possession, however, highly significant differences, $F(1, 57) =14.57$, $p < .01$, were observed, such that perceptions of those with a background in adult education (M=3.92, SD=.48), were significantly higher compared to those without this background (M= 3.38, SD = .49).

Conclusions/Implications/ Recommendations

Although generalizability of this study is limited to the population under study, results from this group suggested that county extension faculty respondents did feel that they spent a significant amount of time on adult education, and that they generally perceived themselves as effective adult educators. However, the majority of faculty surveyed also felt that they have a substantial need for additional training in this area. Further, although respondents perceived both importance and degree of possession of adult education skills/competencies as above average, perceived importance was rated at a higher level than degree of possession.

Other key findings focused on the effect of demographics and academic preparation on respondents' perceptions. For example, respondents' gender and adult education background were the most significant predictors of both their level of perceived importance and degree of possession of skills/competencies in adult education. Further, significant differences existed between male and female respondents such that female respondents perceived the studied skills/competencies as more important than did males. In addition, as might be expected, while both those with and without a background in adult education perceived the skills/competencies as of equal importance, those *with* an adult education background rated their perceived degree of possession significantly higher. Finally, those with the least amount of academic preparation, e.g., those respondents holding bachelors degrees, had significantly lower perceptions as to the importance of these skills/competencies, although all three groups were similar in terms of their perceived degree of possession.

Based on the above, the results seem to indicate that those who possessed a background in adult education may have been more likely to perceive themselves as possessing skills/competencies in this area. Traditionally speaking, many extension faculty have been trained from a technology transfer perspective, but the extension organization to which they belong is now placing heavier emphasis on teaching and learning (Arrington, personal communication, 2002). As a consequence, those who possess these attributes and comprehend their importance may be best positioned to gain and to be most effective. At the same time, more conventional faculty may be less advantaged if they do not possess these competencies, which might be a barrier, both to their perceiving the importance of as well as being receptive to professional development in this area. This may be an area worthy of future research.

Given the results of this study, it is also apparent that gender differences existed among respondents with respect to perceiving the importance of these skills and competencies. Females in this study weremore likely than males to perceive the importance of adult education concepts, and gender was a predictor of both perceived importance and degree of possession. This finding may suggest a need to provide joint training in this area, where males and females could learn from one another, with a view toward facilitating collaborative social learning, which is a founding theoretical basis for the extension service as well as adult learning in general (Birkenholz, 1999; Cornell, 1999).

Another potential limitation of this study is that it measured attitudes and perceptions toward adult learning concepts and not actual knowledge. While utilizing a knowledge test is a direction for future research, studies suggest that perceptions are still a good way to identify felt

needs as opposed to listing ascribed needs for a group. Birkenholz (1999), for example, states that when working with adults, addressing felt needs is often better than ascribing needs, because the adult learner must feel that they are fully involved in learning.

Major recommendations of this study would be to expand adult education offerings within both non-formal and formal curriculum areas. To that end, based on the results of this study, subsequent development of a needs-based adult learning instructional Web module has been initiated and is being implemented to help meet these needs. Future studies are planned to examine broader populations and the effectiveness of specific adult learning modules, delivery methods and professional development offerings in this important area.

Coursework focusing upon the theories, principles and characteristics of adult learning is key for any potential extension educator. Individuals aspiring to become extension faculty as well as those already in the field need education and training in this area if they are to effectively deal with the challenges and opportunities they are facing. Appropriate offerings in these topics will better prepare future extension educators to be effective with diverse adult clientele that have various backgrounds and needs. In addition, understanding how extension faculty perceive the importance of, as well as the degree to which they feel they possess adult learning concepts and competencies will ultimately improve the effectiveness of program planning and trainings conducted in this area.

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A Comparison of Behaviorist and Constructivist-Based Teaching Methods in Psychomotor Instruction

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Abstract

The authors conducted an experimental comparison of two different teaching strategies, one based on behaviorist principles and the other on social constructivist principles, in teaching a linear psychomotor skill. Two randomly selected groups of gifted students were provided instruction on making an origami piece. The purpose of the study was to determine which teaching method produced better short-term retention of the selected task. The pieces were evaluated using a scoring rubric developed and field tested by the researchers. Analysis on the scores showed that there was no significant difference in the performance between the two groups. In addition, the University's official teacher/course evaluation form was used to compare the students' evaluations of the different teaching styles. Analysis of the course evaluation scores showed a significant preference for the behaviorist-based instruction. This study does not support the current trend of shifting instruction from the behaviorist method to the constructivist method of teaching for linear psychomotor tasks. However, there was a definite student preference for the behaviorist method of teaching.

Behaviorism formed the traditional basis for schooling in western societies for most of the past century, but in recent years there has been a visible shift to in educational practice toward social constructivism as the dominant learning theory (Doolittle and Camp, 1999). Using behaviorist principles, teachers often instruct their students using a linear step-by-step approach (Dobbins, 1999). Educators who base their pedagogies on social constructivism, believe that students learn in a less structured and more social environment in which they "construct" their own knowledge (Dobbins, 1999).

Background

In 1956 Benjamin Bloom developed a taxonomy of learning. He identified three domains: cognitive, affective, and psychomotor. Cognitive learning involves fact-based knowledge and affective learning involves student attitudes. The third domain, psychomotor, involves teaching a student to perform a manipulative task. Many educators focus on cognitive and affective learning, but it is equally important to teach psychomotor skills (Gagne, 1975). These psychomotor skills, Gagne (1977) wrote, progress throughout a student's life. Children begin by learning how to sing or throw a ball. They then progress by learning how to use certain tools such as protractors and microscopes as well as learning foreign languages and how to cook or sew.

Dobbins (1999) pointed out that career and technical education curricula tend to be heavily weighted with psychomotor tasks and are often very linear in nature, meaning the tasks must be mastered in a sequential manner. Doolittle and Camp (1999) examined the efficacy of constructivist principles in teaching the kinds of domain-specific tasks that are so common in career and technical education curricula. They concluded that social constructivist principles have serious limitations in terms of the teaching of content that must be learned in a specific sequence and to specific standards. Beyond that, they suggested:

Career and technical education remains, in fact if not expressly, founded on the learning principles of behaviorism. Many scholars and reformers in the profession have advocated changes that implicitly relied on cognitive constructivist principles. Indeed, many of the changes we have seen in recent years implicitly rely on constructivist principles. Nevertheless, scholars in the profession (career and technical education) have yet to explicitly address the shift from behaviorism to constructivism. (Doolittle & Camp, 1999, p 40)

Conceptual/Theoretical Framework

Behaviorism is the basic learning theory underlying most traditional teaching in American schools. According to behaviorist principles, it is the teacher's job to transmit knowledge (Dobbins, 1999). B. F. Skinner, one of the main early proponents of behaviorism, theorized that a job should be broken down into tasks and that students learn best in a linear step-by-step format. Skinner posited that repetition and constant reinforcement of the step-by-step processes were essential for students to learn a skill properly (Entwistle, 1981).

Some psychologists in current times still praise behaviorism and its learning benefits. Derbyshire (*National Review,* 1999) discussed a book written by Andy Koestler in 1967. Although he conceded that behaviorism had become a somewhat out-of-date theory, Koestler argued that behaviorism still has validity.

However, beginning around the 1970s with such writers as Vygotsky, there has been a move towards constructivism and a decrease in the popularity of behaviorism (Eisner, 1999). Constructivists believe that the learner creates his or her own knowledge, and the teacher is simply a facilitator. "They contend that these methods involve students in realistic contents in which 'active' learning can occur and in which the social construction of knowledge can best be fostered" (Sikula, 1996, p. 152). Vygotsky (cited in Dixon-Krauss, 1996) wrote "teaching and

learning occur in a social context as a dynamic process rather than as a preconceived one." The learner must use his or her own previous knowledge about a particular subject to further learning. The teacher's job is to create an environment in which the student can carry out this process. According to Gagne (1977), as a student uses constructivist methods more often, he or she also becomes more self-sufficient and able to create his or her own knowledge.

In the past few decades, teachers have shown a rapid movement towards constructivism. Results from a study conducted by researchers for *American Scientist* showed that "the past few decades have not been kind to the behaviorist school" (Robins et al., 1998, p. 310). There have been many studies supporting the idea that constructivism works best in the fact-based, problem-solving learning. Teachers also praise constructivism for its time- and monetary-efficiency.

To date, educational theorists and researchers have examined constructivist-based instructional methods primarily in the context of teaching cognitive content. Psychomotor tasks make up a significant part of the curricula in career and technical education in general and in agricultural education in particular. A review of the research literature in both career and technical education and in agricultural education produced no research in which constructivist-based pedagogies had been tested in the psychomotor domain.

Purpose and Objectives

The purpose of the experiment was to determine whether teaching methods using behaviorist or constructivist approaches are more effective for teaching students a psychomotor task. We had three objectives in our experiment:

1. To compare the ability of students to perform a psychomotor skill after learning the task through a behaviorist or constructivist-based approach.
   (Null hypothesis: There will be no differences between the mean scores on the **task performance** by treatment and gender.)
2. To compare the reaction of these students to the instruction based on the methods by which they were taught.
   (Null hypothesis: There will be no differences between the mean scores **instruction evaluation** by treatment and gender.)
3. To **qualitatively assess** the reactions of the subjects to the two different instructional paradigms: constructivism-based and behaviorism-based.

Procedures

Population and Sample

The Summer Residential Governor's School for Agriculture (GSA) is a program for rising juniors and seniors in Virginia public, private, and home schools who have been identified as gifted students. Admission is highly competitive and involves screening at both the local and state levels. Students accepted for the program spend a month on campus taking a series of short courses from university faculty and selected high school teachers. In addition, they are required to complete a major group project that is either research or developmental in nature.
Although the general population from which students at the school were drawn is much larger, the students in the GSA were self-nominated and competitively selected. Thus, the actual

population for the study consisted of 85 students attending the Governor's School for Agriculture at Virginia Tech in summer, 2002.

Although, Krejcie and Morgan (1970) suggested a sample size of 70 to represent a population of 85, we elected to select a smaller sample because of the mechanics involved in teaching a psychomotor task of this nature. We concluded that a "class" size above 20 would create instructional problems, therefore we decided on a sample size of 40, with 20 subjects being assigned to each of the two treatments. Because males and females were not equally represented in the total student body, and because gender was considered a variable of interest, a stratified random sample of students (n=40) consisting of equal numbers of males and females was selected to participate in the experiment. The sample was then randomly assigned to two groups so that each group had equal numbers of males and females.

Design

To accomplish the objectives of the study we designed a 2X2 factorial study. The independent variable of primary interest was treatment. Group 1 received the constructivism-based instruction and group 2 received the behaviorism-based instruction. The second independent variable was gender. Each cell was randomly assigned 10 subjects

The Psychomotor Task

The first step towards conducting our comparative study was to select a psychomotor task. The first criterion used was that the task must be psychomotor and linear in nature so that the steps had to be completed in a precise sequence. The second criterion was that the task must include enough steps that it would be difficult to complete. Finally, the task had to be uncommon enough that the subjects were unlikely to have pre-knowledge of it. We chose an unusual origami figure of a "pumpkin face" for the study (Chen, 1997). The researchers then taught themselves the skill using those instructions and practiced the skill so that they would be proficient enough to teach other students.

We next developed an evaluation rubric for grading the participants' final products. The rubric included three categories on which we graded the origami figure: size, shape, and neatness on a scale from one to four. We field tested our rubric to establish our inter-rater consistency by grading sample pumpkin faces.

Behaviorist-Based Treatment. To represent behaviorist principles we used a demonstration procedure based on the suggestions of Newcomb, McCracken, and Warmbrod (1993) and Hammonds (1968). In the behaviorist group, we taught the students how to make the origami pumpkin face using a traditional step-by-step approach.

1. We set up two tables in the middle of the room where two teachers provided the demonstration.
2. The teachers used the instruction sheet to teach the students in blocks of three steps at a time, sending the students back to their own desks in between to complete those three steps.

3. Each student had an instruction sheet and ruler to use as he or she wished and each table had a completed pumpkin head to serve as a model. The students could ask question from the teachers but could not speak to other students.

Constructivist-Based Treatment. To represent social constructivist principles, we used a cooperative learning procedure based on suggestions from McKeachie (1994) and Borich (2000). We let the constructivist group learn in an interactive manner.

1. Students were stationed around larger tables to facilitate cooperative learning.
2. Each student had a sample pumpkin face, ruler, and instruction sheet to use in the process.
3. The students were encouraged to talk with and help each other in order to learn how to replicate the example pumpkin face.
4. Two instructors provided coaching and answered questions.

Pilot Study

We then conducted a pilot study using four students who had not been selected for the sample. We taught one boy and one girl how to complete the task using the behaviorist method and the same was done using the constructivist method. This allowed us to secure an appropriate time frame for the experiment, make sure the pumpkin face was feasible, and work out any other problems in the experimental design. Based on the pilot study, we decided to give each student a ruler to use in order to standardize the instructions and increase accuracy. We also decided to teach the behaviorist students in a series of three step blocks rather than have them complete the task one step at a time. We believe that this change made the study more time efficient and about the same difficulty level as the constructivist teaching method.

Data Collection and Analysis

The two treatments were presented simultaneously in neighboring laboratories. Two of the of the researchers had rehearsed each of the instructional methods and presented the instruction independently. Two additional researchers were assigned to move from one laboratory to the other to observe the process for qualitative assessment.
In the experiment, we provided instruction/facilitation to each group for precisely thirty minutes, based on the results of the pilot study. We then collected all supplies including samples, instruction sheets, and practice figures. We passed out one sheet of origami paper to each person and allowed ten minutes to make a pumpkin face.

Three members of our group formed a scoring committee and used the evaluation rubric to score each pumpkin face. The composite scores were recorded. The instructional evaluation scores were recorded. Both the task performance and the instruction evaluation scores were analyzed using SPSS 11.0. In both cases, the students' gender and the dependent variable of interest were analyzed using univariate, the General Linear Model (GLM) two-way analysis of variance (ANOVA) procedures in SPSS.

At the conclusion of the experiment, each student who participated completed a survey designed to provide an evaluation of the instruction. This survey used was the same

teacher/course evaluation form used by Virginia Polytechnic Institute as described in Virginia Tech University Faculty Handbook (2000). The evaluation from asks for Likert-type ratings of nine additive items and then asks for open-ended comments regarding the instruction.

For the qualitative portion of the study, assessment began during the instruction with observations by the two of the researchers who were not involved as instructors. That was followed by the analysis of the written comments for themes using the general procedures described in Creswell (1994).

Results and Discussion

Findings

Of the 40 subjects selected to for the sample, 20 males and 20 females, only 37 actually participated. A total of 18 females and 19 males participated with 1 being in the behaviorist treatment and 18 in the constructivist treatment. The means were very close with a slight difference favoring the group taught using behaviorist-methods. See Table 1.

Table 1.
Mean composite scores for the completed origami piece using a scoring rubric based on size, shape, and neatness, each scored on a 1-4 scale. Total composite score was on a 3 to 12 scale.

	Behaviorist Based		Constructivist Based	
	n	Mean	n	Mean
Females	10	7.00	9	7.66
Males	8	8.12	10	6.20

Objective 1, Task Performance. The first objective was to compare the ability of the students to perform a psychomotor task after being instructed using the two different approaches. The result of the GLM ANOVA is shown in Table 2. After scoring the origami, both the behaviorist- and constructivist-taught groups had little difference in the final product. The final score was a composite of three scores on scales from one to four which looked at size, shape, and neatness. The results were not significant and the null hypothesis regarding task performance was not rejected.

Table 2.
Analysis of Variance for the composite scores on a completed origami piece representing a linear psychomotor task taught using behaviorist-based versus constructivist-based instruction, using a scoring rubric based on size, shape, and neatness with a 3 to 12 point scale.

Source	Sum of Squares	df	Mean Square	F	Probability
Corrected Model	19.201	3	6.40	.83	.487
Intercept	1927.30	1	1927.30	249.93	.000
Treatment	3.631	1	3.631	.471	.497
Gender	.268	1	.268	.035	.853
Interaction	15.401	1	15.401	1.997	.167
Error	254.475	33	7.711		
Total	2186.000	37			
Corrected Total	273.676	36			

R^2 = .070, Adjusted R^2 = -.014

Objective 2, Instruction Evaluation. Unfortunately, we failed to collect gender data on the evaluation form and were unable to use that as a second independent variable. In addition, one evaluation instrument was not usable. Using our sample, we computed a Cronbach's alpha the with a result of $\propto = 0.97$. The treatment group means are shown in Table 3. The ANOVA results showed a significant difference favoring the behaviorist teaching method. See Table 4.

Table 3.
Mean composite scores for the evaluation of instruction comparing two methods of instruction. Total composite score was on a 9 to 36 point scale.

	n	Mean	Standard Deviation
Behaviorist Based	18	23.50	4.315
Constructivist Based	18	16.11	11.146
Total	36	19.81	9.133

Table 4.
Analysis of Variance for the composite scores for the instructional evaluation comparing a behaviorist-based and a constructivist-based instruction for a linear psychomotor task .

Source	Sum of Squares	df	Mean Square	F	Probability
Corrected Model	491.361	1	491.361	6.880	.013
Intercept	14121.361	1	14121.361	197.723	.000
Treatment	491.361	1	491.361	6.880	.013
Error	2428.278	34	71.420		
Total	17041.000	36			
Corrected Total	2919.639	35			

R^2 = .168, Adjusted R^2 = -.144

Objective 3, Qualitative assessment. The subjects being taught the skill in a linear, structured, behaviorist setting proceeded in an orderly manner. They followed the instructions quietly and efficiently. They exhibited a very receptive manner. The subjects in the group-centered, less structured, constructivist setting quickly became disruptive and surly. They were unwilling to grapple with the problem-solving and group-based requirements of the task. The

room became very noisy and the subjects' attention was clearly not focused on the task at hand. Repeated trips to both rooms not only confirmed the initial reactions but increased divergence in the reactions of the treatment groups continued throughout the experiment. The level of apparent focus became progressively more intense with the behaviorist group and the level of noise and expressed dissatisfaction became increasing intense with the constructivist group.

When we examined the written responses on the evaluation forms to identify themes, it was clear that the students preferred the behaviorist method to the constructivist method. Typical responses from the constructivist group included illustrate this conclusion:

"Give verbal instructions and demo."
"I get too frustrated."
"It was really hard [*sigh*] and if we had been taught it would have been better."

These statements essentially describe the behaviorist method of teaching. Thus, even though there was virtually no difference between the end origami products of the two groups, the surveys still showed a preference for the traditional behaviorist teaching method.

Conclusions

Our group found no significant difference between the performances of behaviorism-taught students and those taught using the constructivist approach. We conclude hat, based on this experiment, using a select group of gifted students learning a linear psychomotor task is done as efficiently and effectively by teacher-centered linear instruction and open-group, self-directed instruction. Neither the behaviorist-based nor the constructivist-based approach offer an advantage in terms of actual task performance in a short-term setting.

We did, however, determine that there is a significant and meaningful difference in the subjects' evaluation of the quality of the instruction between the two groups of students. The students strongly preferred the instruction based on a teacher-centered, behaviorist approach over the less structures, group-centered, self-instruction of the constructivist method.

In terms of the qualitative aspect of the study, the of students taught in the constructivism-based room became very frustrated and responded with negative comments both during the actual instruction and on the open-ended portion of the survey.

We found a strong preference among students for the teaching style based on behaviorist concepts. On the student survey, the majority of people from the constructivism room responded with negative comments explaining their frustration over the lack of formal teaching. We, therefore, believe that behaviorist method provides a more organized learning environment, which consequently produces better student satisfaction.

Discussion

Given the ambiguous outcome of this study on the actual task performance combined with the strong preference for the behaviorism-based instruction method, our study provides qualified support for the use of a behaviorist teaching style for linear psychomotor tasks.

A number of variables that may have affected the outcome of this study. The small number of test subjects involved was a limitation. Different instructors presented the behaviorist and constructivist instruction. Although the instructors did rehearse the task as well as the instruction, it is inevitable that their presentations would be different. Finally, the reader should consider the select nature of the population.

Further studies should be conducted to either refute or support the results from this one. Future experimentation could also include using different psychomotor tasks and different groups of test subjects such as elementary-school students or non-gifted high school students.

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A Follow-Up Evaluation of Governor's Institute for Agricultural Sciences

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Abstract

The overall purpose of this study was to provide the Pennsylvania Department of Education (PDE) with a valid objective-based evaluation to determine the effectiveness of the 2001 Pennsylvania Governor's Institute for Agricultural Sciences. Two evaluation models and an evidence-based approach were used. A total of 110 teachers, counselors, and administrators participated in the Institute. Data were collected through a variety of methods and instruments. A follow-up evaluation of Institute participants was conducted in March 2002 to determine how participants are using and implementing what they learned at the Institute. A total of 63 participants completed the follow-up survey. Data were analyzed using descriptive statistics.

Overall, the Pennsylvania Governor's Institute for Agricultural Sciences was an overwhelming success and accomplished several goals. First, participants were highly satisfied with the overall content, management, and activities offered at the Institute. Second, significant knowledge gain, based on the results of pre/post tests suggest that the Institute was effective in teaching skills relative to standards-based curriculum. Third, positive feedback from follow-up evaluation indicated that participants did learn something and have used the information to integrate curriculum. Additionally, teachers have collaborated with other teachers (science) on projects, helping themselves and each other explore ways to integrate curriculum.

Theoretical/Conceptual Framework

Increasingly agricultural education as a profession is moving toward the integration of academic and vocational/technical information; collaborative learning arrangements and career projects that focus on career clusters, contextualized learning, accountability and career academics in programs. Agricultural education for the 21st century must prepare a more diverse group of students for a workplace that values a broader range of skills. What are not clear is how these concepts and practices should be taught to practicing teachers.

The driving force behind many school reform initiatives today is standards. Occupational, academic, and employability standards are measures of output and suggest that by "raising the bar" student performance will be increased. However, developing a standards-based curriculum, and accompanying assessment instruments, is very difficult. In June 2000, the Pennsylvania Department of Education, Bureau of Career and Technical Education authorized the planning of eight "Governor's Institutes" with the goal of providing inservice education on strategies to integrate Pennsylvania academic standards and industrial/occupational standards into existing curriculum. Specifically, the objectives of the Institute were: 1) to provide Institute participants with opportunities to develop plans which integrate technology, academic and occupational standards, 2) to provide Institute participants with on-the-job examples of the integration of academic and occupational skills, and 3) to provide Institute participants with traditional and non-traditional assessment models that may be implemented in their instruction programs.

In July of 2001, The Pennsylvania Department of Education in collaboration with the Center for Professional Personnel Development at Penn State offered the Governor's Institute for Agricultural Sciences at the Penn Stater Conference Center. The Institute was open to all Pennsylvania academic and vocational teachers and administrators interested in exploring agricultural sciences through standards-based curriculum development.

Since the major thrust of each of the eight "Governor's Institutes" was to encourage teachers to accept and develop a standards driven curriculum, it was extremely important that the impact of the Institute be carefully assessed. To be sure the evaluations were not biased, the state contract specifically stated that the principal investigator could not be the primary evaluator and that a separate RFP for the evaluation component must be developed. The contract was awarded to Lufkin & Associates of Lancaster, PA.

Three independent evaluators were assigned to the Governor's Institute for Agricultural Sciences. The independent team of evaluators participated in all planning sessions for the Institute. In addition, the evaluation team met separately and developed an evaluation plan that was approved by the state. To insure a valid and comprehensive assessment, two evaluation models—Kirkpatrick (1994) and Bennett (1975)--were used as a framework. These are two proven models and have been extensively used in training evaluation and program evaluation. These two models provided the protocol and the breadth to insure a valid and reliable evaluation of the Institute's impact. The two models in the context of this study are briefly described in the following paragraphs.

The Kirkpatrick training model has four components—reaction, learning, behavior change and results/impact (Figure 1). Using Kirkpatrick's model, the Institute attempted to address the first three components and while the final component will be studied later. The *reaction* component measures how well the participants liked the Institute in terms of content, objectives, presenters, methods used and facilities provided; *learning* component addresses the extent of knowledge and skills absorbed (measured by pre/post tests) by the participants; behavior change component measures the extent to which participants can apply what they have learned to classroom situations; and the final component, *results/impact* measures tangible outcomes of the Institute over the long term. The current study addresses the first three components of the Kirkpatrick's model.

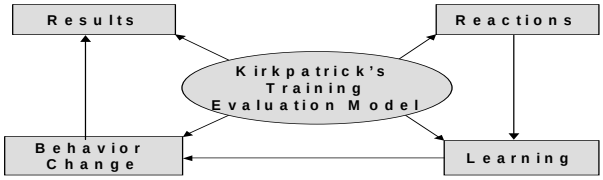

Figure 1: Kirkpatrick's Training Evaluation Model

The Bennett's model (Figure 2) has been used extensively in extension programs. The model has seven hierarchical steps interconnected with each step. The first four steps measure the process while the last three steps measure the outcomes. The reaction component of Kirkpatrick can be linked to the process steps of Bennett's model. Similarly, the KASA (Knowledge, Attitude, Skill, and Aspirations) and practice change steps in Bennett's can be linked to learning and behavior components of Kirkpatrick's model. Finally, the results or impact component can be linked to the SEEC (Social, Economic, and Environmental Consequences)/end result of Bennett's model.

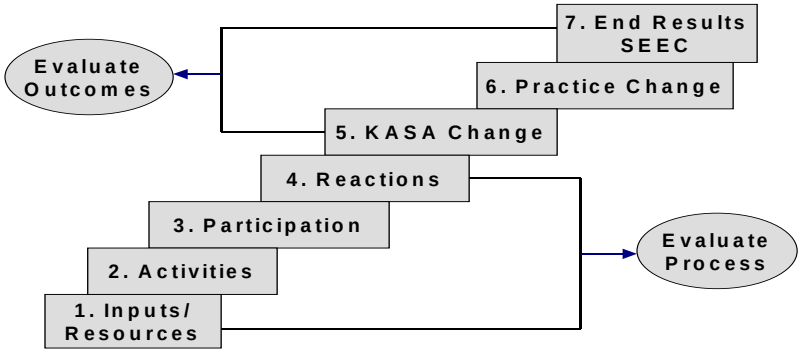

Figure 2: Bennett's Evaluation Model

Literature also supports evaluation of seminars, institutes, workshops and training programs. Several evaluation experts and agricultural educators have emphasized the

importance of evaluating seminars, workshops, and institutes: in providing useful information for improving training (Ross, Freeman, and Lipsey, 1999), in assessing training outcomes in terms of learning and satisfaction (Kirkpatrick, 1994), in documenting behavior change (McCormick, 1994), in identifying factors that led to the success or failures (Bush, Mullis, and Mullis, 1994), and in changing the workshop format to meet learner needs (Ayers, 1989).

McKenny and Terry (1995) evaluated the effectiveness of a workshop relative to xerascaping. They found that the knowledge and perceptions of workshop participants significantly increased as a result of information and skills provided at the workshop. Similarly, Mueseler, Terry, and Holcomb (2000) assessed the impact of a series of short-term small business workshops. They also found significant increases in knowledge gain of participants; however, the workshop did not change the attitudes of participants toward starting a small business.

The Pennsylvania Department of Education (PDE) wanted to know both the process and outcomes. The two models described above were most suitable to the objectives of evaluating the Governor's Institute for Agricultural Sciences.

Purpose and Objectives

The overall purpose of this study was to provide the Pennsylvania Department of Education (PDE) and the Center for Professional Personnel Development at Penn State with a valid objective-based evaluation to determine the effectiveness of the 2001 Pennsylvania Governor's Institute for Agricultural Sciences. The following objectives were formulated to guide this evaluation.

1. To describe the demographic profile of Institute participants
2. To assess knowledge gain of Institute participants relative to key subject matter topics discussed/presented at the Institute
3. To determine reactions and satisfaction of Institute participants in meeting their goals and expectations
4. To determine through a follow-up evaluation the extent to which Institute participants have used and/or applied what they learned at the Institute

Methods and Procedures

The participants for the Governor's Institute for Agricultural Sciences included agricultural educators, science teachers, guidance counselors, and administrators. The Institute was marketed in several ways. In July of 2000, announcements were made at the Pennsylvania Association of Agricultural Educators Summer Convention. In January 2001, a letter was mailed to all Pennsylvania agricultural educators listed in the state directory describing the Institute; its goals and objectives, location, time, and registration procedures. In May 2001, participants' registrations were confirmed through an information packet, which included a final registration form, tentative agenda, and highlights of site visits. Based on registration information obtained from the Institute coordinator, a total of 110 educators participated in the Institute.

The Institute used an evidence-based approach, with an overview of the topics to be discussed followed by industry visits and hands-on-practices (Eckert and Ouchi, 2000). This approach was supplemented by various types of pedagogical activities, including lectures, workshops, small group sessions, panel discussion, and hands-on exercises. In addition, teams of teachers met in small groups and developed standards-based lesson plans for use in their regular instruction. Participants took the limited down time they were given to network with colleagues, share strategies for improving their instruction, and reflect on what they were learning.

Several strategies were used to answer key evaluation objectives about the individual sections of the Institute and the overall Institute, including pre/post test for measuring knowledge gain among participants. Data were collected through a number of different types of methods and instruments. Figure 3 describes the evaluation objectives, instruments used, method of data collection, and number of participants. Each objective for the Institute was measured using one or more instruments.

In March of 2002 (six to seven months after the Institute) a follow-up evaluation was completed (Objective 4). A survey containing 11 items and three open-ended questions were mailed to all the 106 participants who attended the Institute in July of 2001. The 11 items included questions relative to integrated curriculum, program activities, and demographic questions. The open-ended questions elicited information on activities that Institute participants have done to incorporate academic, occupation, and workplace standards into the curriculum and future information needs relative to standards-based curriculum. For the follow-up evaluation, a total of 63 participants returned the survey (initial mailing and two reminders) for a response rate of 59%.

Data collected from various instruments were summarized using descriptive statistics. Paired t-tests were used to determine knowledge gain between pre and posttests. All data were analyzed using SPSS Windows Version 10.1.

Objectives	**Instruments Used**	**Date Collection Method**	**# of Participants**
Objective 1: Demographic Profile of Participants	Institute Participant Survey	Self- reported	106/110 -- 96%
Objective 2: Participants Knowledge Assessment	50 identical pre/post knowledge questions**	Administered by evaluation team	Pretest – 105/110 Posttest – 93/110
Objective 3: Reaction and Satisfaction of Participants	Institute participant survey	Self-reported	106/110
Objective 4: Follow-up	11 item survey and open-ended questions	Mail survey	63/106—59%
** Difference of 12 participants between pre and posttests is accounted by participants coming late and leaving early. Only those participants who took both pre and post tests (N=93) were included in the analysis of knowledge assessment. Last four digits of participant's social security numbers were used to track and/or match responses.			

Figure 3: Description of Objectives, Instruments Used, Method of Data Collection, and Responses

Findings

Objective 1: Demographic Profile of Participants

A total of 110 participants attended the Institute with a significant majority (88%) of them being agricultural teachers. Other participants also included science educators, guidance counselors and administrators. Over 60% of the participants indicated they taught more than one program area suggesting a breadth of subject matter. The majority of respondents were male (75%) and female (25%), which mirrors the population of agricultural education teachers in Pennsylvania. Close to one-half of the participants had graduate degrees (MS/PHD). The average teaching experience of participants was 15.62 years with a low of two years and a high of 37 years.

Demographic profile of follow-up participants was as follows. Of the 63 participants who returned the follow-up survey, 50 were male (79%) and 13 female (21%). Forty-nine (78%) reported graduate degrees (MS/PHD) as their highest education level. The average teaching experience was 16.09 years with a low of two years and a high of 37 years.

Objective 2: Knowledge Gain - Pre/Post Test

The pre/post knowledge test was developed by the evaluation team from questions submitted by each of the program presenters. The entire knowledge test contained seven sections (Table 1). Questions were submitted that covered material regarding scientific inquiry techniques, international agriculture, integration of academic and vocational education, compost processing, and designing challenging courses. In addition, questions were developed by the evaluation team to test the participants' working knowledge of the grade level achievement of various Pennsylvania Academic Standards in Science and Technology and Environment and Ecology. A total of 49 multiple-choice questions were included in both the tests. For scoring purposes, each correct answer was given a value of "1" so that a perfect score on the knowledge test would be 49. The pretest was administered to all participants present at the opening session, while the posttest was administered to all participants present at the closing session of the Institute.

The pre/post test results are shown in Table 1. Ninety-three participants completed both pre and post-tests. The total knowledge test score on the pretest was 23.35 (47.6%) correct answers with a posttest score of 38.48 (78.5%). Paired t-test analysis revealed statistically significant differences ($t= -19.71$, $p < .001$) between pretest and posttest scores for the entire test. All sections of the test with the exception of section one (scientific inquiry) showed significant increase between pretest and posttest scores (Table 1). The two sections that showed the most significant improvement were the sections dealing with the Pennsylvania Academic Standards. The Science and Technology Standards section showed an increase of 52% (25% pretest and 77% posttest), while the Environment and Ecology Standards section showed an increase of 58% (25% pretest and 83% posttest) (Table 1).

In addition to the 49-item knowledge test, Institute participants were asked, "To what extent has their participation increased knowledge and understanding of the standard-based

curriculum?" Sixty-five percent of the participants indicated "quite a bit, to very much," while 31% said, "somewhat," and only four percent said, "not much." (Figure 4).

Table 1:
Comparison of Pretest and Posttest Scores

Section	*# of Items*	Pretest (N=93) *Score*[a]		Posttest (N=93) *Score*[a]		*T* Value
		Mean (SD)	*%* Correct	*Mean (SD)*	*%* Correct	
1	5	2.68 (0.79)	53.6%	2.83 (0.89)	56.6%	-1.42NS
2	4	1.16 (0.87)	29.0	2.27 (0.81)	56.7	-9.15**
3	5	3.63 (0.96)	72.6	4.00 (0.82)	80.0	-2.99*
4	11	2.72 (1.90)	24.7	8.43 (2.43)	76.6	-19.50**
5	9	2.29 (1.81)	25.4	7.51 (2.24)	83.4	-17.51**
6	5	3.33 (1.09)	66.6	4.52 (0.70)	90.4	-10.23**
7	10	7.46 (1.35)	74.6	8.66 (1.12)	88.6	-8.84**
Overall	**49**	**23.35 (4.04)**	**47.6**	**38.48 (6.69)**	**78.5**	**-19.71****

[a]*Score is out of possible 49; *p< .05; **; p< 0.001*
Sections: 1=Scientific inquiry, 2=International agriculture, 3=Integration, 4=Science and Technology standards, 5=Environmental and ecology standards, 6=Composting, and 7=Designing challenging courses.

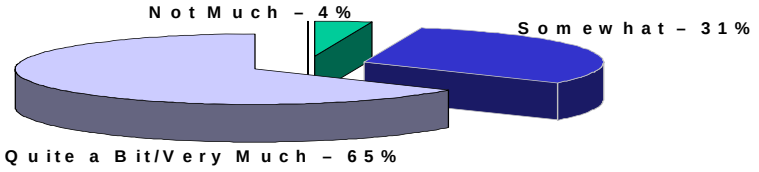

Figure 4: Participants' Knowledge and Understanding of Standards-based Curriculum

Objective 3: Reactions and Satisfaction

Reactions and satisfaction of Institute participants were assessed in several ways: 1) institute goal setting, 2) satisfaction with Institute organization and management, 3) and curriculum integration. Overall, participants rated all the four components very high (Table 2).

Institute participants "agreed" that they were given clear directions and goal expectations the very first day of the Institute (mean/sd=3.75/1.05). They also "agreed" that the Institute provided valuable information/skills that could be used in designing courses (mean/sd=3.88/1.13)

Institute participants were asked to rate on a scale (1=poor to 5=excellent) the organization of the institute in terms of communication, registration, food, accommodation, meeting rooms and equipment. Overall, the participants rated each of these items "excellent" (Table 2). Quality of food and refreshments was rated the highest (4.72), followed by hotel accommodation (4.66), registration (4.43), equipment (4.25), and overall management of the Institute (4.03). However, communication prior to the institute was rated "good" (3.85) (Table 2).

Regarding curriculum integration, a great majority of Institute participants said that they are able to develop a standards-based curriculum lesson (84%), align curriculum with workplace standards (86%), locate gaps between what students need and what they (teachers) currently teach (89%), and acquire strategies to develop student activities to accompany academic or occupational skills (86%). In addition, Institute participants indicated that they had opportunity to brainstorm ideas with other participants (80%). (Table 3).

Table 2:
Participants' Reaction to Institute Goal Setting and Satisfaction with Institute Organization

Statement	*N*	*M**	*SD*
Institute Goal Setting*			
Participant was given clear directions and goal expectations the first day of the institute.	106	3.75	1.05
The workbook planner, Designing Challenging Courses, was a helpful tool to introduce/review for the participant on how to design a course.	106	3.77	1.33
Institute provided valuable information/skills that can be used in courses that participants teach	106	3.88	1.13
Satisfaction**	106	3.88	1.13
Quality of food and refreshment	106	4.72	0.47
Hotel accommodation	106	4.66	0.89
On site registration	106	4.43	0.79
Overall management of the Institute	106	4.40	0.67
Audio-visual equipment	106	4.25	0.77
Overview of the Governor's Institute	106	4.03	0.87
Communication prior to the Institute	106	3.85	1.04

*Measured on a scale 1 "strongly disagree" to 5 "strongly agree"
**Measured on a scale 1 "poor" to 5 "excellent"

Objective 4:

As required by the RFP, a follow-up evaluation of Institute participants was conducted in March 2002. Follow-up questions focused on integration of curriculum, program activities and open-ended questions. Results of follow-up evaluation are shown in Table 4.

Positive results were evidenced during a six-month follow-up. Eighty-seven percent (42% somewhat + 45% a great deal) of the Institute participants indicated that they were able to develop standards-based curriculum for the classes they currently teach. Similarly, 78% (35% somewhat + 43% a great deal) reported that they aligned their curriculum with workplace standards. Seventy-five percent (45% somewhat + 30% a great deal) changed their instructional strategies to include integration activities, while 91% (38% somewhat + 53% a great deal) developed curriculum activities that supported occupation and/or academic skills integration. Open-ended comments given by Institute participants' support that they are using the information in many ways to integrate curriculum. Some of the verbatim comments are listed below.

"Participated in a statewide curriculum project that incorporated academic standards, occupation, and workplace standards into a three-year forestry curriculum."

"I have used the information to include items into my curriculum, and standards are always good to discuss. I am enrolled in a curriculum class and often discuss standards"

"I am working with a science teacher who teaches a biology course to develop a biotech course that will be piloted next year."

"I have implemented many concepts into my teaching. The Institute helped me to be more complete in my understanding of material"

"In my ag construction class I have began using the composting information as a tie to the environmental standards. Each student builds a small compost model and then get into groups to build two large compost bins for use at home."

"Increased the number of field trips to related business within the area and emphasized employee needs in relation to skills my students need to develop."

"I identify standards weekly that my lessons are addressing. I am revising my curriculum to incorporate more of the standards."

Table 3:
Participants' Intention to Use Curriculum Integration

Statement	Yes	No	Total
Curriculum Integration			
Based on the skills learned during the week, will you be able to develop a standards-based curriculum lesson for your classrooms next school year	84%	16%	100
Do you have the skills to align your curriculum with workplace standards	86	14	100
Did you had an opportunity throughout the week to brainstorm ideas with colleagues to improve instructional strategies	80	20	100
Did you acquire strategies to develop student activities to accompany occupational or academic skills	86	14	100

As shown in Table 4 (Program Activities), Institute participants are yet to use various program activities that were shared at the Institute. It appears that less than one-half of the follow-up respondents have used "somewhat to a great deal" program activities presented at the Institute-- Designing a Challenging Course Workbook (41%), documenting academic and employability skills (44%), and developing compost lessons (46%). However, a little over one-half of the participants (54%) indicated that they have integrated Periodical Writing Assignment into their curriculum

Institute participants were asked to indicate future needs relative to standards-based curriculum. Select responses from participants are given below:

"Examples of exemplary lesson plan that is standards-based."

"Easier ways to incorporate science and ecology, math reading, writing standards into the ag curriculum"

"Recognizing standards contained in existing curriculum"

"A workshop that would be planned so that teachers could prepare materials prior to the workshop and take materials to actually begin writing curriculum materials.
Practical/hands on activities that help meet/address the standards"

"Develop a standard format on a word processing program that could easily be used as a curriculum writing template."

"Integration of science and technology, and environmental and ecology standards into existing agriscience curriculum."

Conclusions

Overall, the Pennsylvania Governor's Institute for Agricultural Sciences was an overwhelming success and accomplished several goals. The Institute has provided the needed foundation to develop both the occupational skill standards and Pennsylvania academic standards.

First, participants appear to be highly satisfied with the overall content, management, and activities offered at the Institute. In addition, participants learned valuable and usable skills, were able to network with other colleagues and wanted to attend again in the future. This clearly reflects the reactions, learning, and behavior change components of Kirkpatrick's training evaluation model and the process and outcomes of Bennett's model.

Second, there is evidence of significant knowledge gain, based on the results of pre/post tests, which suggests that the Institute was effective in teaching skills relative to standards-based curriculum. This clearly reflects the learning component of Kirkpartick's training evaluation model and Bennett's level five (Knowledge) or outcome component.

Table 4:

Follow-up Evaluation Results for Integrated Curriculum

Integrated Curriculum	**At the End of Institute July 2001 *N*=93**	**Follow Up March 2002 *N*=63**							
		Not at all/ Not Much		Somewhat		A Great Deal		Overall	
		N	***%***	***N***	***%***	***N***	***%***	***N***	***%***
Able to develop a standards-based curriculum for your classes	84%	8	13	25	42	27	45	60	100
Align your curriculum with workplace standards	86%	13	22	21	35	26	43	60	100
Change your institutional strategies to include integration activities	80%	15	25	27	45	18	30	60	100
Developed curriculum activities which support occupation and/or academic skills integration	86%	13	22	14	38	31	53	58	100
Program Activities									
Used the workbook planner 'Designing a Challenging Course' to improve or create a new course		36	59	22	36	3	5	61	100
Integrated the 'Periodical Writing Assignment' into my current curriculum		28	46	26	43	7	11	61	100
Developed a composting lesson on the 'Filed Guide to On-Farm Composting' &'Compos-ting to Reduce the Waste Stream' books		33	54	19	31	9	15	61	100
Incorporated the 'Documenting Academic and Employability Skills Needed in the Workplace and Found in the Curriculum' site visit sheets into my class trips		33	56	18	30	8	14	59	100

Third, participants have chalked out a plan to implement standards-based curriculum in their schools. This goal setting or future action reflects the behavior change component of Kirkpatrick's model and level five (Aspirations/intentions) of Bennett's model.

Fourth, positive feedback from the follow-up evaluation indicates that participants have learned something and have used what they learnt to integrate curriculum. Additionally, participants have worked with other teachers (science) on projects, helping themselves and each other explore further ways to integrate curriculum. In addition, participants have made attempts to use program materials and activities in class instruction and other school-related activities.

Finally, the Institute has helped to explore the efficacy of delivering information on both academic and workplace performance standards via an institute or workshop format. Overwhelmingly the data suggest that delivering information on standards via this medium is successful. Every state in the nation is currently developing or implementing performance based standards. The ability of agriculture programs to quickly adopt standards and integrate into the mainstream of public education is extremely important. States requiring standards driven curriculum are also in the process of developing rubricks to evaluate the performance of students in basic skills. Unfortunately, the focus of most of the developmental work is on academic skills, with little attention to the needs of agriculture teachers. The responsibility to develop standards based curriculum frameworks, and their subsequent implication, will fall on the shoulders of teacher educators and professional organizations. This study has clearly demonstrated that once standards-based curricula are developed, a good way of moving it out to teachers is through seminars and institutes.

Recommendations

Two sets of recommendations are made based on the input received from Institute participants and Institute evaluation results. The first set of recommendations is aimed at improving the Institute offering in future years, which addresses the process part of evaluation.

- Participants want more time to network and share ideas.
- Outreach to other groups such as the Pennsylvania School Counselors Association.
- Provide more hands-on skill sessions with "packaged" lessons that could be taken home to implement.
- Complete standards-based curriculum development earlier in the week.
- Prepare presenters and business/industry representatives with more direction and complete information regarding the goals of the institute.

The second set of recommendations is based on evaluation and follow-up results. Participants of the Institute provided valuable feedback. The feedback they provided should be valued in the context of improving the implementation of both occupational skill standards and the Pennsylvania academic standards. The following recommendations are made to improve the effectiveness of future institutes and increase the potential that teachers will implement standards-based educational reform:

- Assess what teachers need to fully implement both the occupational skills standards and academic standards. Specifically, incorporate the suggested needs in future inservice and/or workshop offerings
- Identify positive factors that would enhance collaborative efforts between academic and vocational teachers.
- Develop knowledge and skill needs inventory on standards-based curriculum.
- Develop a matrix of the Pennsylvania academic standards and the occupational skills standards for agricultural education to help teachers see the relevance to their curriculum.

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Identifying Informational Sources and Educational Delivery Methods For Private Landowners

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Abstract

Reaching forest landowners with useful information has become a challenging task for educators. This task is even more complex when landowners have differing perceptions about the delivery method and usefulness of the information delivered. This study was conducted to determine the preferred educational delivery methods of private forest landowners in South Carolina. Additionally, the study examined differences, if any between demographic characteristics and preferred use of extension delivery methods. Descriptive research methodology was used to conduct the study. A random sample of 397 landowners responded to a five-section survey. After initial mailing and a follow-up, a total of 231 landowners responded for a return rate of 58%. Data were analyzed using descriptive and inferential statistics.

Findings revealed that landowners: 1) do have preferences toward educational delivery methods, 2) relied on a variety of sources for assistance and advice, and 3) significant differences were found between two demographic characteristics (age and occupation) and educational delivery methods (video and the Internet). The findings in this study reinforce the need to modify delivery systems to fit the demographic characteristics of landowners. We should willingly progress by adopting efficient technologies, but not abandon more traditional methods until it is warranted by lack of demand.

Theoretical/Conceptual Framework

Understanding the communication process between educators and farmers must include the context in which farmers live, operate, and make decisions (Bruening, Radhakrishna, and Rollins, 1992). Effective communication requires a thorough knowledge of the linkages, which affect decisions. Extension educators and communication specialists should use models, which enhance the information-transfer capabilities (Fliegel, 1984).

Several researchers have documented the value of various educational delivery methods in effectively communicating information to farmers and other clientele. Fedele (1985) suggested that information delivery is done by a number of methods. For example, print-based information serves the clientele with specific answers to a myriad of topics. Audio-visual methods such as radio and video tapes often provide information without personally involving extension educators. Mass media delivery methods such as radio, television, and newspapers, are used to advertise events, anticipate client needs, and report agriculture business information. These methods are used in a variety of ways and in a number of contexts, depending on the needs of the farmers.

Richardson (2001) classified educational delivery methods into three groups—experiential, reinforcement, and integrative. To promote effective and efficient learning, a delivery system should include methods wherever possible, that provide desired experiential opportunities for the learner, reinforce the learning, and provide opportunity for the learner to integrate new information with existing knowledge and skills. Further, Richardson (2001) identified several factors that should be considered in the delivery of educational information: target audience, the educational objective, type and content of message being provided, the characteristics of the delivery method, and the method's utility for providing desired learning support.

A host of researchers and educators have examined the perceptions of farmers and other clientele toward delivery of educational information (Suvedi, Campo, and Lipinski, 1999; Trede and Whitaker, 1998; Caldwell and Richardson, 1995; Laughlin and Schmidt, 1995, and Gamon, Bounaga and Miller, 1992). Consensus from these studies suggest that various media and methods are used by extension educators to communicate new and emerging technologies to farmers and other clientele having differing perceptions toward the delivery of information. For example, beginning farmers in Iowa preferred one-on-one, on-site educational meeting and personal contacts (family and neighbors) for information. In addition, farmers preferred radio, newspapers and television for information. Farmers owning highly erodible soils in Iowa identified face-to-face discussion, newspapers, newsletters, and magazine articles as preferred delivery methods (Gamn, Bounaga, and Miller, 1992). Iams and Marion (1991) concluded that learning preferences of farmers and other clientele depends on the subject matter they are learning. For example, clientele preferred television, newspaper, and radio to learn about energy conservation, while pamphlets, correspondence courses and telephone messages were preferred to know more about health and financial management information. Further, when the subject was changed to environmental education, the preferred information sources were videotapes, educational meetings, workshops and bulletins.

Few researchers have examined information sources and education delivery methods that landowners find useful to learn about forestry, natural resource management and environmental issues. Padgitt (1987) found that over 60 percent of Iowa farmers preferred newspapers/ magazines, radio and television to obtain information on groundwater quality. Downing and Finely (2002), in a Pennsylvania study, found that private forest landowners preferred active methods such as outdoor workshops combined indoor/outdoor workshops, field trips, demonstration areas, and skill demonstrations, followed by passive methods such as slides, videos, e-mail/web, correspondence course, video conference and bulletins/newsletters.

Longleaf pine once dominated southern landscapes from southeast Virginia to east Texas. In colonial times the tree occupied as much as 92 million acres (Frost, 1993). Today, less than 3 million acres remain (Outcalt and Sheffield 1996). In South Carolina, longleaf pine occurred on as much as 7.6 million acres, a figure that declined to just over 1.7 million acres in 1936 and to only 396,000 acres at present (Cecil Frost, personal communication; U.S. Forest Service 1989; Outcalt and Sheffield, 1996). The decline in longleaf pine forest resulted from development, overexploitation, and a shift in forestry practices.

Ecologists and many non-industrial forestland owners are interested in restoring longleaf pine to a larger portion of its natural range. Most importantly, longleaf is valuable because it is associated with one of the most biologically diverse ecosystems in the western hemisphere. As 70 percent of commercial forest land in the South is owned by private landowners, they have become a primary focus of longleaf pine restoration efforts. Reaching landowners with useful information has become a challenging task for educators. This task is even more complex when farmers and landowners have differing perceptions about the delivery method and the usefulness of the information delivered. As indicated by Seevers, Graham, Gamon, and Conklin (1997), the greatest ongoing challenge for educators is identifying, developing and delivering information that meets client needs.

For extension educators and communicators, it is particularly important to identify and examine the usefulness of each delivery method. Knowledge about the usefulness of delivery methods will not only help to identify the information needs of farmers, but also assist in developing educational resources to effectively communicate with farmers and other clientele.

Purpose and Objectives

The overall purpose of this study was to determine the characteristics of longleaf pine landowners in South Carolina and their preferred use of educational delivery methods. The following objectives were developed to guide the investigation.

1. Describe the demographic profile of longleaf pine landowners in South Carolina.
2. Determine sources landowners use for technical and financial assistance.
3. Identify the preferred educational delivery methods that landowners find most useful in receiving information about longleaf pine.
4. Determine relationships, if any, between usefulness of educational delivery methods and demographic characteristics of landowners.

Methods and Procedures

Population and Sample

A list of forest landowners (names and addresses) with land ownership within the natural range of longleaf pine was developed from: (1) the South Carolina Forest Stewardship newsletter mailing list (Department of Forest Resources, Clemson, SC), (2) a list of South Carolina plantations, (3) South Carolina members of The Longleaf Alliance (School of Forestry and Wildlife Sciences, Auburn University, AL), and (4) lists of landowners who owned longleaf pine that were enrolled in industry landowner assistance programs. The combined list was checked for duplication and other errors. The final list consisted of a population of 1,170 names. A random sample of 397 names was selected using computer-generated numbers. The sample of 397 is based on a formula provided by Krejcie & Morgan (1970), with a 5% margin of error and a 4% sampling error.

Instrumentation

The survey instrument was a questionnaire designed by the researchers. The survey contained four sections. Section one consisted of questions regarding longleaf pine tract characteristics. Section two inquired about technical and financial assistance information. Section three asked about the preferred format of educational delivery methods and section four requested landowner demographic information (ownership, age, educational level, occupation, income, etc.). Content and face validity of the survey was established by a six-member panel of experts that included three Extension specialists, one Extension agent, and two representatives from the Environmental Defense Fund (1875, Connecticut Avenue NW, Washington, DC).

Data Collection and Analysis

The survey and cover letter explaining the purpose of the study was mailed to members of the sample. After three weeks, a total of 121 (30%) landowners had responded. A second mailing, including a revised cover letter and a copy of the survey was sent to all non-respondents. An additional 134 (34%) questionnaires were returned for a total data sample of n=255 (64%). The final data sample included 231 useable questionnaires for a 58% response rate: 24 questionnaires were not useable due to incomplete responses and incorrect addresses.

The data from the 231 responses was coded and analyzed using Statistical Package for Social Sciences (SPSS) for Windows. Early and late respondents were compared on key variables as per the procedures suggested by Miller & Smith (1983). No significant differences ($p>.05$) were found between early and late respondents. Descriptive and inferential statistics were used to summarize the data.

Results

Objective 1: Demographic Profile

As shown in Table 1, the majority of respondents (82%) were “individual” landowners,

followed by family corporations (8%), partnerships (7%), and other (3%). Over one-half of the landowners (54%) were 55 years or older, 27% were between the ages of 45-54, 16% were between 35-44, and three percent under 25 years of age. A little over one-third of the landowners (35%) reported bachelor's (college) degree as their highest educational level completed, followed by less than college degree (34%-- some college--21%, high school diploma--12%, and less than high school--1%), and graduate degrees (31%).

Table 1
Demographic Profile of Landowners

Item	*n*	*%*
Land Ownership		
Individual	183	82.8 %
Partnership	15	6.8
Family Corporation	17	7.7
Other	6	2.7
Total	221	100.0
Age		
Under 35 Years	6	2.7%
35 - 44	36	16.3
45 - 54	59	26.7
55 - 64	49	22.2
65 and Over	71	32.1
Total	221	100.0
Educational Level		
Less than College Degree	75	33.9%
College Degree	77	34.9
Graduate Degrees	69	31.2
Total	221	100.0
Occupation		
Retired	71	34.1%
Forester/Farmer	32	15.4
Engineering	23	11.0
Physician/Dentist	17	8.2
Real Estate/Bank	15	7.2
Self-employed	18	8.7
Attorney	9	4.3
Sales	10	4.8
Management	8	3.8
Others	5	2.4
Total	208	100.0

No single occupation dominated the landowner's primary profession (Table 1). A little over one-third (34%) were retirees. Fifteen percent were in farming and natural resources, 11%

in engineering, eight percent each were physicians/dentists and self-employed, seven percent were in real estate/banking, four to five percent each were in management, sales, and legal professions, and two percent in other occupations (Table 1). Twenty-two percent reported income less than $55,000; 12% earned between $55,000 and $75,000; 28% earned between $75,000 and $115,000, and 38% over $115,000. A little over one-half of landowners lived on the land they owned (54%), while the remaining 46 percent lived off-site or were absentee landlords.

Tract Characteristics

Collectively, respondents to this survey owned an average of 581.44 acres of forestland. This ranged from a minimum of 0 acres, up to 10,000 acres. The average acreage of longleaf pine was 83.25, with a range of 0 to 1,500 acres. Of this, fifty percent of the longleaf was in stands aged 0 to 25 years; 33 % in multi-aged stands; 10% in stands ages 26-50 years, 3.5% in stands greater than 50 years of age and 3.5% were unsure of age.

Objective 2: Technical and Financial Assistance

Seventy-seven percent of the respondents had received technical assistance from several sources (Figure 1), half of which came from private consulting foresters, followed by state foresters or wildlife biologists (43%), industrial forester (41%), extension service (25%), Natural Resources Conservation Service (24%), Farm Service Agency (20%), and other (5%).

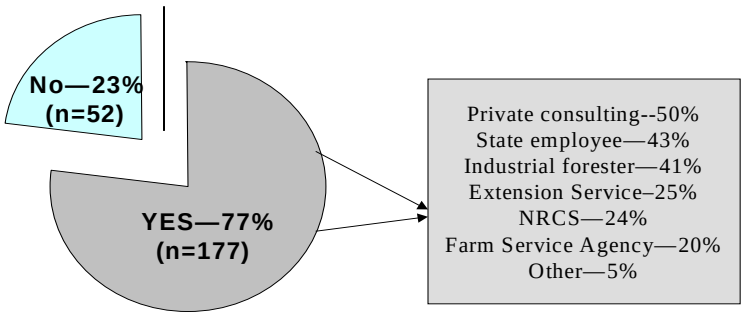

Figure 1: Received Technical Assistance

In addition, these landowners shopped around and got forestry help and advice from several sources including private consulting foresters (55%), State Forestry Commission (50%), Extension Service (40%), and both the Natural Resources Conservation Service and Industrial Foresters (27%), Farm Service Agency (18%), and other (3%). (Table 2).

Table 2
Sources Longleaf Pine Landowners Depend on for Help and Advice

Help and Advice	*f*	%
Private Consulting Forester/Wildlife Biologist	124	55%
Industrial Forester	61	27
State Employee (project forester)	112	50
Extension Service	89	40
Farm Service Agency	41	18
Natural Resource Conservation Service	61	27
Other	7	3

Sixty-one percent had received financial assistance in the form of cost-share for their land management activities (Figure 2). Those that didn't (39%) indicated that they did not apply (39%); did not qualify (24%); were uncomfortable with government (17%); or not interested (14%). (Table 2).

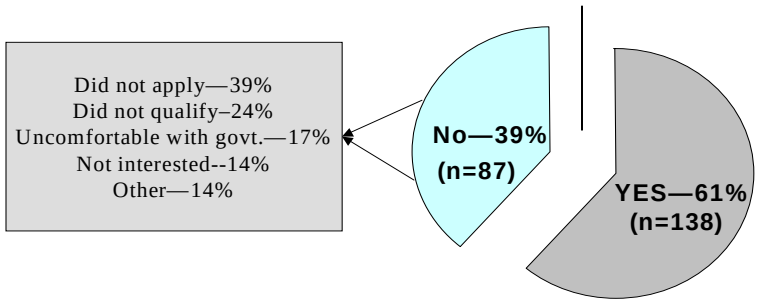

Figure 2: Received Financial Assistance

Objective 3: Usefulness of Educational Delivery Method

Landowners were asked to rate the usefulness of educational delivery methods on a scale 5= Very useful, 4= Useful, 3= Uncertain, 2= Not very useful, 1= Not at all useful. In declining order of utility, landowners rated newsletters (*M* =4.17) as most useful (Table 3), followed by publications (*M* = 4.15), field tours (mean = 3.73), Video (*M* = 3.45), workshops (*M* = 3.40), evening meetings (mean = 3.38), short courses (*M* = 3.30), formal classes (*M* = 3.00), and the Internet (*M* = 2.82).

Table 3
Usefulness of Educational Delivery Methods

Delivery Method	*n*	*M*	*SD*	*Rank*
Newsletters	207	4.17	0.95	1
Publications	197	4.15	1.01	2
Field tours	181	3.73	1.22	3
Video	171	3.44	1.19	4
Workshops	174	3.41	1.28	5
Evening meetings	174	3.38	1.25	6
Short courses	167	3.30	1.22	7
Formal classes	163	3.00	1.25	8
Internet	156	2.82	1.40	9+

* Mean computed on a scale: 1=Not at all useful to 5=Very useful

Objective 4: Demographic Differences

The fourth objective of the study was to determine differences, if any, between usefulness of educational delivery methods and demographic characteristics of landowners. The procedure One-way-ANOVA and Scheffe post hoc test were used to identify differences between groups. For purposes of analysis, age and occupation variables were grouped into four categories (age—less than 45 years, 45-54 years, 55-64 years and over 65 years and occupation—retired, self employed, professional and agricultural related occupations).

ANOVA results revealed significant differences between age and two educational delivery methods—video (F=4.43, p<.05) and the Internet (F=6.05, p<.001) (Figure 3). Younger landowners (under 44 years of age) tended to find video as most useful delivery method than older landowners (over 55 years of age). Landowners who were 55 years or younger tended to find the Internet as most useful delivery method than older landowners (Figure 3). Significant differences were also found between occupation and two educational delivery methods--video (F=5.52, p <.05) and the Internet (F=5.47, p <.05) (Figure 4). Landowners who were employed in professional, agricultural-related, and self-employed occupations tended to find video as most useful delivery method than retired landowners. Landowners employed in professional and agricultural related occupations tended to find the Internet most useful than retired and self-employed landowners (Figure 4).

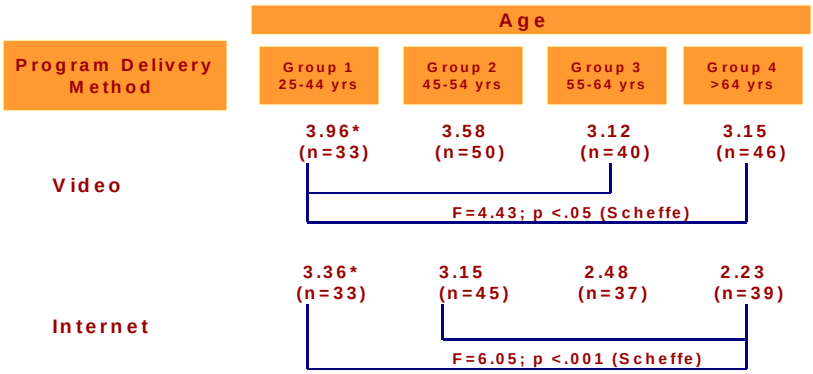

Figure 3: ANOVA Results for Age and Usefulness of Program Delivery Methods—Video and the Internet

* Mean computed on scale 1=not at all useful to 5=very useful

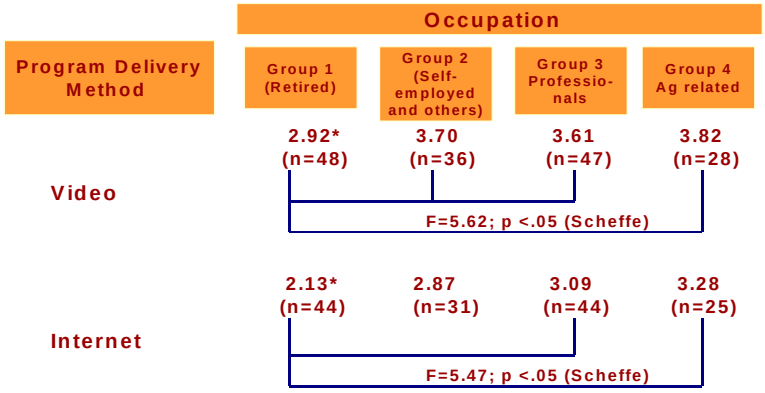

Figure 4: ANOVA Results for Occupation and Usefulness of Program Delivery Methods—Video and the Internet

* Mean computed on scale 1=not at all useful to 5=very useful

Conclusions and Recommendations

Results of this survey indicate that private forest landowners within the natural range of longleaf pine in South Carolina are typically more than 45 years-old, either work in a recognized profession or are retired, are well educated with above average income, and have individual ownership of their land. Their reliance on a variety of sources for assistance and advice would indicate that they are willing to listen and are receptive to a range of ideas. This generalized profile might infer positive approachability concerning information on the restoration and management of longleaf pine. However, landowner preferences did occur with respect to educational delivery methods and should be considered in order to maximize program efficiency.

The significant differences between age and high technology delivery systems (video and the Internet demonstrates that educators should be careful when attempting to reach elderly landowners with video and the Internet. Based on delivery system rankings (Table 3), the large portion (34%) of retired landowners in this sample is likely more comfortable with traditional delivery systems such as newsletters, publications and field tours. Significant differences

between occupation and delivery methods show that certain professionally trained landowners may intuitively be better served with technology driven systems such as video and the Internet. As indicated by Laughlin and Schmidt (1995), extension professionals need to examine the best possible ways to deliver information within the technological revolution. The findings in this study reinforce the need to modify delivery systems to fit the demographic characteristics of the intended audience and to keep up-to-date surveys in order to determine demographic change. We should willingly progress by adopting efficient technologies, but not abandon more traditional methods until it is warranted by lack of demand.

The findings of this study has provided valuable information to design, develop, and deliver educational information for a specific group of Extension clientele, that is, private longleaf pine landowners. Extension professionals, especially those in natural resource management and forestry programming should use the findings of this study in designing their program offerings.

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Change In Knowledge And Practices As A Result Of Adults' Participation In The Texas A&M Ranch To Rail Program

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Abstract

The study, a causal-comparative design, was planned to assess the impact of the Texas A&M Ranch to Rail Program on adults' knowledge of selected cattle performance and carcass-related information and practice level of selected recommended beef production practices. A census was attempted to gather information from 713 participants (1990-2001 program years). Data were collected with a mail questionnaire using a post then pre design following procedures recommended by Dillman (2000). Three hundred eighty-two participants responded to the questionnaire. Respondents had an increase in self-perceived knowledge level as a result of their participation in the Ranch to Rail Program (pre-knowledge Mean = 2.40, post-knowledge Mean = 4.03, where 1 = *Low* through 5 = *High*). The paired samples *t*-test yielded a 2-tailed level of significance beyond 0.05 for the pre- and post-knowledge level comparison. The difference of 1.63 is practically significant as shown in the large effect size of 1.78. Use of practices also increased as a result of respondents' participation in the Ranch to Rail Program (pre-practice Mean = 3.11, post-practice Mean = 3.86, where 1 = *Never* through 5 = *Always*). The paired samples *t*-test resulted in a 2-tailed level of significance beyond 0.05 for the pre- and post-practice level comparison. Again, the difference is important as shown in the large effect size of 1.18.

Introduction

Since its establishment in 1914 through the Smith-Lever Act, the Cooperative Extension System (CES) has grown to become the largest adult and youth education organization in the United States, if not the world (Fiske, 1989). Its mission is simple and straightforward: to help people improve their lives through an educational process that uses scientific knowledge focused on issues and needs (Rasmussen, 1989). Today, as in most public institutions, assessing the outcomes of programs in CES is not just the norm but is mandated. Three major acts were passed in the 1990s that have had a direct impact on Cooperative Extension. These acts are the Government Performance and Results Act (GPRA) of 1993, the Federal Agriculture Improvement and Reform Act (FAIR) of 1996, and the Agricultural Research, Extension, and Education Reform Act (AREERA) of 1998. The GPRA requires all public agencies to link performance plans to annual budget requests by developing in-depth performance strategies which describe the intentions of the allocated funding. FAIR requires that CES use state-of-the-art information technology systems to effectively measure all programs within the system. AREERA requires that plans of work be approved on the federal level on a competitive basis to receive funding. These acts have led to performance-based budgeting in regard to CES budget requests (Ladewig, 1999). Due to this increase in public accountability, it is even more critical that CES develop effective evaluation strategies that measure program outcomes and how they impact the lives of the constituents whom CES serves.

The beef industry is a major contributor to the economy of Texas, and therefore, is a major focus of educational programs of Texas Cooperative Extension. In 2000, cattle and calves comprised 51% of the $13.34 billion total cash farm receipts in Texas. Texas led the United States in the number of cattle operations (152,000), all cattle and calves (13,700,000 head), all cows (5,810,000 head), beef cows that had calved (5,465,000 head), calf crop (5,100,000 head), cattle on feed in lots with 1,000 head capacity (2,930,000 head), fed cattle marketed (6,190,000 head), and value of all cattle and calves ($8.357 billion) (Texas Agricultural Statistics Service, 2000).

One of the major Extension educational programs on beef cattle in Texas is the Texas A&M Ranch to Rail Program. Established in 1990, the Texas A&M Ranch to Rail Program is an information feedback system that allows producers to learn more about their calf crops and the factors that influence value beyond the weaned calf phase of beef production. It creates an opportunity for producers to determine how their calf crops fit the needs of the industry and provides the information needed to determine if changes in genetics and/or management factors are warranted in order to be competitive in beef production (Texas A&M University, 2001). This program has served as a model for most other state sponsored cattle feedout programs across the nation.

Purpose/Objectives

The purpose of this study was to evaluate the impact of the Texas A&M Ranch to Rail Program on learning and adoption of practices by participants in the program. The following objectives were addressed in this study:

1. Did the Texas A&M Ranch to Rail Program impact participants' learning (i.e., knowledge)?

2. Did the Texas A&M Ranch to Rail Program facilitate participants to make changes in their beef production and ranch management practices?

Methods/Procedures

This was a causal-comparative study. It was designed to assess the impact of the Texas A&M Ranch to Rail Program on adult's knowledge level and practice change. Participants from the inception of this program in 1990 to the 2000-2001 program year were targeted. The method of data collection was a mail questionnaire.

The Ranch to Rail participant database of 1,503 names and addresses (1990-91 through the 2000-01 program years) maintained by the Department of Animal Science, Texas A&M University, was used to identify the sampling frame. Because the list was compiled annually and because participants may have consigned cattle in multiple years, there were numerous duplications. Additionally, participants' addresses may have changed from year to year. These changes may have occurred because, in fact, participants moved or, alternately, because the U.S. Postal Service changed participants' addresses to comply with 9-1-1 rules. Removing duplicate entries resulted in a sample frame of 793. A census was attempted to gather information from this population. A census was used to obtain the most accurate results possible. Frame error existed because of duplicate/multiple entries, participants who died after their participation in the program, and participants in the program whose addresses were inaccurate. These "errors" were removed from the original database throughout the conduct of this study.

Dillman (2000) identifies four sources of error which form the cornerstones for conducting a quality survey. These are sampling error, coverage error, measurement error, and nonresponse error. All of these affect external validity, which is a major concern in the outcome measures of survey research. Gall, Borg, and Gall (1996) define external validity as the extent to which the results of a research study can be generalized to individuals and situations beyond those involved in the study. In this study, nonresponse was controlled by comparing early to late respondents. Late respondents were considered to be those who responded in the last wave of successive follow-ups to the questionnaire.

A mail questionnaire was used to collect data on the following:

1. Perceptions of past participants' level of knowledge related to feedlot performance, carcass quality, factors that affect profit and value, retained ownership, and the National Beef Quality Audit.

2. Perceptions of past participants' level of practice related to selected recommended beef production and ranch management practices.

The questionnaire had six sections (Kistler, 2002). Only the data from Section I are reported in this paper. This section was designed to collect information from past participants

related to their perceptions of the educational influence of the Ranch to Rail Program. Questions 1, 2, and 5 used a Likert-type scale utilizing a post then pre design (Rockwell & Kohn, 1989). This method features a retrospective pre-test after an educational intervention as a means of minimizing response shift bias, which can be a source of contamination in self report assessments. The respondent answers the survey questions with the same frame of reference for both pre and post questions. Response shift bias is a change in an individual's frame of reference because of program participation (Howard & Dailey, 1979). This method has shown to provide a more accurate estimate of measuring change than the conventional pre-test/post-test method in self report assessments (Hoogstraten, 1985; Howard & Dailey, 1979; Howard, 1980; Pratt, McGuigan, & Katzev, 2000; Rohs & Langone, 1998; Rohs, 2000; Rohs, Langone, & Coleman, 2001; Skeff, Stratos, & Bergen, 1992; Sprangers & Hoogstraten, 1988a; Sprangers & Hoogstraten, 1988b).

Question one asked respondents their perceptions of their knowledge level of various performance and carcass-related information before and after their participation in the Ranch to Rail Program. Respondents assessed their knowledge level using a scale of 1 = *Low* through 5 = *High*. Knowledge-related questions can be found in Table 1. Question two asked respondents to indicate how often they used selected recommended beef production and ranch management practices before and after their participation in the Ranch to Rail Program on a scale of 1 = *Never* through 5 = *Always*. Selected management practice questions can be found in Table 2.

Table 1
Knowledge-Related Questions of Section I, Question 1 of the Ranch to Rail Evaluation Questionnaire

Question[a, b]
What is your level of knowledge of the following? (Pre-and Post-Ranch to Rail)
• Performance of my calves in the feedlot (e.g., average daily gain, feed conversion, health status)
• Carcass characteristics of my calves (e.g., USDA Yield & Quality grades, carcass weight, ribeye area, dressing percentage, percent retail yield, fat thickness)
• How my calves meet the needs of the beef industry
• Factors that affect performance of calves in the feedlot (e.g., weather conditions, type of ration, age of calf, occurrence of illness, breed type)
• Factors that affect profit in feedlot calves (e.g., average daily gain, occurrence of illness, death loss, degree of fatness, market prices, cost of gain, marketing method – sold live or on the rail)
• Factors that affect carcass value (e.g., carcass weight, percent retail yield, USDA Yield & Quality grades, blood splash, dark cutter)
• Factors that create value beyond the weaned calf phase of production
• Retained ownership as a marketing alternative
• National Beef Quality Audit results and information

[a] Scale: 1 through 5, where 1 = *Low*, 3 = *Average*, 5 = *High*
[b] Cronbach's Alpha: Pre-Ranch to Rail = .91, Post-Ranch to Rail = .87

Table 2
Management Practice Questions of Section I, Question 2 of the Ranch to Rail Evaluation Questionnaire

Question[a, b]
How often do you perform the following management practice? (Pre-and Post-Ranch to Rail)
• Individual identification of cattle and calves (e.g., ear tag, brand, tattoo)
• Keep and utilize herd records to aid in management and marketing decisions
• Keep and utilize performance and carcass data of cattle to aid in management and marketing decisions
• Base breeding program on market trend information (e.g., consumer, order buyer, auction barn, feedlot, and/or packer demands)
• Follow a Value Added Calf Vaccination Management Program
• Select bulls based on performance and quality needs of my cow herd and calf crop (utilizing performance records and EPD's for selection)
• Use alternative marketing strategies based on business needs of the operation, market conditions, and type/class of cattle sold (e.g., auction barn, retained ownership, video alliance)
• Follow a Beef Quality Assurance Program for my operation (e.g., Texas Beef Quality Producer Program)
• Use a controlled breeding/calving season
• Castrate bull calves
• Dehorn calves through mechanical and/or chemical methods
• Dehorn cattle through genetic methods (i.e., use and selection of polled cattle)
• Keep processing and treatment records of all cattle (Includes date treated, animal health product used, dose used, route and location of administration, product withdrawal period)
• Use new technology to aid in management and marketing decisions (e.g., ultrasound, marker-assisted selection, electronic ear tags and data management systems)

[a] Scale: 1 through 5, where 1 = *Never*, 2 = *Seldom*, 3 = *Sometimes*, 4 = *Often*, 5 = *Always*
[b] Cronbach's Alpha: Pre-Ranch to Rail = .83, Post-Ranch to Rail = .79

The questionnaire was developed by the researchers utilizing the Tailored Design Method (Dillman, 2000) with input from faculty of the Department of Agricultural Education and Department of Animal Science at Texas A&M University. As suggested by Gall, Borg, and Gall (1996), content validity was assessed by a panel of experts. These experts were nine Extension Livestock or Beef Cattle Specialists with Texas Cooperative Extension who were located on campus or at various Research and Extension Centers throughout the state and had first-hand knowledge and experience with the Texas A&M Ranch to Rail Program.

Procedures outlined in Dillman's Tailored Design Method were used for mail survey implementation and data collection (Dillman, 2000). A pre-notice letter was mailed to each member in the original database of 793 on October 29, 2001. The purpose of this letter was to alert past participants of the forthcoming survey. Questionnaires and cover letters signed by the researcher and the Associate Department Head and Extension Program Leader, Department of Animal Science, were mailed on November 5, 2001. Enclosed with each questionnaire and

cover letter to each past participant was a business reply envelope addressed to the researcher. The envelope was for use by the respondent when returning his/her questionnaire.

Each questionnaire was identified with an identification number keyed to each of the participants. The identification number was placed on the lower left hand corner of the last page. This number was used to identify and follow-up with non-respondents. Three follow-ups were conducted. A thank you/reminder post card was mailed to each participant on November 16, 2001. On December 5, 2001, a second complete packet was mailed to each non-respondent. This packet included a questionnaire, a revised cover letter, and a return business reply envelope. On January 23, 2002, a final attempt was made to contact non-respondents. Another complete packet, including a different colored questionnaire, a revised cover letter, and a return business reply envelope, was mailed to each of the 361 non-respondents. Throughout survey implementation, returned letters and packets with incorrect addresses were updated, where possible, and re-mailed.

Data collection was discontinued on March 1, 2002. The original frame consisted of 793 names and addresses. Through the implementation phase of the study, prospective respondents were removed from the frame if they had died, were no longer in business, were discovered to be a duplicate entity, or had an incorrect address. As a result, 80 names were removed; leaving an accessible population was 713. Of the accessible population, there were 418 responses received for a response rate of 58.6%. Of these 418 responses, 37 questionnaires were returned unanswered. So the data sample of 382 responses was 53.6% of the accessible population.

Respondents were dichotomized as either early or late by the date their questionnaires were received back to the researcher. Early respondents were those whose questionnaires were received in either the first or second wave of responses before December 10, 2001 (232 responses, 61.0%) through January 31, 2002 (104 responses, 27.0%). Thus, early respondents totaled 336 (88.0%). Late respondents were those whose questionnaires were received in the third and final wave from February 1-28, 2002 (46 responses, 12.0%).

SPSS10.0 for Windows software was used for data analysis. Descriptive statistics were used to summarize and organize the data. Frequencies, percentages, measures of central tendency, and variability were used to describe the data. To accomplish the objectives of the study, pre- and post-knowledge level and practice level data along with an overall knowledge and practice change level were analyzed using a paired samples *t*-test with a 0.05 level of significance. The variables knowledge level and use of practices were composite variables (i.e., scales) consisting of average responses to nine knowledge and 14 practice items. Cronbach's alpha was used to assess reliability (i.e., internal consistency) of each of the scales. Because responses were received from only 54.0% of the accessible population, early and late respondents were compared, using *t* tests, on selected variables. Comparisons between early and late respondents were made on knowledge and practice change, the major variables of this study, and secondary variables of dollars made or saved, satisfaction, herd size, and personal information found in Section IV of the questionnaire (e.g., position, years in cattle business, gender, age, education, and race/ethnicity) (Lindner, Murphy, & Briers, 2001). Differences between early and late respondents on these variables were examined through the use of *t* tests and cross-tabulation. None of these statistical tests yielded statistically significant differences

between the two groups. Because the data were similar, Miller and Smith (1983) state that data from early and late respondents could be pooled together, and results could be generalized to the population. Confidence intervals and tests for statistical significance were set *a priori* at the 0.05 level.

Results/Findings

Section I of the questionnaire was used for the knowledge and practice elements. Knowledge level included nine questions related to various performance and carcass-related information before and after their participation in the Ranch to Rail Program. A five point Likert-type scale was used where 1 = *Low* through 5 = *High*. The questions were formatted using a post then pre design allowing respondents to assess their perceived knowledge level through a retrospective pre-test and post-test using the same frame of reference. This method minimizes response-shift bias, which can be a source of contamination in self report assessments (Rohs, 1998). Reliabilities of the test scales were measured using Cronbach's alpha. Pre-knowledge and post-knowledge level scales had alpha levels of 0.91 and 0.87, respectively. Table 3 displays the overall pre-knowledge, post-knowledge, and knowledge change of the respondents. Respondents had a pre-knowledge mean of 2.40 and a post-knowledge mean of 4.03 which yielded an increase (1.63) in knowledge level. The paired samples t-test resulted in a 2-tailed level of significance beyond 0.05 for the pre- and post-knowledge level comparison. This significance is important as shown in the large effect size index of 1.78 (Cohen, 1988).

Table 3
Pre- and Post-Knowledge Level and Overall Knowledge Change of Ranch to Rail Respondents

Item	No.	Mean[a]	*SD*	*d*[b]	*t*-value	*df*	Sig.[c]
Pre-Knowledge Level	370	2.41	0.84				
Post-Knowledge Level	370	4.04	0.58				
Knowledge Change	370	1.63	0.91	1.78	34.38	369	<.01

[a]Scale: 1 through 5, where 1 = *Low*, 3 = *Average*, and 5 = *High*
[b]Cohen's measure of effect size (0.20 = Small, 0.50 = Medium, 0.80 = High)
[c]2-tailed

Practice level included 14 questions related to the respondent's use of selected recommended beef production and ranch management practices before and after their participation in the Ranch to Rail Program. A five point Likert-type scale was used where 1 = *Never* through 5 = *Always*. These questions were also formatted using a post then pre design. Reliability of the test scale was assessed using Cronbach's alpha. Pre-practice and post-practice level scale had alpha levels of 0.83 and 0.79, respectively. Table 4 displays the overall pre-practice, post-practice level, and practice change of respondents. Respondents' had a pre-practice mean of 3.11 and a post-practice mean of 3.86 which yielded an increase (0.74) in practice level. The paired samples *t*-test resulted in a 2-tailed level of significance beyond 0.05 for the pre- and post-practice level comparison. This difference is important as shown in the large effect size index of 1.18 (Cohen, 1988).

Table 4
Pre- and Post-Practice Level and Overall Practice Change of Ranch to Rail Respondents

Item	No.	Mean[a]	*SD*	*d*[b]	*t*-value	*df*	Sig.[c]
Pre-Practice Level	371	3.12	0.76				
Post-Practice Level	371	3.86	0.64				
Practice Change	371	0.74	0.63	1.18	22.80	370	<.01

[a]Scale: 1 through 5, where 1 = *Never*, 2 = *Seldom*, 3 = *Sometimes*, 4 = *Often*, and 5 = Always
[b]Cohen's measure of effect size (0.20 = Small, 0.50 = Medium, 0.80 = High)
[c]2-tailed

Conclusions and Recommendations

The objectives of this study addressed the impact of the Texas A&M Ranch to Rail Program on participants' knowledge level and use of recommended beef production and ranch management practices.

Respondents had an increase in their knowledge level as a result of the Ranch to Rail Program (pre-knowledge mean of 2.40 and a post-knowledge mean of 4.03 which indicates a increase of 1.63 in knowledge level). The paired samples t-test resulted in a 2-tailed level of significance beyond 0.05 for the pre- and post-knowledge level comparisons. This difference is important as shown in the large effect size index of 1.78 (Cohen, 1988). Therefore, we conclude that the Texas A&M Ranch to Rail Program made a difference in participants' knowledge (i.e., learning) level due to their participation in the program. Further, we conclude that the difference was practically significant due to the large effect size.

Respondents had an increase in their level of practice as a result of the Ranch to Rail Program (pre-practice mean of 3.11 and a post-practice mean of 3.86, an increase of 0.74 in practice level). The paired samples *t*-test resulted in a 2-tailed level of significance beyond 0.05 for the pre- and post-practice level comparison. This difference is important as shown in the large effect size index of 1.18 (Cohen, 1988). Therefore, we conclude that the Texas A&M Ranch to Rail Program made a difference in participants' use of beef production and management practices due to their participation in the program. We also conclude again, that the difference was practically significant due to the large effect size.

Based on the findings and conclusions presented in this study, recommendations have been made in two specific areas. These are 1) recommendations for practice and 2) recommendations for further research.

Recommendations for practice are as follows:

1. The Ranch to Rail Program should continue. Both the quantitative and qualitative data indicate that the program has had a positive impact on respondents and their beef operations.

2. Enhance the educational component of the Ranch to Rail Program. Even though the Ranch to Rail Program is marketed as "an information feedback system" (Texas A&M University, 2001), it is quite evident from the findings of this study that participants are learning and are adopting recommended management practices as a result of their participation in the program. A tremendous opportunity exists for program administrators to build on the successes of this program by concentrating on educational programming efforts to enhance this program. Some of the activities that participants wanted added to the program are the following: in-depth seminars on applying the data received from the program to their operations (58%), field days (55%), participant meetings and updates throughout the feeding period (45%), information and updates through the use of Internet (45%), and one-on-one consultations (38%) (Kistler, 2002).

3. Refine the evaluation process by collecting data from "potential/prospective" participants prior to participation in the Ranch to Rail Program. As addressed in the above recommendations, an evaluation plan needs to be designed that addresses the objectives of the program. Additionally, potential/prospective participants should be surveyed prior to their participation in the program to gather baseline data on their abilities and capabilities (e.g., knowledge level, use of recommended management practices), as well as their needs and expectations. This information should be used by program administrators to focus the educational activities for the participants enrolled in the current program year.

4. Collect qualitative data from "potential/prospective" and past participants. Comments from program respondents include a rich collection of qualitative data that should be used in both the formative and summative evaluation efforts of the Ranch to Rail Program (Kistler, 2002).

5. Maintain an updated Ranch to Rail database/mailing list. To reduce the problems experienced in this study with numerous inaccurate addresses, program administrators need to maintain and periodically update their database. One idea to keep this list current is to develop a Ranch to Rail newsletter that would be sent out to past and current participants. This newsletter can be used to recruit participants, remind past participants of current enrollment deadlines, keep clientele updated on the program, and provide an educational forum to discuss issues related to the Ranch to Rail Program (e.g., carcass and performance data interpretation, production practices, marketing alternatives, industry trends). Numerous comments were made by respondents that they would like to be kept informed on a more regular basis (Kistler, 2002). A newsletter would address this and some of the educational needs identified by respondents.

Recommendations as a result of this study for further research have been developed and are presented as follows:

1. This study should be replicated periodically within a shorter time frame for measurement (e.g., 2-5 years versus 10 years) for program monitoring purposes (formative evaluation) and program impact purposes (summative evaluation).

2. This study should be replicated in other states with similar feedout programs to assess differences and similarities between participants across the nation. This information could be used by program administrators to enhance program efforts (e.g., collaborate on programming, development of educational resources).

Implications

Cooperative Extension, along with other publicly funded agencies, is required to be accountable from many different levels for the resources they receive. Effective evaluation strategies are needed to measure program outcomes and how they impact the lives of Extension clientele.

This study has shown that one statewide Extension program, the Texas A&M Ranch to Rail Program, has had an impact on the lives of the people who have participated. As a result of their participation in the program, respondents had an increase in their knowledge level of selected beef practices and an increase in the use of recommended beef production and management practices. Following the characteristics of adult learners (Knowles, Holton, & Swanson, 1998), participants' experience played a key role in both knowledge level and practices changed. As characterized by Knowles, et al., (1998), Ranch to Rail participants were ready to learn, problem-centered, and motivated as shown by their enrollment in the program. Program planners need to keep these characteristics in mind during the program development and implementation phase.

Evaluation efforts need to continue to measure the impact of other Extension programs. It is extremely important that evaluation methodology is included in the initial planning phase of program development in order for measurable objectives to be developed to provide program direction and criteria for evaluation. Bennett's Hierarchy (Bennett, 1975, 1976) and the TOP Model (Bennett & Rockwell, 1995, Rockwell & Bennett, n.d.) are useful evaluation models to follow in developing an evaluation plan for Extension programs. Evaluation studies are an important means for Extension program leaders and administrators to use to indicate the impact of their educational efforts. The data collected reinforces the testimonials received from clientele. The future of Extension depends on program evaluation efforts that document the relevance of the agency's efforts to not only its clientele, but to stakeholders and funding sources (i.e., national, state, and local governments).

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Freshmen In Transition: A Second Year Evaluation to Determine the Program's Impacts on Academic Achievement, Leadership Skills Development, Institutional Loyalty and Integration, and Retention

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Abstract

The purpose of this formative evaluation project was to determine the impact of the *Freshmen In Transition* program on the academic achievement, leadership skills development, institutional integration and loyalty, and retention of the participants. The FIT program was sponsored by the College of Agricultural Sciences & Natural Resources to provide a smooth transition for traditional incoming freshmen from high school to college life through a variety of interventions. The program was successful in contributing to the academic achievement and retention of the participants, while no changes were observed in the development of leadership skills or institutional integration/loyalty of participants compared to non-participants. The findings of the study suggest further improvements in the program, including a review of the nature and number of interventions that the participants are required to complete.

Introduction

In recent years, one type of program that has received the attention of researchers is residential learning communities and their intellectual and social effects on college students. Research studies by Pascarella and Terenzini (1991), Davis and Murrell (1993), and Pike (1999), have shown that residential learning programs have the potential to positively impact college student co-curricular activities, faculty-student interaction, institutional bonding, and retention.

With the success of several living-learning communities across the nation in mind, Oklahoma State University (OSU), College of Agricultural Sciences and Natural Resources (CASNR) created the *Freshmen in Transition* (FIT) program in fall 2000. The FIT program was designed to provide a comprehensive academic and social experience to first-time freshmen that were enrolled in CASNR. Social programs designed to bring about desirable changes in participants should be constantly evaluated to understand their strengths and weaknesses for program improvement.

This evaluation was formative and participatory in nature (Worthen, Sanders, & Fitzpatrick, 1997). In this report, FIT students referred to the students who successfully completed the FIT program in fall 2001 and spring 2002; the non-FIT students referred to those CASNR freshmen who were traditional residence hall students and who were not participants in the FIT program

Background and Context

The FIT program was founded in fall 2000 for the purpose of helping students to transition from high school to college life. To achieve this goal CASNR hired tutors several hours a week for math, biology, and chemistry assistance. Thirteen volunteer Student Academic Mentors (SAM) were also in residence and provided support to the participants in the form of weekly meetings (small group meetings) and were available when students had emotional or academic needs. The SAMs were sophomore students who were in the FIT program the year before (2000-2001). The SAMs were expected to conduct weekly small group meetings with the students in their group and discuss the happenings in the FIT program and difficulties their group members had.

All FIT participants were expected to complete a variety of activities, nicknamed *expectations* or *requirements*, throughout the academic year. The expectations were designed to achieve the programs goal of integrating the students into college life.

Theoretical Framework

The evaluation approach used for this study was derived from Chen's *Theory Driven Evaluation* model (1990). In using this evaluation approach, the evaluator tries to discover the causal elements (program theory) of the program's outcomes. The causal elements are then analyzed in light of the program model where judgments about the program can be made.

The causal elements (program theory) of the FIT program can be associated with two models of college experiences, Chickering's (1969) model of the effects of background and college experiences and intellectual development and Tinto's (1993) model of institutional departure.

Chickering provided four elements that have an effect on students in their academic life: (a) background characteristics, (b) college experiences that promote differentiation, (c) college experiences that enhance integration, and (d) gains in learning and intellectual development. The model presumes that gains in learning and development are related to students' background characteristics, involvement, and interaction and integration with the university community.

Tinto's model (1993) provided a longitudinal view of the process of voluntary departure. The model correlates several complex interactions between the student and the environment that serve as contributors to retention. According to this model, the student comes to the college with certain pre-entry attributes, which effect the continuing formulation of the goals and commitment stage. The pre-entry attributes and the goals and commitment level determines student performance and interaction and integration with the social and academic systems of the institution (Pascarella & Terenzini, 1980). The next level of institutional experience (academic and social) effects the personal/normative integration of the student. The student's academic performance and interaction with the human environment determines the integration of the student with the institution. The extent of this, along with a reassessment of intentions and commitments, determines the student's decision to stay or leave college (Satterfield, 1999).

Purpose and Objectives

The purpose of the evaluation was to determine the impact of the *Freshmen In Transition* program on the participants' academic achievement, leadership development, institutional integration and loyalty, and retention. Specific research hypothesis were:

H_{o1}: There was no difference between the FIT and non-FIT groups in background formation such as age, gender, race, employment status, family association with agriculture, distance of school from home, parents'/guardians' educational levels, and 4-H and FFA association.

H_{o2}: There was no difference between the FIT and non-FIT students in their academic achievement for their freshman year in CASNR.

H_{o3}: There was no difference between FIT and non-FIT students in the development of their leadership skills during their freshman year at CASNR.

H_{o4}: There was no difference between FIT and non-FIT students in their perceptions of institutional loyalty and integration within CASNR and OSU.
H_{O5}: There was no difference between FIT and non-FIT students in retention status.

Methodology

The evaluation used a mixed-methods approach for gathering data from both the FIT and non-FIT students. Quantitative data consisted of the student responses to a survey instrument developed specifically by the researchers for the evaluation of the program. The instrument measured the five research variables along with some demographic data through Likert like and multiple-choice questions. Qualitative data was sought through open-ended questions on the survey and interviews conducted with purposefully selected stakeholders and students at the conclusion of the program.

From September to December 2001 the researchers conducted critical incident interviews with major program stakeholders to gather input for the research questions. Based on the input a survey instrument was constructed in March 2002. Feedback for the survey was obtained from a panel of experts and a pilot study. Recommendations from the panel of experts were incorporated into the survey. The survey was pilot tested in March-April 2002 by mailing it to 30 randomly selected students from the non-FIT student population. Eleven responses were obtained; therefore, a test of reliability was not conducted. The researchers qualitatively evaluated the returned surveys and made appropriate changes for the final draft.

Two final instruments were constructed. One was a general instrument that was administered to all students (FIT and non-FIT). The non-FIT students were mailed the surveys following the modified Dillman's (2000) four-phase mailing procedure in April 2002 for a 38% usable response rate (n=53). The FIT students were administered the survey in Zink Hall during the evening hours between April 29 to May 3, 2002. The FIT response rate was 89 % (n=62).

The Cronbach coefficient alpha for internal consistency for the general instrument mailed to all FIT and non-FIT students was measured at 0.53. The instrument was found to be relatively reliable as Ary, Jacobs, and Razavieh (1996) state that when the measurement results were to be used for deriving some conclusions about a group or for research purposes, a reliability coefficient of the range of 0.5 to 0.6 was acceptable.

Demographic and academic information such as GPA, SAT, and ACT scores, hours enrolled, and hours earned were downloaded from the OSU Student Information System and were used as variables in the analysis. The data was analyzed using SPSS 8.0 (1997) for Windows. Descriptive and inferential statistics are reported according to the nature of the items.

Cross tabs analysis using Chi-Square was used to determine differences for FIT and non-FIT members on all nominal variables. An independent samples t-test was run on scaled items to determine differences between the two groups. An alpha level of .05 was set a priori when determining differences among variables.

To handle non-response error, respondents were compared to non-respondents by "double-dipping" (Miller & Smith, 1983). Fifteen non-respondents from the non-FIT group were randomly selected and telephoned. The interviewer administered selected questions from the survey for comparison with respondents. There were no differences found between the

respondents and non-respondents for the demographic variables of age, gender, employment status, educational goals, and past 4-H and FFA association.

The primary limitation of the study was that it was not an experimental study with random assignment of groups. Second, though the researchers tried to find out if any differences existed between the groups, all intervening variables could not be controlled between the groups. Therefore, the results of this study should not be generalized beyond the FIT program for the 2001-2002 academic year.

Findings and Conclusions

Comparative Profiles of FIT and non-FIT students (H_{o1})

The FIT and non-FIT students were compared on their demographic data to establish equivalence between groups. A Chi-Square test suggested no significant differences between demographic variables of gender, marital status, ethnic background, place of employment, family association with agriculture, past membership in FFA and 4-H organizations, whether they had any siblings studying in the university, their parents'/guardians educational levels, their personal educational goals, and if they were enrolled in the honors program. However, a significant difference was found between their employment status. More FIT respondents were employed (47.5%) than non-FIT respondents (28.3%) (Tables 1). The Cramer's V test revealed a weak association between the employment statuses of the two groups (0.197) (Warmbrod, 2001).

Table 1: *Chi-Square Analysis for Intervening Demographic Factors*

Demographic Factors	*FIT (%)*	*Non-FIT (%)*	*Pearson Chi-Square*	*Asymp. Sig. (2-sided)*
Employment Status				
Employed	47.5	28.3		
Unemployed	52.5	71.7	4.429	0.04

An independent samples t-test between demographic variables of age, distance of parents' home from Stillwater, number of hours employed per week, and the number of years of FFA and 4-H membership did not reveal any significant differences between the two groups. However, significant differences were found between the high school GPA and the adjusted ACT scores of the students. The non-FIT students had higher means in both high school GPA and adjusted ACT scores (Table 2). The Cohen's *d* calculated for high school GPA and the ACT scores was 0.328 and 0.418, which suggested a medium effect size (Cohen, 1988). These variables could be considered as intervening variables for academic and social development of students (Chickering, 1969), their retention status (Tinto, 1993, Ruddock, Hanson, & Moss, 1999, Stafford, 1999), and leadership qualities (Balschweid & Talbert, 2000).

Therefore, it was concluded as two independent groups, more FIT students were employed than non-FIT students and non-FIT students were more academically prepared than the FIT students when starting college.

Table 2: *Independent Samples t-test for Intervening Demographic Factors*

Demographic Factors	*n*	*Mean*	*SD*	*SE*	*P*
High School GPA					
FIT	70	3.57	0.33	3.94	
Non-FIT	129	3.68	0.34	3.03	0.03
ACT Scores					
FIT	70	24.00	3.36	0.40	
Non-FIT	138	25.54	3.98	0.34	0.01

Academic Achievement(H_{o2})

An independent samples t-test revealed that there were no significant differences between the FIT and the non-FIT students in the fall 01, spring 02 and the cumulative GPAs. However, an independent samples t-test on the number of hours enrolled and earned in fall 01 and spring 02 found significant differences between the two groups, the FIT students having earned more hours than the non-FIT students in the spring semester. The Cohen's *d* of 0.3749 for this variable suggested medium effect size (Cohen, 1988).

Table 3: *FIT vs. Non-FIT t-test for Academic Indicators*

Academic Indicators	*n*	*Mean*	*SD*	*SE*	*P*
Product of GPA & Hours Spring					
FIT	70	45.20	14.65	1.75	
Non-FIT	141	40.42	18.81	1.58	0.05*
Academic Activities Participated					
FIT	55	40.11	33.23	4.48	
Non-FIT	56	25.11	19.24	2.57	0.01*

* Equal variances not assumed

Another independent samples t-test run on the product of GPA and hours earned in both fall and spring semesters suggested no significant difference for the fall semester, but significant difference for the spring semester. The FIT students had a higher product mean for GPA and hours earned in spring 02. Similarly, significant difference was found in the number of academic activities the students participated in during the freshman year between the groups, and the FIT students again scored better on this variable (Table 3).The Cohen's *d* for the product mean for GPA and hours earned in spring 02 was calculated as 0.2835 and the number of activities participated during the freshman year was calculated as 0.5524 which suggested a small, and a medium effect size respectively.

A Chi-Square analysis of what the students considered as high academic achievement did not reveal significant differences between the FIT and non-FIT students. Similarly, a Chi-Square analysis of the factors that motivated students to earn higher grades did not reveal significant differences between the groups.

It can be concluded that the FIT program did make important, although not significant, contributions to the academic achievement of participants. The FIT students earned more credit

hours than non-FIT students spring semester, and the decrease in the college GPA from high school was less than that for non-FIT students. The FIT program intervened successfully to enable its participants to adjust to the academic expectations of college and provide a positive academic transition.

Leadership Skills Development(H_{o3})

The attitudes about leadership and effects of the leadership activities on the FIT and non-FIT, students were measured by multiple survey items. On some survey items the respondents were asked to report their perception of leadership. A Chi-Square analysis on that group of questions revealed no significant differences between the FIT and non-FIT students.

An independent samples t-test on the total number of leadership activities revealed that the students got involved in during the freshman year revealed that the FIT students were involved in a significantly higher number of leadership activities than the non-FIT students. However, on the scores of the Likert-type items that asked the students the perceived change in their leadership abilities as a result of getting involved in the leadership activities, the mean of the non-FIT students was significantly higher than the FIT students (Table 4). The Cohen's *d* for the leadership activities was 1.132, a large effect size, while that for the changes in their leadership abilities was calculated as 0.483, a medium effect size.

Table 4: *FIT vs. Non-FIT t-test for Leadership Activities and Scores*

Leadership Factors	*n*	*Mean*	*SD*	*SE*	*P*
Leadership activities during freshman year					
FIT	56	7.16	4.94	0.66	
Non-FIT	50	1.98	4.18	0.59	0.00
Score on leadership activities					
FIT	52	28.58	6.72	0.93	
Non-FIT	26	31.81	6.63	1.30	0.05

Note: Scale for leadership activities score: 0=Strongly Disagree, 1=Disagree, 2=Agree, 3=Strongly Agree

Based on these findings it is concluded that although the FIT students had a higher rate of participation in leadership activities, those activities did not increase their self-perception of becoming better leaders.

Institutional Loyalty & Integration (H_{o4}*)*

Institutional loyalty and integration were measured by a series of questions that asked students about their experiences while at OSU. A Chi-Square analysis indicated that FIT and non-FIT students differed in their opinion on one item: the FIT students reported that graduating from CASNR was not an indicator of institutional loyalty, whereas the non-FIT students reported that graduating from CASNR was an indicator of loyalty (Table 5).

An independent samples t-test regarding the total participation in on-campus activities revealed that FIT students were involved in more on-campus activities than non-FIT students.

The five specific activities that FIT students participated in to a greater degree than non-FIT students were 1) approaching a sophomore/junior/senior for academic help, 2) general educational activities (outside their course requirements), 3) Allied Arts activities, 4) career developmental activities, and 5) community service activities (Table 6).

Table 5: *FIT vs. Non-FIT Qualities that Reflect Institutional Loyalty among Students*

Factors	*FIT (%)*	*Non-FIT (%)*	*Pearson Chi-Square*	*Asymp. Sig. (2-sided)*
Graduating from OSU				
Yes	69.4	84.9		
No	30.6	15.1	3.846	0.05

Table 6: *FIT vs. Non-FIT t-test Participation in On-Campus Activities*

Activities	*n*	*Mean*	*SD*	*SE*	*P*	*Cohen's d*	*Effect Size*
Approaching a sophomore/junior/senior for academic help	58	7.67	8.68	1.14			
FIT	47	4.64	6.13	0.89	0.04*	0.4032	Medium
Non-FIT							
General Educational Activities							
FIT	61	10.02	11.85	1.52			
Non-FIT	49	2.00	2.48	0.35	0.00*	0.9368	Large
Allied Arts							
FIT	61	3.92	2.67	0.34			
Non-FIT	51	1.51	1.93	0.27	0.00	1.035	Large
Career Development Activities							
FIT	61	4.74	2.42	0.31			
Non-FIT	50	1.02	1.30	0.18	0.00*	1.9150	Large
Community Service Activities							
FIT	60	9.26	10.25	1.32			
Non-FIT	48	5.29	7.96	1.15	0.03	0.4326	Medium
Total Freshman Year Activities							
FIT	51	101.65	71.47	10.01			
Non-FIT	33	66.36	37.30	6.49	0.00*	0.619	Large

* Equality of variances not assumed

It can be concluded that although FIT students were expected to participate in a variety of activities that were thought to encourage and develop institutional loyalty and integration, those activities did not contribute to increasing institutional loyalty and integration among the FIT participants when compared to non-FIT students. Nevertheless, substantial claims about this variable can be made only when the data about students' changes in major and dropping out of CASNR or OSU is made available. Also, as suggested by Tinto's model (1993), such a study is longitudinal in nature.

Retention (H_{O5})

Retention is a function of institutional integration (Tinto, 1993). The survey asked students to respond to a variety of questions that inquired about critical factors affecting retention among freshmen. The only significantly different variable between FIT and non-FIT students was academic support systems. Twenty-six percent of the FIT students versus 9% of the non-FIT students reported that academic support systems were a motivating factor for retention (Table 7). A calculated Cramer's V of 0.211 suggested negligible association of the factor between FIT and non-FIT students.

Table 7: *FIT vs. Non-FIT Motivating Factors for Completing their Freshman Year*

Factors	*FIT (%)*	*Non-FIT (%)*	*Pearson Chi-Square*	*Asymp. Sig. (2-sided)*
Academic support systems				
Yes	25.8	9.4		
No	74.2	90.6	5.132	0.02

Students were asked a variety of questions regarding factors that would cause them to change their major. A lack of financial support and a lack of co-curricular activities on campus were the only significantly different variables between the groups (Table 8). The Cramer's *V* for the items calculated at 0.185 and 0.197 revealed a weak association between the two groups. When asked about reasons that a freshman would drop out of college there were no significant differences between the responses of FIT versus non-FIT students.

Table 8: *FIT vs. Non-FIT Reasons for Changing Major*

Factors	*FIT (%)*	*Non-FIT (%)*	*Pearson Chi-Square*	*Asymp. Sig. (2-sided)*
Lack of financial support systems				
Yes	35.5	18.9		
No	64.5	81.1	3.928	0.05
Lack of co-curricular activities on campus				
Yes	8.1	0.0		
No	91.9	100.0	4.468	0.04

A series of Likert-type items on the survey assessed the effect of the FIT expectations (or requirements) on motivating the FIT students to continue their studies with CASNR. An independent samples t-test on the mean scores on the list of items found a significant difference with a large effect size between the FIT and the non-FIT students (Table 9). FIT students were more motivated to continue studies in CASNR than non-FIT students.

Retention was measured by determining students' status of enrollment for fall 2002 using OSU SIS. On Aug 2, 2002, only selected information concerning students' enrolment status for fall 2002 could be obtained. A Chi-Square analysis of the enrolment status of both FIT and the non-FIT students suggested that the FIT students had a higher frequency of enrollment for fall 2002 (98.6%) versus non-FIT students (88.7%) (Table 10).

Table 9: *FIT vs. Non-FIT t-test on Motivation to Continue Studies in CASNR*

Score on Motivation	*n*	*Mean*	*SD*	*SE*	*P*	*Cohen's d*	*Effect size*
FIT	59	6.00	3.25	0.42		0.7062	Large
Non-FIT	52	3.94	2.54	0.35	0.00		

Table 10: *FIT vs. Non-FIT Enrollment Status for Fall 2002*

Fall 2002 Enrollment	*FIT*	*Non-FIT*	*Pearson Chi-Square*	*Asymp. Sig. (2-sided)*
Enrolled				
Count	69	149		
Percent	98.6	88.7		
Not Enrolled				
Count	1	19		
Percent	1.4	11.3	6.268	0.01

Only one FIT student had not enrolled for fall 2002 compared to 19 non-FIT students. Based on this, and the higher score that the FIT students reported on motivation to continue studies with CASNR, it can be concluded that the FIT program made a positive impact on the retention status of students.

Recommendations

Academic Achievement

The literature on internal versus external locus of control states that when people are responsible for fulfilling their needs they are internally (self) motivated to seek help and do not require external pressure to complete a task (Bandura, 1997; Zimmerman, Bonner, & Kovach, 1996). Requiring FIT students to attend tutoring sessions may have served to shift the locus of control from internal to external, therefore, when the stimulus for action was removed (the FIT requirement or expectation) the motivation decreased.

Based on these findings it is recommended that a) the FIT students not be provided tutoring in-residence, but rather encouraged to seek out tutoring from sources already supported by the university, b) SAMs be trained to provide academic mentoring which focuses on developing an attitude of academic excellence among freshmen, c) the small group meetings be refocused toward academic excellence or replaced by study groups, d) and that the minimum GPA expectation be raised to 3.0.

Is the FIT Program a Learning Community?

The FIT program was originally modeled after several learning communities; however, a learning community is a reorganization of curriculum to link together course work in order to increase interaction with faculty and other students (Gabelnick, MacGregor, Matthews, & Smith, 1990). It is recommended that if the FIT program director desires to create a true learning community, he/she should create a common core curriculum and treat the students as a cohort group during their freshmen year.

Leadership Skills Development

Although the FIT students had a higher rate of participation in leadership activities (workshops, seminars, and lectures), those activities did not increase their perception of becoming better leaders. Leadership development depends on the role models students are exposed to (Smith, 1997). It is recommended that care be taken in selecting and training SAMs, as they are the immediate role models for leadership in the FIT program. Antonio (2000) reported that interracial and interethnic interactions enhance socialization and create a positive effect on leadership development.. It is recommended that fresh attempts be made to not only to increase racial diversity, but also to expose the students to diversity through programming such as offering a workshop on multiculturalism and tolerance.

Institutional Loyalty & Integration

Roweton (1994) reported that emotional and financial support, as well as social integration into campus life creates institutional loyalty. The FIT program exceeds at facilitating social activities for participants, but at the exclusion of non-FIT students. It is recommended that FIT social activities be more inclusive of all OSU students, faculty, and staff; with a special effort made to expose FIT students to a breadth and depth of individuals from all walks of life.

Retention

Studies documenting retention are incomplete until the students are graduated; however, as Ruddock, Hanson, and Moss (1999), Terenzini, Pascarella, and Blimling (1999), and Pike, Schroeder, and Berry (1997) have reported living in residence halls, attending freshman orientation, and increased involvement and interaction with other students and faculty helps to retention students at the university. It is recommended that the FIT program encourage all FIT participants to attend Camp Cowboy and continue to provide opportunities for social interaction with other students, faculty, and staff. It is also recommended that the director of the FIT program emphasize the importance of faculty and staff support to freshmen among the corridors of Agricultural Hall.

Recommendations for Further Research

The following issues should be addressed in future research concerning the FIT program:

1. Research of a longitudinal nature that tracks the present and past groups of FIT cohorts during their tenure at OSU should be conducted to substantiate gains made by students over non-FIT students.
2. More qualitative input from the FIT students and non-FIT students should be collected to evaluate the effects of the FIT program.

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An Examination of Agricultural and Science Educators' Attitudes Towards the Use of Biotechnology

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Abstract

Agriculture has benefited from the use of biotechnology for hundreds of years; however, recent advancements in recombinant DNA and cloning have brought about much ethical debate. Public concerns range from the disapproval of genetic manipulation for moral reasons to potential dangers and risks of the use of the science (Kloppenburg & Burrows, 1995). To address these concerns and to overcome resistance to innovation, research indicates a need to identify sources of information most trusted by the public as well as to determine the most effective means of disseminating information about biotechnology. As is frequently the case, educators play a critical role. However, even though many high school agriculture education programs have infused instruction about biotechnology into their curriculum, national studies indicate that the instruction is not keeping up with the technological advances in biotechnology.

Given that agricultural and science educators are such an important and trusted source of biotechnological information, this study explored the attitudes of high school agricultural and science educators about the use of biotechnology. Like any other adopters of innovation, educators go through a process that involves first becoming aware of the innovation, forming an attitude about the innovation, deciding to adopt or reject the innovation, implementing the idea, and then confirming they made the right decision to adopt the innovation. The objectives of this study were to investigate whether participation in biotechnology training affected their awareness level of the uses biotechnology (awareness of innovation), and their attitudes about the use of biotechnology (forming an attitude). By describing the awareness and attitudes of high school agricultural and science educators about biotechnology, we can then describe where they are in the innovation-decision process and be better able to design training that will be inductive to biotechnology curriculum adoption.

Introduction

Over the last 150 years, the agricultural industry as well as the education of and about agriculture has experienced metamorphic change. Scientific research has led to major advancements in the production and marketing of agricultural commodities. Since the mid 1800's, major discoveries such as the development of fertilizers and pesticides–in addition to recent biotechnology discoveries-have dramatically increased agricultural production in United States.

Carlson (2000) reported that, since 1887, the agricultural industry has progressed through a biological revolution in which the content knowledge base and agricultural productivity have both increased exponentially. New hybrids, oil-seed crops, fertilizer and herbicide manufacturing and genetically altered crops in the field of biotechnology are just a few of the key discoveries that accelerated this revolution. The biotechnology phase of the agricultural biological revolution that emerged in the 1980s and 1990s became commercialized when the genetically transformed tomato, *Flavor-Savor*, was introduced to consumers in grocery stores in 1994. This biotechnological commercialization continued apace: by the late 1990s, four major crops produced by North American farmers-70% of canola, 60% of soybeans and cotton, and 30% percent of corn-were genetically modified.

Exactly what is biotechnology? And why is the topic so controversial? The Committee on Fundamentals of Science (1995) defined biotechnology as "a powerful set of tools that employ living organisms or parts of organisms to make or modify microorganisms for specific uses"(p.1). Agriculture has benefited from the use of biotechnology for hundreds of years; however, recent advancements in recombinant DNA and cloning have brought about much ethical debate.

Smith (2000) suggested that some consumers are opposed to the use of genetically modified crops and animals. Public concerns range from the disapproval of genetic manipulation for moral reasons to potential dangers and risks of the use of the science (Kloppenburg & Burrows, 1995). Some people are concerned that genetically modified organisms will be detrimental to other organisms in the environment or that genetically modified foods are unsafe to consume. Others fear that a few multinational firms that have invested in the majority of the biotechnology product development will monopolize the agricultural economy.

In order to address these concerns, educators should be aware of the confidence the public has in the integrity of different groups. Hoban and Kendall (1992) found that government and private companies are not trusted as much as university professionals, nutritionists, and environmental groups.

Theoretical/Conceptual Framework

Even though many high school agriculture education programs have infused instruction about biotechnology into their curriculum, national studies indicate that the changes in instruction are not keeping up with the technological advances in biotechnology. In 1999, the National FFA Organization commissioned the ABG Strategic Consulting firm to conduct survey

research related to the status of high school agricultural education. In the student analysis, most students who completed the survey responded that they had not heard of the word "biotechnology." After given the definition, they responded they had not been taught any concepts related to biotechnology in agricultural education.

As is frequently the case, education is the most powerful change agent for effecting changes of attitude and modification of behavior. Accordingly, teachers play a critical role. Finch, Schmidt & Faulkner (1992) hypothesized that teachers are a key element of educational change because they oversee what occurs in their classrooms. According to Fullan (1991), if teachers do not support the implementation of innovation, it may be doomed to failure.

On a similar note, Ross, Cornett & McCutchion (1992) suggested that a teacher's personal values and beliefs could determine what is taught in the classroom, including new curriculum. Interventions such as staff development should provide teachers with "internalization," which may lead to a desired change of attitude and modification of behavior as suggested by Fitch & Kopp (1990). However, Schommer (1988) hypothesized that adult learners may not respond to training because it does not reflect their epistemological beliefs. Certain beliefs and values can lead to a teacher's refusal to accept or use new technology.

An innovation was defined by Rogers (1995) as "an idea, practice or object that is perceived as new by an individual or other unit adoption" (p.11). In his innovation-decision process theory, Rogers (1995) hypothesized that an individual must first become aware of the innovation, form an attitude about the innovation, decide to adopt or reject the innovation, implement the idea and then confirm having made the right decision by adopting the innovation. He also believed that this entire process could be influenced by how the adopters perceive the innovation and their prior experiences dealing with the innovation.

Roger's (1995) innovative-decision process theory provides a conceptual framework for the need and purpose of this study. By describing the awareness and attitudes of high school agricultural and science educators about biotechnology, we can then describe where they are in the innovation-decision process and be better able to design training that will be inductive to biotechnology curriculum adoption.

Purpose and Objectives

The purpose of the study was to explore the attitudes of high school agricultural and science educators who had attended training and had not attended training about the use of biotechnology. The objectives of this study were to describe their awareness level of the uses biotechnology (awareness of innovation), and their attitudes about the use of biotechnology (forming an attitude).

Procedures

This was a descriptive study using responses from randomly selected teachers who had not attended biotechnology training and teachers who had self selected themselves to receive intensive technical training in agricultural biotechnology techniques.

The instrument was derived from Hoban and Kendall's (1992) "Consumer Attitudes about the Use of Biotechnology in Agriculture and Food Production," a USDA-Extension Service instrument that was reviewed by a national panel of experts for content validity and pilot tested twice by forty different randomly sampled consumers. Items were analyzed and subscales were created during the pilot analysis.

To control for history effect, thirty-six randomly selected teachers who had not attended training were surveyed twice over a two-week period. The stability of the questions related to teachers' attitudes was measured using the Product-Moment Correlation Coefficient (Pearson r). The initial pilot responses and the responses received two weeks later resulted in a coefficient of stability of r = .72, reflecting a high stability rate. At the conclusion of an intensive biotechnology training, fifty-six teachers were surveyed. Forty-eight of the respondents completed the entire survey instrument for a final response rate of 86%.

Limitations of the study included self-selection by the participants in the survey by the subjects attending the intensive biotechnology training. It is also recognized that the subjects who attended the training were there because of their interest and prior experiences with biotechnology. Therefore this study can not be generalized to all agricultural and science teachers.

The statistical analysis used to interpret the data included descriptive statistics to determine the mean, measure of variance (standard deviation) and frequencies of the items.

Findings

Respondents were asked " How much have you heard about biotechnology?' to determine how aware they were of biotechnology. Both groups of agricultural and science educators, those who attended training and those who had not attended training, possessed some awareness about biotechnology. Those that had attended training were very aware of biotechnology as shown in Figure 1. NOTE: In all of the following tables and charts, "Control" refers to educators who had had not attended training; "Treatment" refers to those who had attended training.

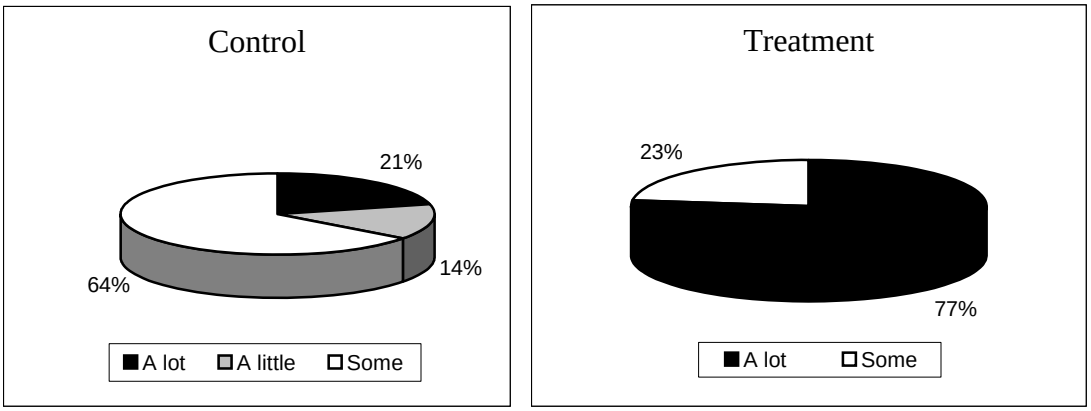

Figure 1. *Awareness of agricultural and science educators about biotechnology.*

As seen in Table 1, agricultural and science educator's attitudes toward the use of genetic engineering varied according to the reason the plant or animal product had been altered. A Likert scale of 1 (unacceptable) to 5 (acceptable) was used to survey the respondents. Both groups were accepting (a rating of 4 to 5) of genetic engineering to improve the production of plants and animals in agriculture. Some in both groups reflected neutral (a rating of 3) attitudes about the acceptance of the use of genetic engineering for the enhancement of food products. Overall, however, both groups were less accepting of the use of genetic engineering for the enhancement of food products.

Table 1:
Agricultural and science educators acceptance of the use of biotechnology to make different products.

	Control		Treatment	
	χ	SD	χ	SD
Plant Production				
ood crops that resist insect damage	4.50	.73	4.51	.71
otton plants that resist damage from the use of weed control chemicals	4.69	.60	4.53	.84
acteria that prevent frost damage to crops	4.44	.73	4.51	.89
Animal Production				
arm animals that resist disease	4.50	.73	4.43	.71
ompounds that increase milk production when given dairy cows	4.00	1.03	4.14	.98
Enhancement				
ompounds that produce less fatty meat when given to farm animals	4.00	.73	4.22	1.01
ood ingredients, such as flavorings	3.81	1.11	4.16	.85
ort fish that grow larger	3.50	1.10	4.16	.85

Scale: 1=Unacceptable to 5=Acceptable

The majority of agricultural and science educators in both groups believe the use of biotechnology will have a positive effect on food quality, fish and wildlife, the reduced use of pesticides, farmers' economic conditions, and environmental quality as seen in Figure 2. Both groups were most confident in the use of biotechnology to improve food and environmental

quality including a reduction in the use of pesticides and the least confident in the use of biotechnology to enhance fish and wildlife recreation.

The majority of participants who had not attended training did not believe genetic engineering would help improve the control of world population growth. The majority of those that attended training did feel biotechnology could improve the control of world population growth but this group had the least amount of confidence in this particular use of biotechnology.

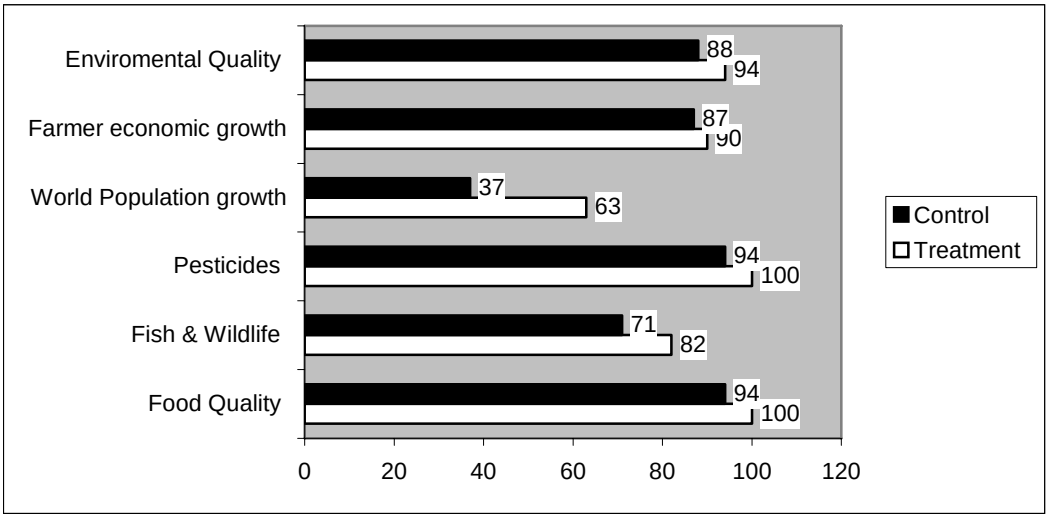

Figure 2. *Percentage of agricultural and science educators who responded positively toward the uses of biotechnology.*

Agricultural and science educators in both groups were accepting of the use of biotechnology to move genes from one plant to another, from animals to plants, and from animal to animal. Neither group was accepting of the transfer of genes from humans to animals. Those that had attended training were more accepting of the human to animal gene transfer. See Figure 3.

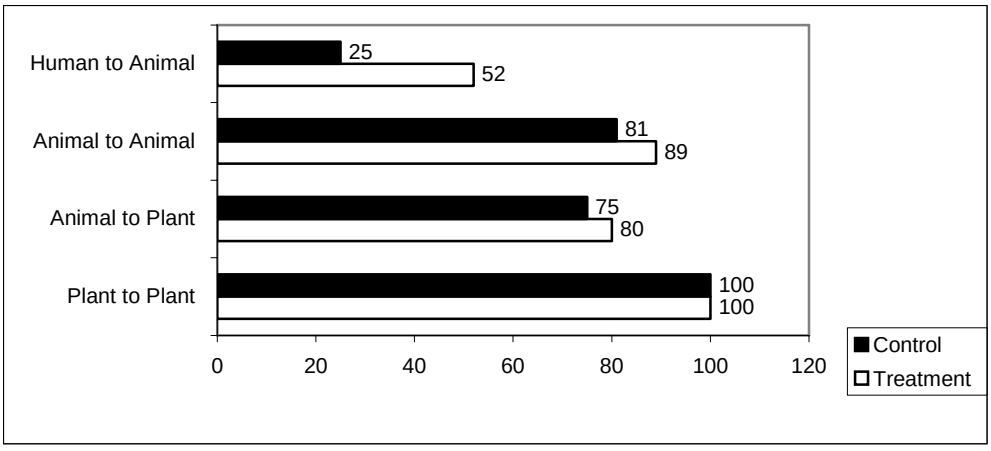

Figure 3. *Percentage of agricultural and science educators who responded positively toward the different types of transgenic biotechnology.*

The majority of agricultural and science educators who had received training and those who had not received training felt that the use of biotechnology to change plants and animals was morally acceptable. In both groups, more respondents were more morally accepting of the use of biotechnology to change plants than to change animals. See Figure 4.

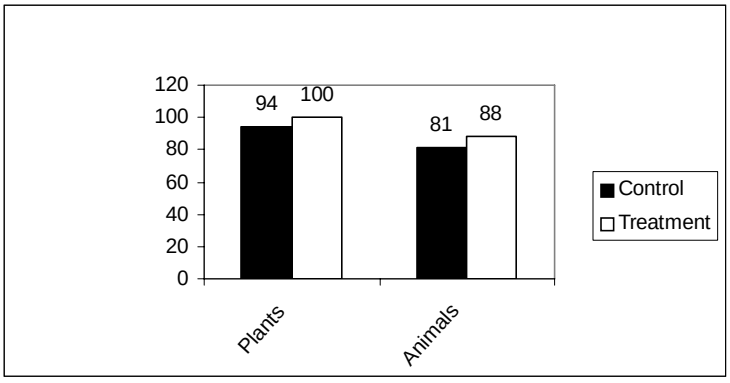

Figure 4. *Percentage of agricultural and science educators who responded they felt the use of technology to genetically engineer plants and animals was morally acceptable.*

Most agricultural and science educators in both groups thought that all types of information about biotechnology were very or somewhat important to them. Both groups placed high importance on information about the risks and benefits of biotechnology. Those who had attended training placed a higher importance on information about the new uses of biotechnology in food production and the basic science of biotechnology. See Table 2.

Table 2:
Agricultural and science educator's attitudes toward the importance of different types of information.

	Control		Treatment	
	χ	SD	χ	SD
otential risks or negative effects of biotechnology	3.00	.00	2.92	.27
otential benefits or positive effects of biotechnology	2.88	.34	2.96	.20
ow government regulates biotechnology	2.88	.34	2.80	.45
ew uses of biotechnology in food production	2.56	.63	2.82	.39
asic science behind biotechnology	2.06	.68	2.76	.43

Scale: 3=Very Important, 2=Somewhat Important, 1=Not Important

For these educators, university professors, county extension agents, and farmers were the most trusted sources of biotechnology information by both groups. Environmental groups and companies making biotechnology products were the least trusted sources of information. See Table 3.

Table 3*: Agricultural and science educator's attitudes toward their trust in sources of biotechnology information.*

	Control		Treatment	
	Mean	SD	Mean	SD
University professors	2.69	.48	2.60	.49
County Extension Agents	2.56	.51	2.42	.50
Farmers or farm groups	2.50	.52	2.32	.51
Federal government agencies	2.13	.72	2.24	.52
State government agencies	2.06	.68	2.24	.48
ompanies making biotechnology products	2.00	.52	2.08	.49
ood processors and manufacturers	1.88	.50	2.06	.42
Environmental groups	1.69	.60	1.78	.47

Scale: 3=A Lot, 2=Some, 1=None

Conclusions

Conclusions in this study should only be generalized to those participating in the study.

1. Those educators who had attended training were very aware of biotechnology, whereas those who had not attended training indicated some awareness about biotechnology. To raise the awareness of biotechnology, it is recommended that agricultural and science educators continue to receive intensive technical training in agricultural biotechnology techniques.
2. Both the Control and Treatment groups indicated their acceptance of genetic engineering to improve the production of plants and animals in agriculture but both groups were less accepting of the use of genetic engineering for the enhancement of food products and recreational wildlife. Technical training for agricultural and science educators should include the applications of biotechnology in agriculture to improve plant and animal production as both groups are more accepting of this technology.
3. Both groups believe the use of biotechnology will have a positive effect on food and environmental quality including reductions in the use of pesticides. Technical training for agricultural and science educators should include the applications of biotechnology in agriculture to increase the quality of food and the environment as both groups are more accepting of this technology.
4. Both groups were accepting of the use of biotechnology to move genes from one plant to another, from animals to plants, and from animal to animal. Neither group was accepting of the transfer of genes from humans to animals but it is interesting to note that those who received training were twice as likely to approve such transfers. More research should be conducted to determine if there is a correlation between the scientific training of agricultural and science teachers and their acceptance of the use of human genes in the genetic engineering of agricultural products.
5. Neither group felt the use of biotechnology to change plants and animals to be morally wrong. In both groups, more respondents were more accepting of the use of biotechnology to change plants than to change animals. Both groups thought that all types

of information about biotechnology were very or somewhat important to them. And both groups placed high importance on information about the risks and benefits of biotechnology. Interestingly, those who had attended training placed a higher importance on information about the new uses of biotechnology in food production and the basic science of biotechnology, suggesting that training might make a difference in attitude. Both groups identified university professors, county extension agents, and farmers as the most trusted sources of biotechnology information. This finding suggests that training designed and conducted by these sources might find the most accepting audiences among agricultural and science educators.

Implications

Biotechnology training for agricultural and science teachers should continue to focus on the awareness of individuals of the innovation as well as the development of their attitudes about the innovation. If technical training is provided, agricultural and science teachers are more likely to possess a higher level of awareness and more positive attitudes about non-conventional uses of biotechnology, such as food enhancement and human to animal gene transfer. As more biotechnology advances are made in agriculture, future training should be considered to promote acceptance of this new technology.

Teachers who already possess awareness of technology are more interested in new research and the basic science of the technology. Future training efforts should include new research in biotechnology and the scientific tools used in this technology. Training should also include the use of biotechnology to improve plant production, animal production, food quality and environmental quality as teachers are more accepting of these uses of biotechnology and may be more willing to adopt related curriculum.

Land grant universities and their extension services should consider providing biotechnology teacher training as part of their outreach programs. Agricultural and science teachers trust professors and extension agents and are most likely to attend training sponsored by these groups. Biotechnology has and will continue to change agriculture. If agricultural and science teachers are to prepare the next generation for a career in agriculture, they must be willing to adopt biotechnology curriculum. Agricultural and extension education can serve as an effective change agent in this innovation adoption process.

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Advising Components, Roles, and Perceived Level of Competence of University Faculty

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Abstract

The roles and expectations of faculty in advising both graduate and undergraduate students are changing throughout much of higher education. These changes are occurring so quickly and so dramatically that both faculty and administration are redefining their approach to advising. This study sought to determine the components, roles, and perceived level of competence of university faculty in regards to student advising. Results of the study showed that the majority of faculty perceived advising to be a component of the teaching load. However, only a small number of faculty have received any type of training in academic advising. This lack of formal preparation in advising issues did not affect faculty's perceived level of competence toward advising. Faculty placed the greatest importance on the traditional roles of meeting degree and program requirements, course scheduling, and career counseling. Faculty agreed that advising should be compensated in the promotion and tenure process, but were reluctant to base rewards on student evaluations of advising. Recommendations include to determine influences on faculty perceptions toward advising and to examine the most effective methods of providing faculty with professional development experiences in advising. Further study is needed to determine how faculty suggest advising be evaluated and rewarded.

Introduction/ Theoretical framework

Whereas the most often cited criterion for hiring faculty is expertise in subject matter, student advising is an expectation of faculty on many college and university campuses – and hopefully a positive experience for both the faculty member and students. However, most faculty enter into an advising role without any professional experience or preparation (Habley, 1997). Instruction in how to properly advise students in academic, personal, or career choices is generally not a component of most doctoral degree programs from which faculty members graduate. As such, faculty are often left with the formidable task of finding workable solutions via any avenue possible.

Although faculty are expected to be experts in their subject matter area, expectations to possess adequate advising skills are not considered at the same level of necessity. Yet many faculty are immediately placed in a position of being experts in advising and counseling students upon employment. Many students are incredulous that college advisors are not required somewhere in their educational preparation to have at least a basic course in advising strategies and techniques.

The extent to which teaching faculty should be expected to advise students continues to create rifts in the higher education community. Perhaps partly because of their self-perceived inadequacy in advising knowledge, many faculty retreat to their expertise in research and only teach in the most limiting of contexts (Hancock, 1996). Yet Boyer (1990) clearly expands the definition of the scholarship of teaching to include such activities as the advisement of students.

Academic advising is an on-going, active process involving the student, advisor, and institution – the primary goal of which is to assist students in the development and accomplishment of meaningful educational plans that are compatible with their life goals (Stull, 1997). While a daunting task for a trained faculty member, it is often an overwhelming task for a new or untrained one. Furthermore, this need for expertise transcends disciplinary lines.

The results of expecting unprepared faculty to advise students can be devastating to an institution and its instructional programs. Kennedy, Gordon, and Gordon (1995) reported that faculty contact plays a significant role in student attitudes toward college. Habley (1993) noted that advising contributes to overall student success. He further stated that faculty and administrators "recognize that students who formulate a sound educational/career plan based on their values, interests, and abilities will have an increased chance for academic success, satisfaction, and persistence. Academic advising remains the most significant mechanism available on most college and university campuses for aiding and abetting this important process" (p. 1).

Not only do the results of poor advising threaten the future of the food and fiber industry, it is also of major concern to the financial stability of institutions of higher learning. More students actually leave college before completing a degree than stay and graduate (Tinto, 1993). This loss of students translates into a substantial monetary loss by colleges of agriculture throughout the nation. Dyer, Lacey, and Osborne (1996) reported an 11 million-dollar loss at one institution because of student attrition. Glennen, Farren, and Vowell (1996) noted that

proper academic advising could improve the fiscal stability of institutions by increasing graduation rates.

Advising is an important component of the scholarship of teaching. The Texas Higher Education Coordinating Board (1996) reported 99% of their institutions considered advising to be an important component of faculty members' expectations. However, the Board also reported that all too often students are forced to "self-advise," emphasizing the need for proper faculty development in the area of advising.

Several authors have called for advising assistance programs for university faculty. Stull (1997) noted that university faculty must be trained in three areas: curricular and programmatic advising, career advising, and developmental advising. Crawford (1991) called for a university-wide review of the nature and structure of academic advising and the ability of faculty to complete this expectation. Stowe (1996) characterized advising as a unique opportunity for faculty to affect students' opportunities for success, not a chore of faculty.

Gordon (1992) noted several advantages of a faculty advising system, but also noted that many faculty are unclear as to the specific roles of advising. Whereas advising can include several different facets, O'Banion (1972) outlined various skills, knowledge, and attitudes that are required for good academic advising. However, according to several researchers (Fiddler & Alicea, 1996; Gordon, 1992; Petress, 1996), faculty need professional development to acquire these attributes.

Professional development opportunities are often not available to faculty. Habley and Morales reported that only about one-third of colleges and universities provide any type of professional development activities for advisors (Gordon, Habley, & Associates, 2000). Of those that do provide assistance, less than one-forth require faculty to participate in these activities. In addition, Habley and Morales also noted that most of the professional development assistance provided focuses solely on the communication of factual information from advisor to student, with little time (if any) devoted to development of advising concepts and relationship skills.

Though the need for faculty professional development in general is well documented, little information has been gathered about the specific needs of advisors. Habley (1997) suggested a three category approach to professional development of faculty advisors. Professional development in the first category would include concept components dealing with the definition of advising, student expectations, and rights and responsibilities of advisors and advisees. The second category would include information components discussing rules and regulations, program and course offerings, referral sources and services. The third category of professional development would address relationship components that would provide professional development in questioning techniques, discussion, and communication skills.

The impact of advising goes beyond that of student academic progress. Academic advising influences areas such as student retention, institution fiscal stability, and faculty perceptions (Glennen, et al., 1996; Stowe, 1996). A number of studies have identified advising as a frequent source of dissatisfaction among students, which is directly related to retention (Corts, Lounsbury, & Saudargas, 2000). Likewise, students feel strongly that interaction with

faculty has a positive influence on their attitude toward college (Kennedy, et al., 1995). This individual interaction (advising) may be a key to the success of many students.

Petress (1996) identified four major factors that affect a faculty member's self perceptions of his or her ability to advise: 1) how advisors interpret their advising role, 2) training and/or guidance that is provided to advisors, 3) expectations of administrators and colleagues for advisors, and 4) recognition or rewards available for competent or exemplary advising.

The theoretical framework for this study lies in Bandura's social-cognitive theory as adapted by Mager (1992). Mager noted that four conditions must be present in order for a person to successfully perform a task: skill, opportunity, a supportive environment, and self-efficacy. The university setting can provide the first three conditions. The fourth component, self-efficacy, is supplied by the faculty member. Mager noted that a person's self-efficacy can be improved through completion of tasks that allow a person to practice a certain skill. As adapted to this study, if faculty members feel as though they are adequately prepared to advise students, their levels of self-efficacy increase and the adviser feels comfortable in that role. By contrast, if the adviser feels inadequately prepared, it is likely that this lower level of self-efficacy will manifest itself in less favorable attitudes toward advising, and eventually in lower performance of task.

Many faculty are not afforded the opportunity to adequately prepare for future advising roles through their doctoral program course work. As such, faculty often rely on personal experiences to help them adequately meet the expectations of advising. This lack of formal instruction may often leave faculty members with low levels of self-efficacy, which according to Mager (1992), may severely limit their ability to perform.

Purpose and Objectives

The purpose of this study was to determine the attitudes, needs, and level of competence in advising as perceived by faculty of a college of agriculture at a land grant institution. The objectives of the study, stated as questions, were as follows:

1. How do faculty define advising in terms of rewards and time commitments?
2. What are the attitudes/perceptions of faculty toward student advising?
3. What is the perceived competence/preparation level of faculty to advise students?
4. What advising roles do faculty perceive to be most important?
5. What advising practices do faculty consider to be most useful?

Methods

This study used a descriptive survey research design. The population for the study was faculty with teaching appointments in a college of agriculture in a land grant institution. A random sample of 150 faculty (Gall, Borg, & Gall, 1996) meeting the population criteria was established using computer generated random numbers. Names and contact information of faculty were obtained from the university personnel office.

The study used a researcher-designed instrument to assess the attitudes, needs, and perceptions of faculty members toward advising. The mailed questionnaire used a 4-point Likert-type scale (1 = Strongly Disagree, 2 = Disagree, 3= Agree, 4 = Strongly Agree) to solicit responses. A 4-point scale was chosen to compel the respondent to express an opinion about the statement. Dillman (2000) noted that it is appropriate to pose attitudinal questions without giving the option of a neutral opinion or no opinion at all. In addition, each question was designed to be general enough that all faculty should have enough knowledge on the subject to form an opinion. Demographic questions were asked using open-ended and short-answer options.

Face and content validity was established by a panel of experts consisting of current and future faculty at two land grant universities. The instrument was pilot tested using a random sample of faculty not included in the study. The coefficient of internal consistency was established at $r = .94$ using the Spearman-Brown test for reliability.

In an attempt to reduce nonresponse error, a total of six respondent contacts were made (Dillman, 2000). Sixty-seven faculty returned questionnaires. Of these, 21 faculty asked to be removed from the sample for reasons such as "no advising responsibilities" and "not interested in participating." This somewhat low response rate was found to be similar to response rates found in other studies investigating faculty advising and other related topics (Jirojwong & Wallin, 2002; Klingele & Lyden, 2001; Madison & Huston, 1996; Milem, Berger, & Dey, 2000). However, due to the limited response rate from the multiple contacts with the sample, and negative feedback from sample respondents who expressed a desire to not be contacted again, it was reasoned that those faculty who responded represented respondents who were interested in advising. Cajoling a response from faculty who were not interested in advising would have yielded inappropriate data as noted by Miller & Carr (1997).

The results of the study were analyzed using SPSS software. Frequencies, standard deviations, percentages, and means were calculated for individual questions. Although by definition Likert-type scales produce ordinal data, results were treated as interval data for analysis and interpretation purposes. This procedure is commonly accepted in social science research, especially if data are categorized into equal intervals as was done in this study (Clason & Dormody, 1994).

Results

The first objective sought to describe how faculty define advising in terms of rewards and time commitments. Most respondents indicated that advising should be a component of promotion and tenure (93.5%), compensation (93.2%), and teaching FTE (90.9%). However, less than 32% of the respondents indicated that advising is currently valued in promotion and tenure decisions (see Table 1). Similarly, over 68% indicated that advising student organizations should be a factor in promotion and tenure, yet only 31% reported that it is currently considered.

There appears to be limited value placed upon the quality of advising. Only slightly more than half (52.2%) of respondents indicated that quality advising, as determined by student

advising evaluations, should be a component of faculty pay. Likewise, only slightly more than 73% of the respondents indicated that quality advising is valued by their department.

The second objective sought to describe attitudes/perceptions of faculty toward advising. All respondents (100%) indicated that advising is a good way to build rapport with students (see Table 2). In addition, almost all respondents indicated that advising plays an important role in recruiting (91.1%) and retaining students (97.9%). Likewise, over 95% indicated that students are more likely to change majors when they have negative advising experiences.

Advising graduate students appears to be held in higher esteem than advising undergraduate students. Whereas most respondents (85.8%) indicated that advising undergraduate students is a good use of their time, a larger percentage (97.9%) indicated that advising graduate students is a good use of faculty time. The same pattern of agreement prevailed on attitudes of advising as a scholarly activity. Whereas over 71% agreed that advising undergraduate students is a scholarly activity, more than 93% agreed that advising graduate students is scholarly.

Table 1
Faculty Definition of Advising in Terms of Rewards and Time Commitments (n = 46)

Statement	Agree[a]		Disagree[a]	
	f	%	*f*	%
Student advising should be a component of promotion and tenure review.	43	93.5	3	6.5
Student advising should be a component of faculty compensation.	41	93.2	3	6.8
The number of students advised should be a component of teaching FTE.	40	90.9	4	9.0
The advising of student organizations should be a component of teaching FTE.	33	75.0	11	25.0
Quality advising is valued in my department.	33	73.3	12	26.7
Advising student organizations should be a component of promotion and tenure review.	30	68.2	14	31.8
The quality of student advising, as determined by student advising evaluations, should be a component of faculty pay scale.	24	52.2	22	47.8
Faculty are provided enough time to adequately advise students.	14	31.8	30	68.2
Student advising is currently a valued component of promotion and tenure review.	14	31.8	30	68.2
Advising student organizations is currently a valued component of promotion and tenure review.	13	31.0	29	69.0

[a] *Means were indexed and categorized as follows: Disagree (M = 1.00 – 2.49), Agree (M = 2.50 – 4.00).*

Advising undergraduate students may be perceived as being more closely related to teaching than is advising graduate students. Most respondents disagreed with the statement that only faculty with teaching appointments should advise graduate students (86.4%) and student

organizations (83.3%). However, a majority of faculty (54.5%) agreed that only faculty with teaching appointments should advise undergraduate students.

The third objective sought to describe faculty preparation to advise students. In general, faculty perceived themselves to be competent and/or prepared to advise individual students on academic career decisions, but indicated a need for assistance in advising student organizations, in advising students on personal matters, and in the use of on-line advising technology (see Table 3).

Almost 98% of the respondents indicated that they felt comfortable working with students one-on-one. Most respondents also indicated a knowledge of where to find information on academic policies (91.2%), assisting students in planning class schedules (84.5%), locating campus resources (80%), and in helping students to make career choices (80%). Likewise, over 78% of the respondents considered their current level of expertise to be adequate. However, respondents did not perceive themselves to be as competent/prepared in advising student organizations (48.9%), using on-line advising tools (40%), or in their knowledge of legal issues concerning advising (22.2%).

Table 2
Attitudes / Perceptions of Faculty Toward Advising (n = 46)

Statement	Agree[a]		Disagree[a]	
	f	%	*f*	%
Advising students is an effective way to build rapport.	46	100	0	0.0
Advising graduate students is a good use of faculty time.	43	97.9	1	2.3
Advising plays an important role in retaining students.	44	97.8	1	2.2
Students are more likely to change majors when they have negative advising experiences.	43	95.6	2	4.4
Advising graduate students is a scholarly activity.	41	93.2	3	6.8
Advising plays an important role in recruiting students.	41	91.1	4	8.9
Advising undergraduate students is a good use of faculty time.	36	85.8	6	14.3
Advising student organizations is a good use of faculty time.	36	83.7	7	16.3
Advising students should be an expectation of all faculty.	33	81.0	8	19.0
Advising undergraduate students is a scholarly activity.	32	71.2	13	28.9
University faculty should be responsible for advising students regardless of pay.	25	58.1	18	41.9
Only faculty with teaching appointments should advise undergraduate students.	24	54.5	20	45.5
Students should utilize advising sessions with faculty on a walk-in basis.	12	30.0	28	70.0
Only faculty with teaching appointments should advise student organizations.	7	16.7	35	83.3
Only faculty with teaching appointments should advise graduate students.	6	13.6	38	86.4

[a] *Means were indexed and categorized as follows: Disagree (M = 1.00 – 2.49), Agree (M = 2.50 – 4.00).*

Only one-third (33.3%) of the respondents indicated they had received any type of professional training on how to advise and/or counsel students on academic and professional matters. A smaller percentage (10.9%) indicated they had received any training on how to advise students on personal matters. An equally low percentage (10.9%) indicated they had received any type of training in advising student organizations.

Over three-fourths of the respondents (77.8%) rated themselves as either "competent" or "very competent" in their knowledge of degree and/or program requirements (see Table 4). Likewise, faculty considered themselves as "very competent" or "competent" in assisting with course scheduling (77.2%), career counseling (75.5%), and industry/job market demands (77.8%). However, a total of 60% of the respondents rated themselves as either "not competent at all" or "somewhat competent" on dealing with students' personal issues. Likewise, over 64%

of the respondents also indicated limited expertise in advising students for financial assistance opportunities, and over 53% indicated a lack of competence in advising student organizations.

Table 3
Faculty Perceived Knowledge and Preparation for Advising (n = 46)

Statement	Agree[a]		Disagree[a]	
	f	*%*	*f*	*%*
I feel comfortable in communicating one-on-one with students.	45	97.9	1	2.2
I know where to find information on academic policies.	41	91.2	4	8.9
I feel competent in assisting students in planning schedules.	38	84.5	7	15.6
I am aware of campus resources to assist students who are in academic difficulty.	36	80.0	9	20.0
I feel competent in counseling students on making career choices.	36	80.0	9	20.0
My current level of expertise in advising students is adequate.	36	78.3	10	21.7
I feel competent in counseling students on personal matters.	26	59.1	18	40.9
I feel competent in advising student organizations.	22	48.9	23	51.1
I feel competent in using on-line advising tools.	18	40.0	17	60.0
I have received training in how to advise students on academic and professional matters.	15	33.3	30	66.7
I feel competent in my knowledge of legal issues concerning advising.	10	22.2	35	77.8
I have received training on how to counsel students on personal matters.	5	10.9	41	89.1
I have received training on how to advise student organizations.	5	10.9	41	89.1

[a] *Means were indexed and categorized as follows: Disagree (M = 1.00 – 2.49), Agree (M = 2.50 – 4.00).*

The fourth objective of the study sought to determine what advising roles faculty perceive to be most important. Index scores of respondent rankings were used to determine an overall ranking of advising roles.

Table 4
Faculty Perceived Advising Competence Level (n = 46)

Area of Advising	Not at all Competent		Somewhat Competent		Competent		Very Competent	
	f	%	*f*	%	*f*	%	*f*	%
Degree / Program Requirements	2	4.4	8	17.8	12	26.7	23	51.1
Course Scheduling	3	6.8	7	15.9	17	38.6	17	38.6
Career Counseling	0	0.0	11	24.4	19	42.2	15	33.3
Industry / Job Market Demands	4	8.9	6	13.3	23	51.1	12	26.7
Activities / Competitions	6	14.0	14	32.6	21	48.8	2	4.7
Personal Issues	3	6.7	24	53.3	16	35.6	2	4.4
Financial Assistance Opportunities	11	24.4	18	40.0	15	33.3	1	2.2
Student Organization Advising	16	35.6	8	17.8	14	31.1	7	15.6

As noted in Table 5, respondents considered three roles of advisers to be most important for student advising: helping students meet degree/program requirements, career counseling, and course scheduling. Assisting with student organizations, preparing students for activities/competitions, and assisting students with personal issues were ranked lowest.

Table 5
Rank Importance of Adviser Roles (n = 46)

Item	Undergraduate		Graduate	
	Rank	Index Score[a]	Rank	Index Score[a]
Degree/Program Requirements	1	307	1	324
Career Counseling	2	271	3	241
Course Scheduling	3	258	2	242
Scholarship/Financial Aid Counseling	4	171	5	153
Industry/Job Market Demands	5	148	4	185
Personal Issues	6	117	6	134
Activities/Competitions	7	115	7	120
Student Organization Advising	8	112	9	48
Other	9	0	8	88

[a] *An index score was calculated by reverse coding respondent ranking (e.g., 1 = 8 pts, 2 = 7 pts, etc.) and summing total points received by each item.*

The final objective of the study was to determine the most effective practices used by advisers. As indicated in Table 6, those practices were grouped into six categories: course scheduling, knowledge of the "system," student planning, technology, personal relationships with students, and strategies used in advising individual students. No practices were identified that dealt with advising student organizations.

Advisors appear to be relying more on the use of technology as a useful tool in advising. Many listed the use of e-mail distribution lists and e-mail reminders as an effective tool. Also,

several faculty have developed websites with important advising information for students. These websites were described as both genetic department advising sites as well as advisor made websites with specific information for their advisees.

Many faculty listed developing a personal relationship with their advisees as important. Practices such as being interested in each individual student's situation, being a good listener, and treating students with respect were listed as effective methods.

Respondents listed only a limited number of strategies for advising. Peer advising was found to be a practice that many found to be useful. This was accomplished through both group advising sessions and one-on-one interaction between students. Placing the responsibility of program planning on the student was also listed by several faculty. One method suggested for giving the student more responsibility was to have the student develop a course plan. This was suggested for advising both undergraduate and graduate students.

Table 6
Advising Best Practices

Category	Practice
Course Scheduling	Be available
	Schedule regular meetings with advisees
Knowledge of the "system"	Know available student services
	Know course and degree requirements
Student Planning	Students complete a plan of study
	Goal setting
	Keep compete records
	Regularly monitor student progress
	Regular evaluation of student progress
Technology	Use computer auditing system
	E-mail reminders
	Distribution lists
	Advising websites
Personal relationship with students	Be interested in the student
	Be a good listener
	Treat students with respect
	Be honest with students
	Use leading questions
	Counsel students on personal matters
Strategies used in advising individual students	Peer advising
	Project development
	Make student responsible for program
	Always suggest and discuss additional options

Conclusions / Implications / Recommendations

Overall, there appears to be a lack of understanding among respondents as to the definition of advising and the subsequent roles of faculty, as outlined by Glennen et al. (1996),

Habley (1993), Stickle (1982), Stowe (1996), and Stull (1997). Both undergraduate and graduate student advisors placed a great deal of importance on the traditional roles of assisting students in meeting degree and program requirements, course scheduling, and career counseling – the roles most generally associated with basic levels of advising. Other areas of student development were consistently ranked as less important. Focusing on academic issues does not preclude advisors from employing developmental advising techniques. The differentiation between developmental and prescriptive advising is made on the basis of how the different roles and duties are completed. It is recommended that programs be implemented to develop and expand faculty advising capacity.

Faculty perceive advising to be an element of faculty teaching load, value it as a component in promotion and tenure decisions, and expressed the opinion that it should be compensated. Faculty were reluctant, however, to base rewards on student evaluations of advising. Further study is warranted to determine how faculty suggest advising duties be evaluated and rewarded. Faculty perceive advising to be a good way to recruit and retain students, and to develop positive rapport with students. Almost all respondents indicated that negative advising experiences would likely cause students to change majors. Faculty should utilize this opportunity for rapport-building both on an individual basis and in advising student groups.

Faculty perceive undergraduate advising to be more closely tied to teaching than is graduate advising. In addition, advising graduate students seems to be held in higher esteem than is the advisement of undergraduate students. This may indicate a lack of understanding of the importance of advising, or may reflect an institutional hierarchy of research over teaching. Remediation may be warranted to emphasize the scholarship of teaching as outlined by Boyer (1990).

In general, faculty perceive themselves to be competent and/or prepared to advise students on items such as class scheduling and/or making career choices, but indicated a lack of expertise in advising student organizations, in advising students on personal matters, in dealing with various legal issues surrounding advising, and in the use of on-line advising technology. Even with these deficiencies, nearly 80% of the respondents considered their current level of expertise to be adequate. This may imply that faculty in this study define advising only as class scheduling and career preparation. Further research is needed to determine how faculty define their advising responsibilities.

Based upon Mager's theory of task performance, faculty in this study likely experience a high level of self-efficacy in the advising areas of scheduling and career guidance. In accordance with Mager's theory, faculty exhibited positive attitudes toward advising in these areas. According to Mager's theory, they would therefore be willing to advise students in these areas. However, faculty indicated a low level of self-efficacy in relating to students on a personal basis and in advising student organizations.

Although most faculty indicated they perceived their preparation to advise students as adequate, only one-third of the respondents indicated that they had ever received any type of preparation in advising strategies and/or techniques. The literature base suggests that these

perceptions of preparedness may be in error. According to Fiddler and Alicea (1996), Gordon (1992), and Petress (1996), training is necessary for faculty to gain the skills, knowledge, and attitudes required for good advising as outlined by O'Banion (1972). This situation may also exist as a result of a misunderstanding of exactly what constitutes student advising. As recommended earlier, professional development activities to acquaint faculty with the holistic responsibilities and duties of advising may be warranted.

Respondents considered three roles of advisers to be most important for both undergraduate and graduate student advising: helping students meet degree/program requirements, career counseling, and course scheduling. Advising student organizations, activities/competitions, and advising students on personal issues were viewed as the least important roles of advisers.

The request by numerous faculty to be removed from the study because of little or no interest in advising, and the resulting low response rate after six contacts, was surprising. Although not all nonresponse can be attributed to non-interest in advising, it does possibly signal a potential problem and lack of understanding of what constitutes advising. With so many studies showing that positive advising experiences aid in retaining students (Corts et al., 2000), disinterest among faculty in advising issues should be of great concern to college administration. This needs further study, thus it is recommended that this study be replicated on a national scale

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The Relationship Between Teacher Burnout And Student Misbehavior

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Abstract

This study examined the of seriousness at which agriculture teachers view the misbehavior of students enrolled in their agriculture programs today and sought to determine if the level of seriousness of student misbehavior in agricultural education has changed over time. The participants in the study were 165 agricultural education teachers in North Carolina, South Carolina, and Virginia. These teachers rated 77 misbehaviors according to how serious a problem it creates for them in their agriculture programs. No misbehaviors received a rating higher than 2.0 on a scale that had 4.0 as the critically disruptive behaviors. This indicates that student misbehavior is not a serious problem in agricultural education and that instruction is, at most, minimally disrupted. The teaching profession is one of the most visible professions in the world, and even though significant improvements have been made in student achievement, society continues to expect more from its teachers. As the gap widens between the public's expectations of education and the teachers ability to deliver that education, burnout will continue to be a concern. This study sought to determine the level of burnout experienced by agriculture teachers in three southeastern states using the Maslach Burnout Inventory – Educator's Survey. The study found that agricultural teachers experience moderate levels of emotional exhaustion, low levels of depersonalization in relationships with students, colleagues and others, and a high degree of personal accomplishment in their work. An agriculture teacher's gender, academic degree, field preparation method, and annual contract length do not seem to influence teachers' responses on each of the sub-scales of the Maslach Burnout Inventory nor do the size of the school, the type of community, and the size of the agricultural education department. The age and years of teaching experience of the agriculture teacher is related to depersonalization scores, but not to emotional exhaustion and personal accomplishment scores on the Maslach Burnout Inventory.

Introduction

Ask parents to identify the problems facing schools today, and they are likely to respond that a lack of discipline among students is a serious problem (Rose & Gallup, 2000). The public has identified discipline as a predominant problem in schools during the past 20 years and contends that stricter disciplinary measures are the essential factor in improving schools (Langdon & Vesper, 2000). The public perceives that managing student behavior is an important component of the teacher's duty (Pestello, 1989). Unfortunately, the physiological, cognitive and moral dimensions to behavior make it difficult for instructors to diagnose and treat misbehavior (Blakeney, 1990).

The job of being an agricultural education instructor is both demanding and challenging. Agriculture teachers draw upon physical, emotional and intellectual resources in order to be effective in the classroom (Cano, 1990). Teachers often find themselves working well beyond a 40-hour week as they supervise student projects, coach career development teams, evaluate student work and prepare lessons (Straquadine, 1990). The long hours at work, coupled with the stress of teaching could eventually lead to debilitating health problems (Vaughn, 1990). Furthermore, the hazards of laboratory instruction are aggravating stress factors that often lead to chronic health problems and absence from the classroom (Lee, 1990). As a consequence, agriculture teachers are prone to experience a condition called "burnout".

Much of the research in the area of burnout can be traced to Herbert Freudenberger, a psychologist practicing in New York during the 1960's and 70's, who used the term to describe the effects of overwork, exhaustion and frustration he experienced while operating a free clinic for drug users and indigent persons. Freudenberger (1974) defined the problem as one of chronic exhaustion and frustration resulting from continued devotion to a goal or principle that has failed to produce a corresponding reward

Theoretical/Conceptual Framework

Teacher burnout

Maslach (1981) defined burnout as a condition characterized by emotional exhaustion, depersonalization and loss of a sense of personal accomplishment. This condition evolves primarily in individuals who work in human services occupations such as education, social work, police and emergency services. Burnout is manifested in the following ways: work overload, lack of control over one's work environment, lack of community among teachers in the school, lack of fairness in work assignments and the uneven distribution or absence of rewards (Maslach, 1981). Teachers are agents of change for many social problems including drug and alcohol abuse, physical, and mental abuse among young people (Maslach, Jackson & Leiter, 1996). In addition to these problems, teachers are also expected to provide individualized instruction and enrichment activities even though 24% of America's classrooms are overcrowded (United States Department of Education, 2001). In the face of these challenging tasks, teachers must perform even though the necessary human and fiscal resources are often lacking (Maslach, Jackson & Leiter, 1996). Mullins (1993) reported that the daily job demands placed on teachers were major causes of unrelieved stress. In recent years, the credibility of teachers has been eroded as the public offers competing and often conflicting solutions to the problems of education (Gough,

2000). A consequence of these conditions has led teachers to leave the profession prematurely (Malach, Jackson & Leiter, 1996).

Student misbehavior

Student misbehavior can be defined as any behavior that interferes with the effectiveness of the teacher's instructional plan or a student's ability to learn (Stebbins, 1971). There are three variables in most instances of misbehavior: the student with the problem, the environmental conditions under in which the problem occurs, and the teacher (Debruyn, 1983). The variable that can be controlled with the greatest ease is the teacher's behavior. Thus, the teacher must not only diagnose the problem, but take steps to adjust instruction and interaction with students to deplete the inappropriate behavior (Debruyn, 1983). Students recognize that teachers play a major role in curtailing inappropriate behavior through the employment of effective instructional activities (Supapron, 2000; Doyle, 1986)

When misbehavior reaches a certain point, instruction fails to have its desired effect on the students. Recognizing the seriousness of behavior in the classroom is an essential part of teaching. Teacher-preparation programs should understand the problems confronting teachers in the classroom with regard to student misbehavior if instruction is to work and students are to learn. Providing teachers with valuable tools to manage student behavior effectively could slow the teacher attrition rate in agricultural education (Moore & Camp, 1979). Stebbins (1971) found that teachers rarely communicate among themselves to any depth about the subject of student misbehavior even though the stress generated by misbehavior was of greater concern than other working conditions (Abel & Sewell, 1999). Since most teachers spend the majority of their workday almost exclusively with pupils, most teachers tended to formulate their own definition of misbehavior and handle those misbehaviors accordingly (Borg & Riding, 1991).

Purpose

The purpose of this study was to determine if a relationship exists between student misbehavior and teacher burnout in agricultural education. To accomplish this, the study proposed to:

1. Assess the attitude of burnout of a sample population of agricultural education teachers through employment of the Maslach Burnout Inventory.

2. Assess the ability of agricultural education teachers to cope with student misbehavior through employment of a survey instrument. This instrument gathered data on teacher responses to 77 different behaviors exhibited by students.

3. Compare the findings from the two surveys to determine if student misbehavior and teacher burnout are correlated.

Procedures

This descriptive study utilized a proportional sample of 248 agricultural education instructors in three Southern states. The student misbehavior survey instrument developed and validated by Camp and Garrison (1984) served as the basis for instrument design. Additional refinements were made to the instrument based on the findings of Burnett and Moore (1988). The instrument gathered demographic data and asked respondents to rate 77 behaviors according to how serious a problem they created for them in their respective agriculture programs. Two statements were added regarding the unauthorized use of the Internet and the presence of plagiarism in student work (Vernon, Bigna, & Smith, 2001). The revised instrument generated a Cronbach's Alpha of .98. The rating scale ranged from 0 (Not a problem) to 4 (Critical – Behavior is unmanageable and instruction is halted)

The Maslach Burnout Inventory – Educator's Survey (MBI-ES) was the instrument used to determine the frequency of burnout in respondents. The MBI-ES is the predominant instrument used to assess burnout in teachers and educational administrators (Maslach, Jackson & Schwab, 1986). The MBI-ES consists of 22 statements describing the feelings an individual might have as a result of being over-stressed or burned out. Respondents were asked to indicate the frequency at which they experienced these feelings by selecting from a list of six response choices. that ranged from 0 (Never) to 6 (Everyday). The MBI-ES measures burnout on three sub-scales: Emotional Exhaustion – Chronic emotional fatigue resulting from counseling and teaching a large number of individuals on a continual basis; Depersonalization – An indifferent and negative attitude toward students characterized by the use of disparaging labels to describe students.; and Personal Accomplishment – The contribution a teacher makes for the well-being and intellectual advancement of students. Feelings of low personal achievement can lead to burnout. The response scale for personal accomplishment is different from the other two sub-scales because the scoring is reversed. That is, a score of less that 32 on the personal accomplishment sub-scale means a high degree of personal accomplishment. The response categories and their corresponding values for emotional exhaustion, depersonalization and personal accomplishment on the Maslach Burnout Inventory – Educators Survey (Maslach, Jackson & Leiter, 1996) are presented in Table 1. The individual scores for each question pertaining to a category of burnout are added together, resulting in the potential scores depicted in Table 1.

Table 1
Response Categories for Emotional Exhaustion, Depersonalization and Personal Accomplishment on the Maslach Burnout Inventory – Educators Survey

Response Category	Emotional Exhaustion	Depersonalization	Personal Accomplishment
High	27 or over	13 or over	0-31
Moderate	17-26	7-12	32-38
Low	0-16	0-6	39 or over

Note. The numerical values for the personal accomplishment subscale are reversed. A score of less that 31 on the personal accomplishment sub-scale indicates a high degree of personal accomplishment.

The MBI-ES is not designed to label individuals as burned out. Instead, it is most beneficial in identifying areas within the school system that would improve the working conditions for teachers. A study by Iwanicki and Schwab (1981) and Gold (1984) validated the three-factor structure of the instrument. Iwanicki and Schwab's (1981) measure of internal consistency yielded a Cronbach's Coefficient Alpha of .90 for Emotional Exhaustion, .76 for Depersonalization, and .76 for Personal Accomplishment. Gold's (1984) Cronbach's Coefficient Alpha yielded .90 for Emotional Exhaustion, .74 for Depersonalization, and .72 for Personal Accomplishment. This study yielded a Cronbach's Coefficient Alpha of .90 for Emotional Exhaustion, .75 for Depersonalization, and .77 for Personal Accomplishment.

A Pearson Product Moment Correlation was computed between the aggregate scores for each of the burnout sub-scales on the Maslach Burnout Inventory and the aggregate score on the misbehavior instrument. The agriculture teachers were mailed an introductory letter and survey instrument. Subsequent mailings to were made non-respondents and the final response rate was 67% (n = 165 respondents). Early responders (n = 127) were compared to late responders (n = 38) and no significant differences were found to exist (Miller & Smith, 1983).

Findings

Males made up 76% of the sample. Teachers with a degree in agricultural education comprised the majority of respondents (86.7%), and 48.5% had either earned an advanced degree beyond the baccalaureate level or had completed some type of post-baccalaureate work. One-third of all teachers in the sample (n = 109) held 12-month contracts. The largest groups of respondents teach were single-teacher programs (42.4%) and two-teacher programs (38.2%). Rural schools with enrollments between 1000 and 2000 students made up slightly more than half of the communities in which the agricultural education programs in this study were located. Seventy-six percent of the schools in the sample operated on a block-schedule format.

Agricultural education instructors and burnout

Using Maslach's scale as described in Table 1, 48% of the respondents reported a low degree of emotional exhaustion from their work. The mean score for respondents was 18.20 (SD = 10.47) indicating moderate emotional exhaustion. Almost 33% of participants experienced moderate degrees of emotional exhaustion and 19% reported a high degree of emotional exhaustion. However, at least a few times per month, some teachers in this study feel completely exhausted at the end of the school day (M=3.20, SD=1.62) and emotionally drained by the experience (M=2.91, SD=1.62). A few teachers also report that they believe they are occasionally putting too much effort into their work (M=2.76, SD=1.73). To an even lesser extent, teachers are finding themselves frustrated (M=2.35, SD=1.57) and burned out (M=1.88, SD=1.53) from the teaching experience. Finally, teachers rarely find themselves adversely reacting in situations where they must work with others (M=1.17, SD=1.27). Teaching and working with others is not overly stressful (M=.87, SD=1.06) to agricultural education teachers. Table 5 presents respondents' scores on emotional exhaustion on the job.

For depersonalization, the overall mean score for respondents was 5.96 (SD = 5.21). Sixty-four percent of respondents reported that they were experiencing a low degree of

depersonalization in their relationship with others (M=1.45, SD=1.45) while 24% reported moderate degrees of depersonalization and 12% reported high degrees of depersonalization. They perceived that students were blaming them for their problems only a few times during the academic year. Teachers rarely exhibited a callous attitude toward others (M=1.49, SD=1.69) and their concern that their teaching role was hardening their emotions was similarly infrequent (M=1.24, SD=1.54). An uncaring attitude toward students (M=.96, SD=1.37) and a disposition to treat students as impersonal objects (M=.95, SD=1.21) occurred in very rare instances. Table 6 shows the respondents' scores on depersonalization.

For personal accomplishment, the mean score for respondents was 8.04 (SD = 5.98). None of the individual respondents scores fell outside of the high personal accomplishment range on the scale. All of the scores were in the range identified by Maslach (1996) as indicative of high personal accomplishment. Teachers feel exhilarated by working with students and energetic about their work. They deal with emotional problems in a calm manner and are adept at expressing empathy towards students. They see themselves as being influential in helping students solve problems. Respondents believe they have accomplished many worthwhile things and are a positive influence in the lives of students. They also create a relaxed learning environment in which students can learn. Table 7 describes respondents' scores on personal accomplishment at work.

Agriculture teachers and student misbehavior

A majority of respondents did not find any of the 77 behaviors addressed by the questionnaire to be of such seriousness that the class was more than minimally disrupted. Overall, teachers perceived student behaviors to be relatively easy to manage. The item with the highest mean score was that students have a negative attitude toward school (M=1.88, SD = 1.06). This was followed closely by students talking without permission during a class or formal assembly (M=1.85, SD=0.90) and the students' failing to take responsibility for their actions (M=1.83, SD=0.97). Teachers also ranked highly the students' failure to bring essential materials to class (M=1.82, SD=0.94) as well as the tendency for students to act in a clowning or foolish fashion (M=1.73, SD=0.91). Teachers ranked certain passive misbehaviors higher than others, such as inattentiveness (M=1.57, SD=0.87) and a failure to complete in-class assignments (M=1.53, SD=0.87). Students also exhibited active misbehaviors such as interfering with the work of others (M=1.55, SD=0.79) and displaying hyperactivity (M=1.51, SD=0.84). On the scale used in the study, these ratings do not constitute serious misbehaviors. Table 2 depicts the mean scores for each item on the Maslach Burnout Inventory.

Table 2
Mean Scores of Respondents on Burnout SubScales

Item Description	Mean	SD
Emotional Exhaustion		
I feel used up at the end of the workday.	3.20	1.62
I feel emotionally drained from my work.	2.91	1.62
I feel I'm working too hard on my job.	2.76	1.73
I feel frustrated by my job.	2.35	1.57
I feel fatigued when I get up in the morning and have to face another day on the job.	2.15	1.67
I feel burned out from my work.	1.88	1.53
Working with people all day is really a strain for me.	1.17	1.27
I feel like I'm at the end of my rope.	1.11	1.25
Working directly with people puts too much stress on me.	.87	1.06
Depersonalization		
I feel students blame me for their problems.	1.45	1.45
I've become more callous toward people since I took this job.	1.49	1.69
I worry that this job is hardening me emotionally.	1.24	1.54
I don't really care what happens to some students.	.96	1.37
I feel I treat some students as if they were impersonal objects.	.95	1.21
Personal Accomplishment		
I feel exhilarated after working closely with my students.	1.54	1.49
I feel very energetic.	1.46	1.41
In my work, I deal with emotional problems very calmly.	1.45	1.54
I can easily understand how my students feel about things.	1.32	1.52
I have accomplished many worthwhile things in this job.	1.26	1.31
I deal very effectively with the problems of my students.	.90	1.32
I feel I'm positively influencing other people's lives through my work.	.87	1.17
I can easily create a relaxed atmosphere with my students.	.78	1.18

Note. 6 = Never; 5 = A few times a year or less;4 = Once a month or less; 3 = A few times a month; 2 = Once a week; 1 = A few times a week; and 0 = Everyday.

The least serious school rule violations observed by teachers included students bringing pornographic materials to school (M=.18, SD=0.38). Teachers also reported a low frequency of students bringing unauthorized persons onto campus (M=.26, SD=0.49). Other behaviors that occurred with such low frequency and intensity that they were unlikely to be a problem include political activism by students (M=.11, SD=0.46) and their participation in unauthorized political protests (M=0.007; SD=0.32). Very serious behaviors such as murder or attempting to commit murder (M=0.005; SD=0.44), and committing rape or attempting rape (M=0.008; SD=0.48) also occurred at a very low frequency. Table 3 lists the top 40 misbehaviors observed by respondents.

Table 3
The Description Of Misbehaviors And Their Rank and Mean

Description	Present Study n=165	
	Mean	Rank
Having a negative attitude toward school	1.88	1
Talking without permission	1.85	2
Failing to assume responsibility for actions	1.83	3
Failing to bring necessary materials to class	1.82	4
Displaying clownish and foolish behavior	1.73	5
Failing to follow instructions	1.68	6
Inattentiveness during class	1.57	7
Interfering with work of others	1.55	8
Failing to do in-class assignments	1.53	9
Being disrespectful toward other students	1.53	10
Displaying abnormally active behavior	1.51	11
Using profanity/abusive language	1.50	12
Absenteeism (truancy)	1.49	13
Failing to submit homework on time	1.48	14
Teasing others	1.46	15
Making inappropriate comments to others	1.45	16
Consuming food and/or beverages	1.44	17
Being dishonest toward teachers and others	1.44	18
Being disrespectful toward authorities	1.43	19
Exhibiting an ambivalent attitude	1.38	20
Abusing privileges	1.35	21
Failing to submit homework at all	1.35	22
Being tardy to school	1.35	23
Being tardy to class	1.34	24
Cheating on tests and in-class assignments	1.33	25

Note. 0 = Not a problem – never observed or is in no way a problem, 1 = Minor – behavior is easily managed and instruction is, at most, minimally disrupted, 2 = Moderate – behavior requires moderate effort to manage and instruction is, at most, moderately disrupted, 3 = Major – behavior is handled with great difficulty and instruction is, at most, severely disrupted, 4 = Critical – behavior is unmanageable and instruction is halted.

The Relationship Between Student Misbehavior and Teacher Burnout

The computation of the Pearson Product Moment Correlation Between The Aggregate Student Misbehavior Score and emotional exhaustion, depersonalization, and personal accomplishment scores did not yield any significant correlation. No significant relationship was found to exist between student misbehavior and teacher burnout.

Table 4
Pearson Product Moment Correlation Between The Aggregate Student Misbehavior Score and Emotional Exhaustion, Depersonalization, and Personal Accomplishment.

	Emotional Exhaustion	Depersonalization	Personal Accomplishment
Aggregate Student Misbehavior Score	-.016	.067	.059

*$p<.05$.

Conclusions/Discussion/Implications

In spite of personal and environmental conditions that place teachers at risk of burnout, agriculture teachers appear to be managing well. Agriculture teachers see themselves as energetic and engaged professionals who are accomplishing something worthwhile for the benefit of students. They work to create an environment where learning flourishes. Building rapport with students is important to teachers, and they consider it part of their to duty to help students develop coping mechanisms to deal with everyday problems. The best interests of the students are important. As teachers get older and more experienced in teaching, they tend to develop coping skills that alleviate work stress. This research study found that teachers tended to find ways to combat fatigue and to prevent treating students as impersonal objects. Teachers occasionally worry that students blame them for problems they are experiencing, and sometimes perceive that the job has caused them to become uncompassionate. Even though the results of this study suggest that as a whole, our teachers aren't burned out, the results of the study indicated a moderate level of emotional exhaustion. Generally, the more emotionally fatigued agriculture teachers become, the more likely their teaching performance is going to suffer (Brouwers & Tomic, 2000). However, the respondents in this study had very high scores on personal accomplishment, and as long as they are able to maintain that high degree of self-efficacy, the effects of emotional exhaustion should probably not be a cause for concern.

Generally, those students under the supervision of agriculture teachers are manifesting behavior that meets commonly accepted norms. This indicates that student misbehavior is not a serious problem in agricultural education and that instruction is, at most, minimally disrupted. The level of seriousness at which agriculture teachers view student misbehavior has not changed significantly over time.

The most serious behavior manifested by students in the year 2000 is a negative attitude toward school. This same behavior existed in 1988 (ranked 2nd) and in 1984 (ranked 3rd). However, there could be cause for concern when one realizes the previous number one problem in 1984 and 1988 "exhibiting an ambivalent attitude" has slid to a 20th place ranking. Is the "I don't care" attitude being replaced by a decidedly negative attitude? Students who exhibit an ambivalent attitude toward school generally have no polar opinion about school - they are unsure.

Implications And Recommendations

Some potential teachers (e.g., former state FFA officers, people with agricultural degrees working in industry.) have considered becoming certified to teach but have decided against teaching because they don't want to handle all those "unruly high school students". The reality is that high school students are not that unruly and the misbehaviors teachers can expect to handle are rather minor. This needs to be communicated clearly to potential teachers. The reality is that teachers have a high degree of satisfaction with their accomplishments, and burnout is not a major problem for those teachers who stay in the profession and develop coping mechanisms for student misbehavior.

In our teacher education classes, we need to instruct our students about the types of misbehaviors they can realistically expect to encounter while teaching. We should also provide them with suggestions and strategies for handling the top misbehaviors identified. If student-teachers know in advance that their students may have a negative attitude, will talk without permission, will clown around, etc., then they will be less inclined to take the problem personally and think they are the only ones with these types of problems. And they will be better prepared to handle these situations if they know they are coming.

Three suggestions are offered for further research:

1. Study the function of misbehavior. Denti (2002) suggests that misbehavior can be measured in four dimensions: form, frequency, duration, and intensity. This theory was not used in this study because the researchers chose to maintain consistency with two previous studies. This was necessary in order to make useful comparisons among the three studies. However, research on the function of misbehavior has merit and should be considered for further research.

2. Investigate student perceptions of misbehaviors. This study and the previous two asked agricultural teachers for their perceptions of student misbehaviors. It might be informative to ask the students. Do they identify the same behaviors as the teachers? Do they believe that these misbehaviors actually interfere with their ability to learn?

3. Study factors that increase the likelihood of burnout. Additional research might be useful in determining which individual factors and organizational factors increase or decrease the likelihood of burnout among teachers.

It is further recommended that researchers investigate the effects of induction programs for new agriculture teachers. Have induction programs successfully taught new teachers how to deal with the stress and demands of teaching agriculture, particularly for those teachers in year-round programs? It would be valuable to study the ways that teachers are socialized into the teaching profession and inoculated against common stress-causing agents. Finally, researchers should investigate burnout among teachers who have exited the profession. This study only examined those teachers still in the classroom. It would be beneficial to study those teachers who have left the profession to ascertain whether or not burnout was a contributing factor to their decision to leave.

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Attitudes of Mississippi Secondary Agricultural Science and Biology /Business Students Toward Information Technology

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Abstract

The purpose of this study was to determine the attitudes of secondary students enrolled in Agricultural and Environmental Science and Technology (AEST) programs and biology/business programs in Mississippi toward information technology. The population for the study consisted of 1,312 secondary students enrolled in Agricultural and Environmental Science and Technology (AEST) programs (N = 14) and Biology/Business programs (N = 14) from all geographical areas of Mississippi. Students had favorable attitudes toward information technologies. Information technology careers are exciting for everyone, including females and minorities. One does not need strong math skills or computer programming skills to be engaged in an IT career. Actively learning through the use of information technologies can help improve communication skills and develop marketable job skills. Females disagreed that IT jobs were only for males and individuals who possessed strong math skills. Caucasian students have an easier time completing their schoolwork because they have no problem accessing the Internet and feel comfortable using information technologies. Caucasian students enrolled in biology/business programs agreed that their parents think computers and information technologies are important subjects to learn. Teachers guiding AEST programs must be adequately prepared and skills in the use of information technologies if such programs are to be successful. Appropriate professional development opportunities should be provided to AEST teachers to keep them abreast of information technologies and their applications to agriculture. AEST programs should also develop career awareness opportunities for their students to promote information technology careers in agriculture.

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Introduction

Information Technology (IT) is a concept describing all aspects of managing and processing information. IT careers are based on computer technologies, the Internet, and networks concerned with creating, analyzing and accessing data for decision-making and problem solving. Information tools, such as personal computers and the Internet, are increasingly critical to economic success and personal advancement. The IT workforce is not just computer engineers and programmers, but individuals with a high skill level in information technologies. These careers require computer fluency--being able to interpret the information that technology makes available, understanding design concepts, and being a lifelong learner of technology that covers a wide range of subjects and careers other than computer science. Many IT workers design, develop, support and/or manage the IT systems found in careers related to agriculture. These applications range from record keeping, to making management decisions about fertilizer and pesticide applications, to determining livestock breeding programs, to using Global Positioning Systems (GPS) and Global Information Systems (GIS).

Individuals least likely access to technology is minorities living in rural communities. In Mississippi, twenty-five percent of the citizens live at or below the poverty level and nearly one in three children lives at or below the poverty level (US Census Bureau, 1998). However, Mississippi has the research and IT industry base, and public/private institutions to support information technology clusters (Mississippi Economic Council, 2000). Jackson, the state capital, has been recognized as a telecommunications hub for not only the state, but also the world (Doty, 2000). As a result, Mississippi can enhance the productivity of traditional industries and move toward a more competitive advantage within the region (Mississippi Economic Council, 2000). Such gains would be more attractive at the national level and could entice information technology businesses to locate in Mississippi, especially in rural areas. However, if Mississippi is to develop a competitive advantage in relation to IT, public school systems must educate and prepare students about information technologies.

Mississippi is a large, diverse state, with a vital agriculture industry making it a “major player” on the national and international scene. This fact, along with Mississippi’s information technology research and industry base, provided the impetus for the Mississippi State Department of Education to transform traditional “agriculture programs” into contemporary Agricultural and Environmental Science and Technology (AEST) programs with the latest agricultural science knowledge base and technological advancements during the late 1990s.

AEST introduces students to new technologies and instructional areas leading to careers in related industries. The curriculum is designed to start students with a broad knowledge base in agricultural production, food processing, plant genetics, environmental stewardship, and international trade. Subject matter areas are supported by a variety of information technologies required for accessing and analyzing information and solving problems. Emphasis is on an active learning environment enriched with technology and science based applications. The course serves as the entry-level course for the other courses in the AEST curriculum. The course consists of 13 units taught using computer modules and related activities. Students use the computers for obtaining instructional content, journaling, accessing World Wide Web sources, and submitting unit evaluations. Computers are used daily as an integral component of the

instructional program. Each unit explores current and emerging trends, technologies, and career opportunities associated with that unit. These programs are located in all areas of Mississippi, urban and rural, and have a significant percentage of females and minority students enrolled.

From an educational standpoint, information technologies have an effect on how people learn, what people know, and where people obtain knowledge and information (National Science Foundation, 2000). IT influences the creation of scientifically derived knowledge; how children learn in school; lifelong learning by adults; and the storage of a society's cumulative knowledge. IT can bring new information and types of instruction into the classroom; it can provide students with new tools for finding and manipulating information; and it can provide resources that are not available in a particular geographical area. All of this is dependent on the attitude individuals have toward information technologies and their impact on society.

Theoretical Framework

In the innovation-decision process individuals pass through a series of five stages when deciding whether or not to adopt a new product or innovation (Rogers, 1995). In the second stage individuals are to form an attitude toward the innovation. Fishbein and Ajzen (1975) refer to an attitude as a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object. An individual should already have knowledge and exposure to the innovation's existence. From that stage, individuals must be persuaded to form either a favorable or unfavorable attitude toward the innovation. In developing this attitude, individuals may mentally apply the new idea to their present or future situation before deciding whether or not to accept the innovation (Rogers, 1995). In this vicarious situation, individuals must think hypothetically and project the future to assist them with forward planning regarding the innovation. While the innovation may have a degree of uncertainty, individuals seeking to adopt a new innovation will want to know that their thinking is on the right track in comparison to their peers.

The main outcome should be the adoption or rejection of the innovation as long it is consistent with the attitude held (Rogers, 1995). This may not always be the case. While the formation of a favorable or unfavorable attitude may not lead to adoption or rejection respectively, the tendency is for attitudes and actions to become more consistent over time. Attitudes may also not be converted into action because communication channels used to help adopters make their decision are not utilized effectively.

Though the literature is void with respect of attitudes towards information technologies, numerous studies report attitudes towards computers and technology careers, which are a vital component of the information technology picture. Having an understanding of students' knowledge and attitudes are necessary and prerequisite to effective teaching about technology (Bame, Dugger, deVries, & McBee, 1993). However, it may be difficult for students to express their attitude towards technology because they may have neither an accurate nor a complete knowledge of such technology.

Secondary school students have mixed attitudes towards certain aspects of information technology. Houtz and Gubta (2001) found that 38 percent of Nebraska highs school students

had little or no interest in pursuing an information technology career. Sixty two percent had at least some interest in an IT career although only 9 percent indicated they were very interested. In a study by Bame, Dugger, deVries, and McBee (1993), 60 percent of males thought they would chose a technological profession while 66 percent of females said they would not seek a technological career.

Males are more interested in pursuing an IT or technology career than their female peers (Houtz & Gubta, 2001; Ratt & deVries, 1985) even though girls believe that technological fields are appropriate for both genders (Ratt & deVries, 1985). Furthermore, males also felt more confident in their ability to acquire the necessary technology skills (Houtz & Gubta, 2001). Brunner and Bennett (1987) and Ratt and deVries (1985) found that young women often feel they are not suited for technological careers because they are not whole-heartedly "for" technology.

Canada and Brusca (1991) discovered males expressed more interest in computers, less anxiety about mastering computers, a stronger belief that computer skills lead to respect from parents and peers, and a stronger belief that women cannot be as skilled with computers as men. Females with computer programming experience expressed similar levels of computer interest, self-confidence, and beliefs in gaining respect from computer mastery. Females also disagreed with the belief that women cannot be as skilled with computers as men. Attitudinal differences disappeared when both males and females had at least one class in computer programming.

Students who have enrolled in technology education programs and encountered a positive educational experience have developed favorable attitudes toward technology and the pursuit of technological careers (Ratt & deVries, 1985). Such results did occur in the Bosser, Palmer, and Daugherty (1998) for students who enrolled in a nine-week technology education course. It is hoped that AEST programs in Mississippi can have the same impact on the students who enroll in such courses to prepare individuals with the knowledge and skills to pursue careers in the information technology workforce.

In agricultural education, the literature is void of studies about the use and attitudes of computers by high school students. Numerous studies exist examining uses skills needed by and attitudes of computers at university settings by college students and faculty members or by secondary agriculture teachers. Monk, Davis, Peasley, Hillman, and Yarbrough (1996) recommended in their report that university students should be comfortable with computer and information technologies so they can develop new computer skills throughout their careers, implying computer skills and information technology skills are directly related to career success. A study by Kotrlik, Redmann, Harrison, and Handley (2000) focused on information technology professional development opportunities of Louisiana agriscience teachers and found that while teachers value information technology, they places less reliance on information technology training offered in university settings. Furthermore, these teachers, while having computers in their classrooms, really do not have all of the latest information technologies available, especially multimedia devices and electronic mail.

Purpose and Objectives

The purpose of this study was to determine the attitudes of secondary students enrolled in Agricultural and Environmental Science and Technology (AEST) programs and biology/business programs in Mississippi toward information technology. In addition, the study sought to determine the differences between selected student demographic characteristics and their attitudes toward information technology. Specifically, the objectives were:

1. To identify secondary students' level of agreement with statements regarding their attitudes toward information technology.
2. To determine relationships between selected demographic characteristics and secondary students' attitudes toward information technology.

Methods and Procedures

The population for the study consisted of 1,312 secondary students enrolled in either Agricultural and Environmental Science and Technology (AEST) programs (N = 14) or Biology/Business programs (N = 14) from all geographical areas of Mississippi. A census of all students from these 28 programs was used in the study.

During Spring Semester 2001, letters were sent to all 14 AEST teachers explaining the purpose of the study and outlining their duties related to the research project. Researchers visited each school and met with the teacher and administrator to discuss the project. The required procedures for the study were discussed and questions were answered. During this meeting AEST teachers and their administrators were asked to identify biology/business programs from a neighboring school district based on demographic characteristics, such as school size, ethnic makeup and school programs. Biology and business programs were used because the knowledge base and/or program content of these programs was similar to the knowledge base and program content of AEST programs. Biology/business teachers and administrators from these schools were contacted and asked to participate in the project. After meeting with the biology or business teachers and their administrators to explain the purpose of the study and outline their duties, all 14 biology/business programs agreed to participate in the study.

Data were collected through a questionnaire developed by the researchers. The questionnaire consisted of six parts. The part of the questionnaire used to collect data on students' attitudes toward information technology consisted of 23 statements. Students rated the 23 statements on a Likert-type scale as (1) Strongly Disagree, (2) Disagree, (3) Agree or (4) Strongly Agree to identify their attitude towards information technology. Students could also indicate they had no opinion towards each statement.

AEST and biology/business teachers agreeing to allow their classes to participate in the project checked the questionnaire for content validity. Teachers reviewed and edited the proposed instrument. Teachers also added and/or deleted items, recommended more appropriate wording, and suggested an appropriate instrument format. Final decisions were made by group consensus. Teachers also recommended procedures for data collection and suggested placing survey instruments on-line to expedite the data collection process. Face validity and reliability

of this part of the questionnaire were determined though a pilot test on state officer candidates attending the state FFA convention and re-administered at the state leadership conference. A test-retest reliability coefficient measuring .59 for this section of the instrument was calculated. Even though the reliability coefficient was low, such reliability coefficients are acceptable according to the recommendations by Nunnally and Bernstein (1994) for instruments that are developed and used for the first time.

Teachers were instructed to collect data between September 10 and September 21, 2001. Schools on block scheduling also collected data again in January 2002 for new students enrolling the respective AEST/biology/business courses. Seventeen of the 28 teachers utilized the online instruments and had their students complete the instruments on-line. The remaining 11 teachers were supplied with scanable instruments for data collection. AEST teachers surveyed all students enrolled in the Concepts of Agriscience Technology course while biology/business teachers surveyed introductory classes made up of 9th and 10th grade students.

Data were summarized using descriptive statistics. Frequencies, percentages, means, and standard deviations were used to describe demographic characteristics and attitudes towards information technology. The Chi square test for independence was used to determine if significant differences existed (alpha = .05) between selected demographic characteristics and attitudes toward information technology. Cramer's V was used to describe the magnitude of significant relationships.

Results

A census of 1,312 secondary students from 14 AEST programs and 14 biology/business programs in Mississippi were surveyed. From the population, 1,063 students completed the survey instrument, yielding an 81 percent response rate. Fifty two percent of those who responded to the instrument were male while 48 percent of the respondents were female. The research was designed to focus on students in the 9th and 10th grades. The majority of those who participated were 9th graders (53 percent) and 32 percent were 10th graders. Another 10 percent were in the 11th grade with only 5 percent in the 12th grade. Caucasians comprised 55 percent of the participants while African Americans comprised 42 percent. Hispanic Americans, Asian Americans, and individuals reporting to be of mixed ethnicity comprised the remaining 3 percent.

Attitudes Towards Information Technology

Respondents indicated how much they agreed or disagreed with a list of 23 Likert-type statements regarding their attitudes toward information technology. Their responses are presented in Table 1. Seventeen statements had a modal response category of "Agree." Three statements had a modal response category of "Strongly Disagree" while 2 statements had a modal response category of "Disagree." Once statement was bimodal, having equal responses on "Agree" and "Strongly Agree."

In this discussion, only statements with modes that included 50% or more of the responses will be discussed. Students agreed that "My information technology skills are

adequate for me to complete my schoolwork," (56%) and "As a result of using information technologies, my communication skills have gotten better" (50%). Students strongly disagreed with the statement " I think information technology careers are just for males" (59%).

Relationships By Gender

Significant relationships between gender and attitudes toward information technology, as determined by Chi square analyses, are reported in Table 2. All relationships were low (Cramer's V = .10 to .28) according to Davis' (1971) descriptors. Females indicated disagreement with the statements "I think information technology careers are just for males", "Information technology careers are only available to people with really good math skills", "I dislike working with information technologies", "An information technology career means only working with a computer" and "Information technology careers are boring".

Males and females tended to equally agree that "If more people used e-mail, our world could save valuable resources", "As a result of using information technologies, my communication skills have gotten better", "Careers in the information technology field sound exciting", "My parents think computers and information technologies are important subjects to learn", and "Using information technologies helps me develop marketable job skills".

Table 1
Mississippi High School Students' Attitudes Towards Information Technology (N = 1,063)

Statements Regarding Information Technology	Percentage				
	NO[a]	SD[a]	D[a]	A[a]	SA[a]
My information technology skills are adequate for me to complete my schoolwork.	13	3	8	56	20
I think information technology careers are just for males.	9	59	25	4	3
Completing my schoolwork with information technologies is easier than using paper and pencil.	10	6	16	43	25
Ethnic minorities could be very successful in an information technology career.	26	7	12	42	13
My community depends on information technology to conduct business daily.	17	7	16	45	15
I received enough instruction about the Internet before completing class assignments.	12	8	18	45	17
An information technology career means working only with a computer.	11	22	42	19	6
If more people used e-mail, our world could save valuable resources.	19	10	21	34	16
Information technology careers are boring.	16	27	36	15	6
I have no trouble accessing the Internet from my home.	12	11	14	32	31
Information technology careers are only available to people with really good math skills.	11	36	33	14	6
As a result of using information technologies, my communication skills have gotten better.	13	7	14	50	16
I have no trouble using e-mail programs.	8	10	12	35	35
Careers in the information technology field sound exciting.	14	7	18	44	17
I have no trouble accessing the Internet from my school.	9	8	17	40	26
I would like to find a job that allows me to use information technology on a daily basis.	17	9	21	36	17
My parents think computers and information technologies are important subjects to learn.	15	7	13	39	26
Information technology jobs do not mean you have to be a computer programmer.	13	7	12	47	21
Using information technologies helps me develop marketable job skills.	16	7	15	46	16
Learning with information technologies is more enjoyable than learning through traditional classroom instruction.	15	8	15	38	24
I am comfortable when using information technologies.	11	6	15	45	23
I dislike working with information technologies.	15	34	29	16	6
Females should look for information technology jobs.	25	10	11	34	20

[a] *NO = No Opinion, SD = Strongly Disagree, D = Disagree, A = Agree, SA = Strongly Agree*

Table 2
Relationship Between Gender[1] and Attitudes Toward Information Technology

Statement	Coefficient	Strength
I think information technology careers are just for males.	.28	Low
An information technology career means working only with a computer.	.17	Low
If more people used e-mail, our world could save valuable resources.	.11	Low
Information technology careers are boring.	.19	Low
Information technology careers are only available to people with really good math skills.	.18	Low
As a result of using information technologies, my communication skills have gotten better.	.10	Low
Careers in the information technology field sound exciting.	.10	Low
My parents think computers and information technologies are important subjects to learn.	.10	Low
Using information technologies helps me develop marketable job skills.	.10	Low
I dislike working with information technologies.	.14	Low

[1] *1 = Male, 2 = Female*

Differences By Ethnicity

Significant relationships between ethnicity and attitudes towards information technology, as determined by Chi square analyses, are reported in Table 3. All relationships were low (Cramer's V = .10 to .16) according to Davis' (1971) descriptors. Caucasians indicated agreement with the statements "Completing my schoolwork with information technologies is easier than using paper and pencil", "If more people used e-mail, our world could save valuable resources", "Careers in the information technology field sound exciting", "I would like to find a job that allows me to use information technology on a daily basis", "My parents think computers and information technologies are important subjects to learn", "I am comfortable when using information technologies", and "Females should look for information technology jobs", "I have no trouble accessing the Internet from my home", and "I have no trouble using e-mail programs". Caucasians indicated disagreement with the statement "Information technology careers are only available to people with really good math skills".

Table 3
Relationship Between Ethnicity and Attitudes Towards Information Technology

Statement	Coefficient	Strength
Completing my schoolwork with information technologies is easier than using paper and pencil.	.10	Low
If more people used e-mail, our world could save valuable resources.	.12	Low
I have no trouble accessing the Internet from my home.	.13	Low
Information technology careers are only available to people with really good math skills.	.10	Low
I have no trouble using e-mail programs.	.16	Low
Careers in the information technology field sound exciting.	.11	Low
My parents think computers and information technologies are important subjects to learn.	.14	Low
I am comfortable when using information technologies.	.11	Low
Females should look for information technology jobs.	.14	Low

[1]*1 = Caucasian, 2 = Minority*

Differences By Program Type

Significant relationships between program and attitudes towards information technology, as determined by Chi square analyses, are reported in Table 4. All relationships were low (Cramer's V = .10 to .13) according to Davis' (1971) descriptors. Students enrolled in biology/business programs indicated disagreement with the statements "I think information technology careers are just for males", "Information technology careers are only available to people with really good math skills", "I dislike working with information technologies", and "An information technology career means working only with a computer". Biology/business students indicated agreement with the statement "Information technology jobs do not mean that you have to be a computer programmer". Both groups indicated equal agreement on the statements "As a result of using information technologies, my communication skills have gotten better", "My parents think computers and information technologies are important subjects to learn", "I am comfortable when using information technologies", and "Females should look for information technology jobs".

Table 4
Relationship Between Program Type and Attitudes Towards Information Technology

Statements	Coefficient	Strength
I think information technology careers are just for males.	.16	Low
An information technology career means working only with a computer.	.11	Low
Information technology careers are only available to people with really good math skills.	.13	Low
As a result of using information technologies, my communication skills have gotten better.	.11	Low
My parents think computers and information technologies are important subjects to learn.	.11	Low
Information technology jobs do not mean you have to be a computer programmer.	.10	Low
I am comfortable when using information technologies.	.10	Low
I dislike working with information technologies.	.10	Low
Females should look for information technology jobs.	.10	Low

[1]*1 = AEST Program, 2 = Biology/Business Program*

Conclusions and Recommendations

Overall, students agree with a majority of the statements regarding their attitudes toward information technologies. Students agree that it was easier to complete their schoolwork using information technologies, that minorities and females should look for and can be successful in information technology careers, and that their communication skills have gotten better through the use of information technologies. Students have no problem securing Internet access, either at home or at school, and have no problem using e-mail programs. While students are comfortable in using information technologies, they believe IT careers are exciting and not boring, are not solely for males, and are not only for people with good math skills or computer programming skills. Students would like to find a job that requires the use of information technologies.

Findings from this study are congruent with those from Canada and Brusca (1991) and Ratt and deVries (1985) that females believe they can be just as skilled and successful as males in information technology careers. While Canada and Brusca (1991) found that males had more interest in and less anxiety about computers, this study found that females disagree that information technology careers are only for males. However, even though females agreed with that statement and believe such careers are exciting, the researchers cannot determine from this study if females would seek such a career. Further research is needed to determine if females would seek information technology careers.

While Houtz and Gubta (2001) found that high school students had little or no interest in pursing an information technology career, this study found that students agree that they wish to find a job that allows them to use information technologies on a daily basis. Furthermore, students in this study believed females should seek information technology jobs, a difference of opinion in what Bame, et. al. found when females said they would not seek information technology careers. AEST teachers should identify businesses within their communities that

require the use of information technologies on a daily basis and plan instructional activities geared at preparing students for job opportunities within the local community.

With data in this study being collected at the beginning of a course and/or semester, it is difficult to ascertain if enrolling in the AEST program helped students develop a favorable attitude towards information technologies and agricultural careers employing the use of information technologies like the AEST program is designed to do. Biology/business students having stronger levels of agreement or disagreement with statements regarding information technology evidence this. Data collected at the end of the course and/or semester will be a better indicator of whether or not the AEST program is reaching the goals it established.

Remembering what Bame, Dugger, deVries, and McBee (1993) say about understanding the attitudes of students as a prerequisite to effective teaching, what can agricultural educational professionals do to further promote IT careers in agriculture? Secondary agriculture teachers must be comfortable with the use of information technologies, as stated by Kotrlik, et. al. (2000). These teachers will be the individuals who will help secondary school students develop basic information technology skills needed to progress in agricultural careers, supporting the research by Monk, et. al. (1996) that students need to be comfortable with computer and information technology skills. Research should be conducted to determine teachers' skill levels and comfort with using information technologies and appropriate professional development opportunities should be developed to equip these teachers with the requisite skills needed to use and demonstrate information technologies with their students.

Parental and community input should be utilized when planning educational experiences for students to help them gain exposure to IT careers and the technologies available within the community. This can mean developing career awareness opportunities though career days or job shadowing experiences through a student's supervised agricultural experience program. Particularly, females and minorities employed in IT careers should be involved in such projects as we try to increase the number of females and minorities employed in the information technology workforce.

To lay the foundation for preparing students with favorable attitudes toward information technology, the agricultural education profession needs to understand the impact of information technology in agriculture. Research should be conducted to determine specific applications of information technology in agriculture. Furthermore, once these applications are identified, professional development workshops should be conducted for agricultural education teachers to help them understand and practice information technology applications in Mississippi.

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